World malaria report 2021

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Contents

Foreword

Dr Tedros Adhanom Ghebreyesus
Director-General
World Health Organization

This year's *World malaria report* surveys the extent of damage wrought by the COVID-19 pandemic to the global malaria response, and outlines what is needed to get back on track and accelerate progress in the fight against one of our oldest and most deadly diseases.

There were an estimated 14 million more malaria cases and 47 000 more deaths in 2020 compared to 2019, due to disruptions to services during the pandemic. However, things could have been far worse if not for the efforts of malaria endemic countries to maintain services.

Even before the pandemic, global progress against malaria had levelled off, and countries with a high burden of the disease were losing ground. Since 2015, the baseline of WHO's global malaria strategy, 24 nations have registered *increases* in malaria mortality. Now, critical 2020 milestones of WHO's global malaria strategy have been missed, and without immediate and dramatic action, the 2030 targets will not be met.

Compounding the need for urgent action, this report also includes sobering new estimates of malaria's toll on children under 5 years of age in sub-Saharan Africa, where a vast majority of malaria deaths occur each year. Using better data and more accurate methodology, it suggests the disease has claimed many more young lives over the past two decades than previously reported.

The situation now is especially precarious. Without accelerated action, we are in danger of seeing an immediate resurgence of the disease, particularly in Africa. As the report outlines, this is due to a convergence of threats – ranging from COVID-19 and Ebola outbreaks to flooding and other humanitarian emergencies – which have led to disruptions in malaria services in several high-burden African countries. The emergence of antimalarial drug resistance in East Africa is also a considerable concern.

Despite the challenges of COVID-19, we've also seen positive trends this year. In 2021, WHO certified two countries – China and El Salvador – as malaria-free, and a further 25 are on track to end malaria transmission by 2025.

This year will also be remembered for WHO's recommendation for broad use of the world's first malaria vaccine. If introduced widely and urgently, the RTS,S vaccine could save tens of thousands of children's lives every year.

Even so, we continue to need new tools to put an end to malaria, and more investment in research and development. We also need to use the funding we have more efficiently, while urgently mobilizing additional resources. The roughly US$ 3.3 billion spent fighting malaria in 2020 will need to more than triple in the next 10 years to successfully implement the global strategy.

Malaria has afflicted humanity for millennia. We have the tools and strategy now to save many lives – and with new tools, to start to dream of a malaria-free-world.

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Abbreviations and acronyms

ACT	artemisinin-based combination therapy
AIDS	acquired immunodeficiency syndrome
AL	artemether-lumefantrine
An.	*Anopheles*
ANC	antenatal care
ANC1	first ANC visit
AQ	amodiaquine
AS	artesunate
BCS	Blantyre coma score
C19RM	COVID-19 Response Mechanism
CDC	Centers for Disease Control and Prevention
CoD	cause of death
COVID-19	coronavirus disease
CQ	chloroquine
DDT	dichlorodiphenyltrichloroethane
DHA	dihydroartemisinin
dhfr	dihydrofolate reductase
DHIS2	District Health Information Software 2
dhps	dihydropteroate synthase
DHS	demographic and health surveys
E-2020	eliminating countries for 2020
E-2025	eliminating countries for 2025
EHS	essential health service
EUV	end-use verification
GDP	gross domestic product
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GMS	Greater Mekong subregion
GTS	*Global technical strategy for malaria 2016–2030*
HBHI	high burden to high impact
HIV	human immunodeficiency virus
HRP2	histidine-rich protein 2
iDES	integrated drug efficacy surveillance
IPTp	intermittent preventive treatment in pregnancy
IPTp1	first dose of IPTp
IRS	indoor residual spraying

ITN	insecticide-treated mosquito net
LMIC	low- and middle-income countries
MIS	malaria indicator surveys
MPAG	Malaria Policy Advisory Group
MQ	mefloquine
NIH	National Institutes of Health
NMP	national malaria programme
OECD	Organisation for Economic Co-operation and Development
P.	*Plasmodium*
PBO	piperonyl butoxide
PCR	polymerase chain reaction
pfhrp	*Plasmodium falciparum* histidine-rich protein
*Pf*PR	*Plasmodium falciparum* parasite rate
PMI	United States President's Malaria Initiative
PPQ	piperaquine
PQ	primaquine
PY	pyronaridine
R&D	research and development
RDT	rapid diagnostic test
RTS,S	RTS,S/AS01
SAGE	Strategic Advisory Group of Experts on Immunization
SARS-CoV2	severe acute respiratory syndrome coronavirus 2
SDG	Sustainable Development Goal
SMC	seasonal malaria chemoprevention
SP	sulfadoxine-pyrimethamine
TB	tuberculosis
TES	therapeutic efficacy studies
UHC	universal health coverage
United Kingdom	United Kingdom of Great Britain and Northern Ireland
US	United States
USA	United States of America
USAID	United States Agency for International Development
VCP	vector control products
WHO	World Health Organization

This year's report at a glance

KEY EVENTS IN 2020–2021

Service disruptions

- In April 2020, during the early months of the coronavirus disease (COVID-19) pandemic, analysis by the World Health Organization (WHO) and partners had projected a doubling of malaria deaths if the worst-case scenario of service disruptions occurred.
- With support from global, regional and national partners, countries have mounted an impressive response to adapt and implement WHO guidance to maintain essential malaria services during the pandemic.
- Overall, most malaria endemic countries experienced moderate levels of disruptions to the provision of malaria services.
- Of the 31 countries that had planned insecticide-treated mosquito net (ITN) campaigns in 2020, 18 (58%) completed their campaigns by the end of that year; 72% (159 million) of the ITNs from the planned campaigns had been distributed by the end of 2020.
- Thirteen of the 31 countries (42%) were left with 63 million ITNs that were initially planned for distribution in 2020 but spilled over to 2021. Among these 13 countries, six (46%) had distributed less than 50% of their ITNs by the end of 2020. By October 2021, only Kenya and South Sudan had not completed distribution of all spillover ITNs.
- Seasonal malaria chemoprevention (SMC) was distributed as planned in 2020, and an additional 11.8 million children were protected with SMC in 2020 compared with 2019, mainly because of the expansion of SMC to new areas in Nigeria.
- Planned indoor residual spraying (IRS) campaigns were also on target in most countries in 2020.
- Overall, survey and routine data suggest that there were moderate levels of disruption in access to clinical services in most moderate and high malaria burden countries in 2020.
- During the COVID-19 pandemic, up to 122 million people in 21 malaria endemic countries needed emergency relief due to other humanitarian emergencies unrelated to the pandemic.

Emergence of partial resistance to artemisinin in the WHO African Region

- Recent evidence of the independent emergence of artemisinin partial resistance in the WHO African Region is of great global concern.
- Artemisinin-based combination therapies (ACTs) remain efficacious in countries in this region; thus, there should be no immediate impact for patients.
- In the Greater Mekong subregion (GMS), artemisinin partial resistance is likely to have been involved in the spread of resistance to ACT partner drugs, and there are concerns that the same could happen in the WHO African Region.
- WHO will work with countries to develop a regional plan for a coordinated response to this threat. An immediate priority is to improve therapeutic efficacy and genotypic surveillance, to better map the extent of the resistance.

WHO recommendation on the use of the RTS,S/AS01 malaria vaccine

- In January 2016, WHO recommended further evaluation of RTS,S/AS01 (RTS,S) in a series of pilot implementations, to address several gaps in knowledge before considering wider country-level introduction.
- As part of the Malaria Vaccine Implementation Programme, in January 2016, WHO recommended the RTS,S malaria vaccine for pilot introduction in selected areas of three African countries: Ghana, Kenya and Malawi.
- Data from the pilot introductions have shown that the vaccine has a favourable safety profile; significantly reduces severe, life-threatening malaria; and can be delivered effectively in real-life childhood vaccination settings, even during a pandemic.
- On 6 October 2021, WHO recommended that the RTS,S malaria vaccine be used for the prevention of *P. falciparum* malaria in children living in regions with moderate to high transmission.

TRENDS IN THE BURDEN OF MALARIA

Malaria cases

- Globally, there were an estimated 241 million malaria cases in 2020 in 85 malaria endemic countries (including the territory of French Guiana), increasing from 227 million in 2019, with most of this increase coming from countries in the WHO African Region. At the *Global technical strategy for malaria 2016–2030* (GTS) baseline of 2015, there were 224 million estimated malaria cases.
- The proportion of cases due to *Plasmodium vivax* reduced from about 8% (18.5 million) in 2000 to 2% (4.5 million) in 2020.
- Malaria case incidence (i.e. cases per 1000 population at risk) reduced from 81 in 2000 to 59 in 2015 and 56 in 2019, before increasing again to 59 in 2020. The increase in 2020 was associated with disruption to services during the COVID-19 pandemic.
- Twenty-nine countries accounted for 96% of malaria cases globally, and six countries – Nigeria (27%), the Democratic Republic of the Congo (12%), Uganda (5%), Mozambique (4%), Angola (3.4%) and Burkina Faso (3.4%) – accounted for about 55% of all cases globally.
- The WHO African Region, with an estimated 228 million cases in 2020, accounted for about 95% of cases.
- Between 2000 and 2019, case incidence in the WHO African Region reduced from 368 to 222 per 1000 population at risk, but increased to 232 in 2020, mainly because of disruptions to services during the COVID-19 pandemic.
- The WHO South-East Asia Region accounted for about 2% of the burden of malaria cases globally. Malaria cases reduced by 78%, from 23 million in 2000 to about 5 million in 2020. Malaria case incidence in this region reduced by 83%, from about 18 cases per 1000 population at risk in 2000 to about three cases in 2020.
- India accounted for 83% of cases in the region. Sri Lanka was certified malaria free in 2016 and remains malaria free.
- Malaria cases in the WHO Eastern Mediterranean Region reduced by 38%, from about 7 million cases in 2000 to about 4 million in 2015. Between 2016 and 2020, cases rose by 33% to 5.7 million.
- Over the period 2000–2020, malaria case incidence in the WHO Eastern Mediterranean Region declined from 21 to 11 cases per 1000 population at risk. The Sudan is the leading contributor to malaria in this region, accounting for about 56% of cases. In 2020, the Islamic Republic of Iran had no indigenous malaria cases for 3 consecutive years.
- The WHO Western Pacific Region had an estimated 1.7 million cases in 2020, a decrease of 39% from the 3 million cases in 2000. Over the same period, malaria case incidence reduced from four to two cases per 1000 population at risk. Papua New Guinea accounted for nearly 86% of all cases in this region in 2020. China was certified malaria free in 2021 and Malaysia had no cases of non-zoonotic malaria for 3 consecutive years.

- In the WHO Region of the Americas, malaria cases reduced by 58% (from 1.5 million to 0.65 million) and case incidence by 67% (from 14 to 5) between 2000 and 2020. The region's progress in recent years has suffered from the major increase in malaria in the Bolivarian Republic of Venezuela, which had about 35 500 cases in 2000 and more than 467 000 cases by 2019. In 2020, cases reduced by more than half compared with 2019, to 232 000, owing to restrictions on movement during the COVID-19 pandemic and a shortage of fuel that affected the mining industry, which is the main contributor to the recent increase in malaria in the country. These restrictions may also have affected access to care, reducing cases reported from health facilities.
- Countries that experienced substantial increases in the region in 2020 compared with 2019 were Haiti, Honduras, Nicaragua, Panama and the Plurinational State of Bolivia.
- The Bolivarian Republic of Venezuela, Brazil and Colombia accounted for more than 77% of all cases in this region.
- Argentina, El Salvador and Paraguay were certified as malaria free in 2019, 2021 and 2018, respectively. Belize reported zero indigenous malaria cases for the second consecutive year.
- Since 2015, the WHO European Region has been free of malaria.

Malaria deaths

- In 2019, WHO updated the distribution of mortality in children aged under 5 years by cause of death (CoD). This affected the malaria CoD fraction, raising the point estimate of malaria mortality from 2000; however, this change has had little effect on trends in malaria mortality.
- Globally, malaria deaths reduced steadily over the period 2000–2019, from 896 000 in 2000 to 562 000 in 2015 and to 558 000 in 2019. In 2020, malaria deaths increased by 12% compared with 2019, to an estimated 627 000; an estimated 47 000 (68%) of the additional 69 000 deaths were due to service disruptions during the COVID-19 pandemic.
- The percentage of total malaria deaths in children aged under 5 years reduced from 87% in 2000 to 77% in 2020.
- Globally, the malaria mortality rate (i.e. deaths per 100 000 population at risk) halved from about 30 in 2000 to 15 in 2015 and then continued to decrease but at a slower rate, falling to 13 in 2019. In 2020, the mortality rate increased again, to 15.
- About 96% of malaria deaths globally were in 29 countries. Six countries – Nigeria (27%), the Democratic Republic of the Congo (12%), Uganda (5%), Mozambique (4%), Angola (3%) and Burkina Faso (3%) – accounted for just over half of all malaria deaths globally in 2020.
- Malaria deaths in the WHO African Region reduced by 36%, from 840 000 in 2000 to 534 000 in 2019, before increasing to 602 000 in 2020. The malaria mortality rate reduced by 63% between 2000 and 2019, from 150 to 56 per 100 000 population at risk, before rising to 62 in 2020.
- Cabo Verde and Sao Tome and Principe have reported zero malaria deaths since 2018.
- In the WHO South-East Asia Region, malaria deaths reduced by 75%, from about 35 000 in 2000 to 9000 in 2020.
- India accounted for about 82% of all malaria deaths in the WHO South-East Asia Region.
- In the WHO Eastern Mediterranean Region, malaria deaths reduced by 39%, from about 13 700 in 2000 to 8300 in 2015, and then increased by 49% between 2016 and 2020, to 12 300 deaths in 2020. Most of the increase was observed in the Sudan, where more than 80% of cases are due to *P. falciparum*, which is associated with a higher case fatality rate than *P. vivax* cases.
- In the WHO Eastern Mediterranean Region, the malaria mortality rate reduced by 50% between 2000 and 2020, from four to two deaths per 100 000 population at risk.
- In the WHO Western Pacific Region, malaria deaths reduced by 47%, from about 6100 cases in 2000 to 3200 in 2020, and the mortality rate reduced by 55% over the same period, from 0.9 to 0.4 malaria deaths per 100 000 population at risk. Papua New Guinea accounted for more than 93% of malaria deaths in 2020.
- In the WHO Region of the Americas, malaria deaths reduced by 56% (from 909 to 409) and the mortality rate by 66% (from 0.8 to 0.3). Most of the deaths in this region were in adults (77%).

Malaria cases and deaths averted

- Globally, an estimated 1.7 billion malaria cases and 10.6 million malaria deaths were averted in the period 2000–2020.
- Most of the cases (82%) and deaths (95%) averted were in the WHO African Region, followed by the WHO South-East Asia Region (cases 10% and deaths 2%).

Severe malaria

- Severe malaria is multi-syndromic and often manifests as cerebral malaria, severe malaria anaemia and respiratory distress.
- Mortality is high if severe malaria is not promptly and effectively managed.
- The distribution of severe malaria syndromes varies by age across transmission intensities, influenced mainly by changes in community-level immunity patterns.
- Secondary analysis of demographic and clinical data of children aged 1 month to 14 years from 21 surveillance hospitals in east Africa was conducted.
- Twelve of the sites were described as low transmission (*P. falciparum* parasite rate among 2-10 year olds [$Pf\mathrm{PR}_{2-10}$] <5%), five as low to moderate transmission ($Pf\mathrm{PR}_{2-10}$ 5–9%), 20 as moderate transmission ($Pf\mathrm{PR}_{2-10}$ 10–29%) and 12 as high transmission ($Pf\mathrm{PR}_{2-10}$ ≥30%).
- Across all transmission settings in east Africa, severe malaria was concentrated in children aged under 5 years, with the number of severe disease cases increasing with transmission intensity. Severe anaemia was the most common manifestation of severe malaria.
- Data on children aged under 15 years admitted with malaria to Manhiça District Hospital (Mozambique) during 1997–2017 were analysed. As transmission declined during this period, the mean age of malaria admission appeared to change, with a higher proportion of older children increasingly being admitted for severe malaria; however, most of the malaria deaths still occurred in children aged under 5 years, with the risk of death further concentrated in those aged under 3 years.

Burden of malaria in pregnancy

- In 2020, in 33 moderate and high transmission countries in the WHO African Region, there were an estimated 33.8 million pregnancies, of which 11.6 million (34%) were exposed to malaria infection during pregnancy.
- By WHO subregion, west Africa had the highest prevalence of exposure to malaria during pregnancy (39.8%), closely followed by central Africa (39.4%), while prevalence was 22% in east and southern Africa.
- It is estimated that malaria infection during pregnancy in these 33 countries resulted in 819 000 children with low birthweight.
- If all of the pregnant women visiting antenatal care (ANC) clinics at least once received a single dose of intermittent preventive treatment in pregnancy (IPTp), assuming they were all eligible and that second and third doses of IPTp (IPTp2 and IPTp3) remained at current levels, an additional 45 000 low birthweights would have been averted in these 33 countries.
- If IPTp3 coverage was to be raised to the same levels as that of ANC first visit coverage, and if subsequent ANC visits were just as high, then an additional 148 000 low birthweights would be averted.
- If IPTp3 coverage was optimized to 90% of all pregnant women, 206 000 low birthweights would be averted.
- Given that low birthweight is a strong risk factor for neonatal and childhood mortality, averting a substantial number of low birthweights will save many lives.

MALARIA ELIMINATION AND PREVENTION OF RE-ESTABLISHMENT

- Globally, the number of countries that were malaria endemic in 2000 and that reported fewer than 10 000 malaria cases increased from 26 in 2000 to 47 in 2020.
- In the same period, the number of countries with fewer than 100 indigenous cases increased from six to 26.
- In the period 2010–2020, total malaria cases in the 21 countries that were part of the "eliminating countries for 2020" (E-2020) initiative reduced by 84%.
- The Comoros, Mexico, the Republic of Korea, Nepal, Eswatini and Costa Rica saw a reduction of cases in 2020 compared with 2019, with reductions of 13 053, 262, 129, 54, 6 and 5, respectively. The following countries had more cases in 2020 than in 2019: South Africa (1367 additional cases), Botswana (715), Ecuador (131), Suriname (52), Saudi Arabia (45) and Bhutan (20).
- The Islamic Republic of Iran and Malaysia reported zero indigenous malaria cases for the third consecutive year. Timor-Leste reported zero indigenous malaria cases in 2018 and 2019; however, in 2020, three indigenous cases were reported following a malaria outbreak in the country.
- Azerbaijan and Tajikistan have officially made a formal request for malaria free certification.
- Building on the achievements of the E-2020 initiative, the new E-2025 initiative was launched, identifying a set of 25 countries with the potential to halt malaria transmission by 2025. All E-2020 countries that have not yet requested malaria free certification by WHO have automatically been selected to participate in the E-2025 initiative, along with eight additional countries: the Democratic People's Republic of Korea, the Dominican Republic, Guatemala, Honduras, Panama, Sao Tome and Principe, Thailand and Vanuatu.
- Between 2000 and 2020, in the six countries of the GMS – Cambodia, China (Yunnan Province), the Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam – *P. falciparum* indigenous malaria cases fell by 93%, while all malaria indigenous cases fell by 78%. Of the 82 595 indigenous malaria cases reported in 2020, 19 386 were *P. falciparum* cases.
- The rate of decline has been fastest since 2012, when the Mekong Malaria Elimination programme was launched. During this period, indigenous malaria cases reduced by 88%, while indigenous *P. falciparum* cases reduced by 95%.
- Overall, Myanmar (71%) and Cambodia (19%) accounted for most of the *P. falciparum* indigenous malaria cases in the GMS.
- This accelerated decrease in *P. falciparum* is especially critical because of increasing drug resistance; in the GMS, *P. falciparum* parasites have developed partial resistance to artemisinin, the core compound of the best available antimalarial drugs.
- Between 2000 and 2020, malaria transmission has not been re-established in any country that was certified malaria free.

HIGH BURDEN TO HIGH IMPACT APPROACH

- Since November 2018, all 11 high burden to high impact (HBHI) countries have implemented HBHI-related activities across the four response elements.
- In 2020 and 2021, WHO and the RBM Partnership to End Malaria supported countries to implement rapid self-evaluations on progress against the HBHI objectives across the four response elements.
- All HBHI countries mounted considerable efforts to maintain malaria services during the COVID-19 pandemic. SMC campaigns were delivered on time, and planned distribution of ITNs in 2020 was realized in most countries, despite delays.

- The results of the WHO pulse surveys on essential health services showed that HBHI countries reported moderate levels of disruption to access to malaria diagnosis and treatment (mostly of between 5% and 50%).
- Between 2019 and 2020, all HBHI countries except India reported increases in cases and deaths (and in India, the rate of reduction decreased compared with pre-pandemic years). Overall, malaria cases in HBHI countries increased from 150 million cases and 390 000 deaths in 2015, to 154 million cases and 398 000 deaths by 2019, and to 163 million cases and 444 600 deaths in 2020.
- By 2020, HBHI countries accounted for 67% and 71% of malaria cases and deaths, respectively; they also accounted for 66% and 67% of increases in malaria cases and deaths between 2019 and 2020, respectively.

INVESTMENTS IN MALARIA PROGRAMMES AND RESEARCH

- The GTS sets out estimates of the funding required to achieve milestones for 2020, 2025 and 2030. Total annual resources needed were estimated at US$ 4.1 billion in 2016, rising to US$ 6.8 billion in 2020. An additional US$ 0.85 billion is estimated to be required annually for global malaria research and development (R&D) during the period 2021–2030.
- Total funding for malaria control and elimination in 2020 was estimated at US$ 3.3 billion, compared with US$ 3.0 billion in 2019 and US$ 2.7 billion in 2018. The amount invested in 2020 fell short of the US$ 6.8 billion estimated to be required globally to stay on track towards the GTS milestones.
- The funding gap between the amount invested and the resources needed has widened dramatically over recent years, increasing from US$ 2.3 billion in 2018 to US$ 2.6 billion in 2019 and US$ 3.5 billion in 2020.
- Over the period 2010–2020, international sources provided 69% of the total funding for malaria control and elimination, led by the United States of America (USA), the United Kingdom of Great Britain and Northern Ireland (United Kingdom) and France.
- Of the US$ 3.3 billion invested in 2020, more than US$ 2.2 billion came from international funders. The highest contribution of bilateral and multilateral disbursements was from the government of the USA (US$ 1.3 billion) which was followed by Germany and the United Kingdom of about US$ 0.2 billion each, contributions of about US$ 0.1 billion each from France and Japan, and a combined US$ 0.3 billion from other countries that are members of the Development Assistance Committee and from private sector contributors.
- The highest share of contributions over the past 10 years from international sources came from the USA, the United Kingdom, France, Germany and Japan, followed by other donors.
- Governments of malaria endemic countries contributed almost a third of total funding in 2020, with investments nearing US$ 1.1 billion. Of this amount, an estimated US$ 0.3 billion was spent on malaria case management in the public sector and more than US$ 0.7 billion on other malaria control activities.
- Of the US$ 3.3 billion invested in 2020, almost US$ 1.4 billion (42%) was channelled through the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). Compared with 2019, the Global Fund's disbursements to malaria endemic countries increased by about US$ 0.2 billion in 2020.
- Of the US$ 3.3 billion invested in 2020, more than three quarters (79%) went to the WHO African Region, 7% to the South-East Asia Region, and 4% each to the Region of the Americas, Western Pacific Region and Eastern Mediterranean Region.
- Total R&D funding in malaria was US$ 619 million in 2020.

- The malaria R&D funding landscape has been led by investment in drugs (US$ 226 million, 37%), followed by basic research (US$ 176 million, 28%) and vaccine R&D (US$ 118 million, 19%). A further 10% went to vector control products (US$ 65 million). All other products saw smaller investments, including diagnostics (US$ 17 million, 2.7%), biologics (US$ 5.3 million, 0.9%) and unspecified products (US$ 12 million, 1.9%).
- Within the public sector and among all malaria R&D funders, the US National Institutes of Health (NIH) was the largest contributor in 2020, focusing just over half of its US$ 1.9 billion investment into basic research (US$ 1.02 billion, 54% of its overall malaria investment between 2007 and 2018).
- The Bill & Melinda Gates Foundation has been another major player, investing US$ 1.8 billion (25% of all malaria R&D funding) between 2007 and 2018, and supporting the clinical development of key innovations such as the RTS,S vaccine.
- With respect to the largest funders of malaria R&D, the top three – US NIH, Bill & Melinda Gates Foundation and industry – have remained steady, making up more than two thirds of investment in all malaria R&D in 2020 (US$ 422 million, 68%) as they did in 2019 (US$ 419 million, 66%), and retaining the top funder positions they have held since 2007.

DISTRIBUTION AND COVERAGE OF MALARIA PREVENTION

- Manufacturers' delivery data for 2004–2020 show that almost 2.3 billion ITNs were supplied globally in that period, of which 2 billion (86%) were supplied to sub-Saharan Africa.
- Manufacturers delivered about 229 million ITNs to malaria endemic countries in 2020. Of these, 19.4% were pyrethroid–piperonyl butoxide (PBO) nets (12.4% more than in 2019) and 5.2% were dual active ingredient ITNs (3.6% more than in 2019). About 91% of these ITNs were delivered to countries in sub-Saharan Africa.
- By 2020, 65% of households in sub-Saharan Africa had at least one ITN, increasing from about 5% in 2000. The percentage of households owning at least one ITN for every two people increased from 1% in 2000 to 34% in 2020. In the same period, the percentage of the population with access to an ITN within their household increased from 3% to 50%.
- The percentage of the population sleeping under an ITN also increased considerably between 2000 and 2020, for the whole population (from 2% to 43%), for children aged under 5 years (from 3% to 49%) and for pregnant women (from 3% to 49%).
- However, since 2017, indicators for ITN access and use in sub-Saharan Africa have been declining.
- Globally, the percentage of the population at risk protected by IRS in malaria endemic countries declined from 5.8% in 2010 to 2.6% in 2020. The percentage of the population protected by IRS has remained stable since 2016, with less than 6% of the population protected in each WHO region.
- The number of people protected globally fell from 161 million in 2010 to 127 million in 2015, and further declined to 87 million in 2020.
- The number of children reached with at least one dose of SMC steadily increased, from about 0.2 million in 2012 to about 33.5 million in 2020.
- In the 13 countries that implemented SMC, a total of about 31.2 million children were targeted in 2020. On average, 33.5 million children received treatment.
- Using data from 33 African countries, the percentage of IPTp use by dose was computed. In 2020, 74% of pregnant women used ANC services at least once during their pregnancy. About 57% of pregnant women received one dose of IPTp, 46% received two doses and 32% received three doses.

DISTRIBUTION AND COVERAGE OF MALARIA DIAGNOSIS AND TREATMENT

- Globally, 3.1 billion rapid diagnostic tests (RDTs) for malaria were sold by manufacturers in 2010–2020, with almost 81% of these sales being in sub-Saharan African countries. In the same period, national malaria programmes (NMPs) distributed 2.2 billion RDTs – 88% in sub-Saharan Africa.
- In 2020, 419 million RDTs were sold by manufacturers and 275 million were distributed by NMPs.
- More than 3.5 billion treatment courses of ACT were sold globally by manufacturers in 2010–2020. About 2.4 billion of these sales were to the public sector in malaria endemic countries; the rest were sold through either public or private sector co-payments (or both), or exclusively through the private retail sector.
- National data reported by NMPs in 2010–2020 show that 2.1 billion ACTs were delivered to health service providers to treat malaria patients in the public health sector.
- In 2020, some 243 million ACTs were sold by manufacturers for use in the public health sector; in that same year, 191 million ACTs were distributed to this sector by NMPs, of which 96% were in sub-Saharan Africa.
- Aggregated data from household surveys conducted in sub-Saharan Africa between 2005 and 2019 in 20 countries with at least two surveys (baseline 2005–2011, and most recent 2015–2019) in this period were used to analyse coverage of treatment seeking, diagnosis and use of ACTs in children aged under 5 years.
- Comparing the baseline and latest surveys, there was little change in prevalence of fever within the 2 weeks preceding the surveys (median 25% versus 20%) and in treatment seeking for fever (median 65% versus 69%).
- Comparisons of the source of treatment between the baseline and more recent surveys show that a median 62% versus 71% received care from public health facilities, and a median 40% versus 31% received care from the private sector. Use of community health workers was low in both periods, at a median of less than 2%.
- The rate of diagnosis among children aged under 5 years with fever and for whom care was sought increased considerably, from a median of 21.1% at baseline to 39% in the latest household surveys.
- Use of ACTs among those for whom care was sought also increased, from 39% at baseline to 76% in the latest surveys.
- Among those for whom care was sought and who received a finger or heel prick, use of ACTs was 29% in the most recent survey.

PROGRESS TOWARDS THE GTS MILESTONES OF 2020

- The GTS aims for a reduction in malaria case incidence and mortality rate of at least 40% by 2020, 75% by 2025 and 90% by 2030 from a 2015 baseline.
- The number of countries that achieved the GTS targets for 2020 was derived from official burden estimates, rather than from projections (as was done in the World malaria report 2020).
- This year, the estimates included the effect of disruptions of malaria services during the pandemic and were based on a new method for quantifying the malaria CoD fraction.
- Despite the considerable progress made since 2000, the GTS 2020 milestones for morbidity and mortality were not achieved globally.

- The malaria case incidence of 59 cases per 1000 population at risk in 2020 instead of the expected 35 cases per 1000 if the world was on track for the 2020 GTS morbidity milestone means that, globally, we are off track by 40%.
- Although relative progress in the mortality rate is greater than that of case incidence, the GTS target of 8.9 malaria deaths per 100 000 population at risk in 2020 was 42% lower than the mortality rate of 15.3 observed in the same year.
- Of the 93 countries that were malaria endemic (including the territory of French Guiana) globally in 2015, 30 (32%) met the GTS morbidity milestone for 2020, having achieved a reduction of 40% or more in case incidence or having reported zero malaria cases.
- Twenty-four countries (26%) had made progress in reducing malaria case incidence but did not achieve the GTS milestone.
- Thirty-two countries (34%) had increased case incidence and 17 countries (18%) had an increase of 40% or more in malaria case incidence in 2020 compared with 2015.
- In seven countries (7.5%), malaria case incidence in 2020 was similar to that of 2015.
- Forty countries (43%) that were malaria endemic in 2015 achieved the GTS mortality milestone for 2020, with 32 of them reporting zero malaria cases.
- Fifteen countries (16%) achieved reductions in malaria mortality rates but of less than the 40% target.
- Malaria mortality rates remained at the same level in 2020 as they were in 2015 in 14 countries (15%), whereas mortality rates increased in another 24 countries (26%), 12 of which had increases of 40% or more.
- The WHO South-East Asia Region met the GTS 2020 milestones for both mortality and morbidity. All countries in the region except Bhutan and Indonesia reduced case incidence and mortality by 40% or more.

BIOLOGICAL THREATS

Parasite deletions of *pfhrp2/3* genes

- Deletions in the parasite's *pfhrp2* and *pfhrp3* (*pfhrp2/3*) genes renders parasites undetectable by RDTs that are based on histidine-rich protein 2 (HRP2).
- WHO has recommended that countries with reports of *pfhrp2/3* deletions or neighbouring countries should conduct representative baseline surveys among suspected malaria cases to determine whether the prevalence of *pfhrp2/3* deletions causing false negative RDT results has reached a threshold for a change in RDT (>5% *pfhrp2* deletions causing false negative RDT results).
- Alternative RDT options (e.g. based on detection of the parasite's lactate dehydrogenase) are limited; in particular, there are currently no WHO-prequalified non-HRP2 combination tests that can detect and distinguish between *P. falciparum* and *P. vivax*.
- WHO is tracking published reports of pfhrp2/3 deletions using the Malaria Threats Map application, and is encouraging a harmonized approach to mapping and reporting of *pfhrp2/3* deletions through publicly available survey protocols.
- The WHO Malaria Policy Advisory Group released a statement calling for urgent action to address the increase in prevalence of *pfhrp2* deletions in all endemic countries, and particularly in the Horn of Africa.
- Between September 2020 and September 2021, investigations of *pfhrp2/3* deletions were reported in 17 publications from 13 countries. Among these studies, *pfhrp2* deletions were confirmed in Brazil, the Democratic Republic of the Congo, Djibouti, Ethiopia, Ghana, the Sudan, Uganda and the United Republic of Tanzania.

- Based on data from publications included in the Malaria Threats Map, some form of investigation has been conducted in 44 countries, among which the presence of deletions has been confirmed in 37.

Parasite resistance to antimalarial drugs

- Antimalarial drug efficacy is monitored through therapeutic efficacy studies (TES), which track clinical and parasitological outcomes among patients receiving antimalarial treatment.
- Artemisinin partial resistance is monitored using an established list of validated and candidate *PfKelch13* markers associated with decreased sensitivity to artemisinin.
- In the WHO African Region, the first-line treatments for *P. falciparum* include artemether-lumefantrine (AL), artesunate-amodiaquine (AS-AQ), artesunate-pyronaridine (AS-PY) and dihydroartemisinin-piperaquine (DHA-PPQ). TES conducted according to the WHO standard protocol between 2015 and 2020 have demonstrated high efficacy among ACTs used to treat *P. falciparum*. There is now evidence of the clonal expansion of *PfKelch13* mutations in Rwanda (R561H) and Uganda (C469Y and A675V). Treatment failure rates in Rwanda and Uganda remain below 10%, because the partner drug is still effective. Additionally, R622I, a candidate marker of artemisinin partial resistance, has been found in an increasing proportion of samples in the Horn of Africa, particularly in Eritrea. Further studies are needed to determine the extent of the spread of the *PfKelch13* polymorphisms in east Africa, and to investigate any changes to parasite clearance time and in vitro resistance.
- In the WHO Region of the Americas, first-line treatment for *P. falciparum* includes AL, artesunate-mefloquine (AS-MQ) and chloroquine (CQ). TES of AL conducted between 2015 and 2020 in Brazil and Columbia demonstrated high efficacy. There has been no increase in the prevalence of the C580Y mutation in Guyana.
- In the WHO South-East Asia Region, first-line treatments for *P. falciparum* include AL, AS-MQ, AS-PY, artesunate plus sulfadoxine-pyrimethamine (AS+SP) and DHA-PPQ. TES of AL conducted in Bangladesh, India and Myanmar between 2015 and 2020 found high efficacy with all treatments. In India, although treatment failure rates with AS+SP remained low, one study from Chhattisgarh State detected a high prevalence of *dhfr* and *dhps*, indicating decreased sensitivity to the partner drug, SP. TES of DHA-PPQ conducted in Indonesia and Myanmar demonstrated high rates of efficacy, with failure rates of less than 5%. In Thailand, where drug efficacy is assessed with integrated drug efficacy surveillance, treatment failure rates with DHA-PPQ plus primaquine in 2018, 2019 and 2020 were all less than 10%, except in Sisaket province, where failure rates were high. This led the province to change its first-line therapy to AS-PY in 2020.
- In the GMS, *PfKelch13* mutations associated with artemisinin partial resistance have reached high prevalence. Among samples collected in Myanmar and western Thailand between 2015 and 2020, PfKelch13 wild-type parasites were found in 65.5% of samples. Two mutations, R539T and C580Y, are prevalent throughout the GMS, with a higher prevalence in the eastern part of the subregion.
- In the WHO Eastern Mediterranean Region, AL and AS+SP remain efficacious in the countries that use them as first-line treatment.
- In the WHO Western Pacific Region, the first-line treatments include AL, AS-MQ, AS-PY and DHA-PPQ. TES conducted between 2015 and 2020 found high efficacy with AL, AS-MQ and AS-PY in all countries where studies were conducted. In Viet Nam, the first-line treatment of DHA-PPQ was replaced with AS-PY in provinces where high treatment failure rates were observed.
- Trends in antimalarial drug sensitivity in Cambodia continue to evolve: an analysis of molecular markers found that the percentage of samples with the PfKelch13 mutation C580Y and *Pfplasmepsin* multiple copy numbers is decreasing, whereas there is a high percentage of samples with *Pfmdr1* multiple copy numbers and *PfKelch13* wild type. The presence of Pfmdr1 multiple copy numbers has thus far not affected the efficacy of AS-MQ.
- All studies mentioned here have been published in the Malaria Threats Map.

Vector resistance to insecticides

- From 2010 to 2020, 88 countries reported data to WHO on standard insecticide resistance monitoring, including 38 on the intensity of resistance to pyrethroids, and 32 on the ability of PBO to restore susceptibility to pyrethroids.
- In 2020, new discriminating concentrations and procedures for monitoring resistance in malaria vectors against chlorfenapyr, clothianidin, transfluthrin, flupyradifurone and pyriproxyfen became available, and discriminating concentrations for pirimiphos-methyl and alpha-cypermethrin were revised. Countries should adjust their monitoring of insecticide resistance in malaria vectors to align with these new procedures. WHO has not received any vector resistance monitoring data for transfluthrin, flupyradifurone and pyriproxyfen. Although WHO has received some resistance monitoring data for chlorfenapyr and clothianidin, these data are insufficient to assess the potential presence of resistance to either of these two insecticides.
- Of the 88 malaria endemic countries that provided data for 2010–2020, 78 have detected resistance to at least one insecticide class in at least one malaria vector and one collection site; 29 have already detected resistance to pyrethroids, organochlorines, carbamates and organophosphates across different sites; and 19 have confirmed resistance to all these four classes in at least one site and at least one local vector.
- Globally, resistance to pyrethroids – the primary insecticide class currently used in ITNs – is widespread, being detected in at least one malaria vector in 68% of the sites for which data were available. Resistance to organochlorines was reported in 64% of the sites. Resistance to carbamates and organophosphates was less prevalent, being detected in 34% and 28% of the sites that reported monitoring data, respectively.
- Of the 38 countries that reported data on the intensity of pyrethroid resistance, high intensity resistance was detected in 27 countries and 293 sites.
- Since 2010, PBO has been observed to fully restore susceptibility in 283 sites across 29 countries.
- To guide resistance management, countries should develop and implement national insecticide resistance monitoring and management plans, drawing on the WHO *Framework for a national plan for monitoring and management of insecticide resistance in malaria vectors*. The number of countries that reported having such a plan increased from 53 in 2019 to 67 in 2020.
- Technical and funding support is required to support countries to monitor and manage insecticide resistance.
- Standard insecticide resistance data reported to WHO are included in the WHO global database on insecticide resistance in malaria vectors and can be explored via the Malaria Threats Map.

Avant-propos

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Le *Rapport sur le paludisme dans le monde* de cette année analyse l'impact de la pandémie de COVID-19 sur le contrôle du paludisme et examine les actions requises pour relancer, puis accélérer les progrès dans la lutte contre l'une des maladies les plus anciennes et les plus meurtrières.

En raison de la perturbation des services sanitaires pendant la pandémie, 14 millions de cas de paludisme et 47 000 décès supplémentaires ont été estimés en 2020 par rapport à l'année précédente. L'impact aurait été bien plus négatif encore, si les pays endémiques n'avaient pas réagi comme ils l'ont fait pour maintenir les services de santé.

Avant même cette pandémie, les progrès mondiaux contre le paludisme avaient marqué un coup d'arrêt, et les pays les plus durement touchés perdaient pied. Depuis 2015, année de référence de la stratégie mondiale de lutte contre le paludisme définie par l'OMS, 24 pays ont enregistré une *hausse* de la mortalité due au paludisme. Aujourd'hui, les objectifs importants fixés par la stratégie mondiale de l'OMS pour 2020 ont été manqués et, sans une action immédiate et spectaculaire, les cibles de 2030 ne seront pas atteintes.

Pour renforcer la nécessité d'une action urgente, ce rapport inclut également de nouvelles estimations qui donnent à réfléchir sur le poids du paludisme chez les enfants de moins de 5 ans en Afrique subsaharienne, là où surviennent la grande majorité des décès associés chaque année. Grâce à des données de meilleure qualité et à une méthodologie plus précise, le rapport suggère que la maladie a coûté la vie à beaucoup plus de jeunes au cours des deux dernières décennies que ce qui avait été précédemment rapporté.

La situation actuelle est particulièrement précaire. Si nous n'accélérons pas nos actions, nous risquons d'assister à une résurgence de la maladie dès maintenant, notamment en Afrique. Comme le souligne le rapport, cela est dû à une convergence de menaces (épidémies de COVID-19 et d'Ebola, inondations et autres urgences humanitaires) qui ont entraîné la perturbation des services antipaludiques dans plusieurs pays africains déjà durement touchés par le paludisme. L'émergence d'une résistance aux médicaments antipaludiques en Afrique de l'Est est également très préoccupante.

En dépit des difficultés liées à la pandémie de COVID-19, des résultats positifs ont été observés cette année. En 2021, deux pays, la Chine et le Salvador, ont été certifiés exempts de paludisme par l'OMS, et 25 autres pays sont en bonne voie pour interrompre la transmission du paludisme d'ici 2025.

Cette année restera aussi marquée par la recommandation de l'OMS d'une utilisation à grande échelle du premier vaccin antipaludique. S'il était introduit à grande échelle et en urgence, le vaccin RTS,S pourrait sauver chaque année des dizaines de milliers de vies parmi les enfants.

Nous avons néanmoins besoin d'autres outils pour mettre fin au paludisme, et davantage d'investissements sont nécessaires en matière de recherche et développement. Nous devons aussi utiliser plus efficacement les financements disponibles, tout en mobilisant de façon urgente des ressources supplémentaires. Les quelque US$ 3,3 milliards consacrés à la lutte contre le paludisme en 2020 devront plus que tripler au cours des dix prochaines années pour que la mise en œuvre de notre stratégie mondiale réussisse.

Le paludisme affecte l'humanité depuis des millénaires. Nous disposons aujourd'hui des interventions et de la stratégie nécessaires pour sauver de nombreuses vies et, grâce à de nouveaux outils, nous pouvons commencer à rêver d'un monde sans paludisme.

Le rapport de cette année en un clin d'œil

ÉVÉNEMENTS CLÉS EN 2020-2021

Perturbation des services

- En avril 2020, au cours des premiers mois de la pandémie de coronavirus (COVID-19), l'Organisation mondiale de la Santé (OMS) et ses partenaires avaient estimé que le nombre de décès dus au paludisme sera multiplié par deux dans le cas où il se produirait le pire des scénarios de perturbation des services.
- Grâce au soutien des partenaires internationaux, régionaux et nationaux, les pays ont répondu de façon impressionnante pour adapter et mettre en œuvre les directives de l'OMS sur le maintien des services antipaludiques essentiels pendant la pandémie.
- Le déploiement des services antipaludiques a connu des perturbations modérées dans la plupart des pays d'endémie palustre.
- Sur les 31 pays qui avaient prévu des campagnes de distribution de moustiquaires imprégnées d'insecticide (MII) en 2020, 18 (55 %) ont achevé leur campagne avant la fin de l'année ; 72 % (159 millions) des MII prévues pour distribution l'ont été avant la fin de l'année 2020.
- Cependant, 13 pays (42 %) se sont retrouvés en 2021 avec un total de 63 millions de MII initialement prévues pour distribution en 2020. Parmi ces 13 pays, six (46%) avaient distribué moins de 50 % de leurs MII à la fin de 2020. En octobre 2021, seuls le Kenya et le Soudan du Sud n'avaient pas achevé la distribution de toutes les MII prévues pour 2020.
- Les traitements de chimioprévention du paludisme saisonnier (CPS) ont été distribués comme prévu en 2020 et 11,8 millions d'enfants supplémentaires ont bénéficié de cette intervention en 2020 par rapport à 2019, principalement en raison de l'extension de la CPS à de nouvelles régions au Nigéria.
- Dans la plupart des pays, les campagnes de pulvérisation intradomiciliaire d'insecticides à effet rémanent (PID) ont également été déployées comme prévu en 2020.
- Dans l'ensemble, les données d'enquête et de routine suggèrent que les perturbations ont été modérées en 2020 en ce qui concerne l'accès aux services cliniques dans la plupart des pays où le paludisme sévit lourdement ou modérément.
- Pendant la pandémie de COVID-19, jusqu'à 122 millions de personnes dans 21 pays d'endémie palustre ont eu besoin d'une aide d'urgence en raison de crises humanitaires sans rapport avec la pandémie.

Émergence d'une résistance partielle à l'artémisinine dans la région Afrique de l'OMS

- Les données récentes faisant état de l'émergence indépendante d'une résistance partielle à l'artémisinine dans la région Afrique de l'OMS suscitent une grande inquiétude au niveau mondial.
- Les combinaisons thérapeutiques à base d'artémisinine (ACT) restent efficaces dans les pays de cette région ; dans l'immédiat, il ne devrait donc y avoir aucun impact pour les patients.
- Dans la sous-région du Grand Mékong, la résistance partielle à l'artémisinine a probablement joué un rôle dans la propagation de la résistance aux médicaments partenaires des ACT, et l'on craint un scénario similaire dans la région Afrique de l'OMS.
- Face à cette menace, l'OMS va travailler avec les pays pour élaborer un plan régional de réponse coordonnée. Une priorité immédiate est d'améliorer l'efficacité thérapeutique et la surveillance génotypique, afin de mieux identifier l'étendue de la résistance.

Recommandation de l'OMS sur l'utilisation du vaccin antipaludique RTS,S/AS01

- En janvier 2016, l'OMS a recommandé de poursuivre l'évaluation du vaccin RTS,S/AS01 (RTS,S) dans le cadre de projets pilotes visant à combler certaines lacunes dans nos connaissances scientifiques actuelles avant d'envisager une introduction plus large au niveau national.
- En janvier 2016 et dans le cadre du programme de mise en œuvre du vaccin antipaludique (MVIP), l'OMS a recommandé l'introduction pilote du vaccin antipaludique RTS,S dans des zones bien précises au Ghana, au Kenya et au Malawi.
- Les données issues des introductions pilotes ont montré que le vaccin présentait un profil d'innocuité solide, qu'il réduisait de manière significative le paludisme grave et potentiellement mortel, et qu'il pouvait être administré efficacement dans un contexte réel de vaccination des enfants et ce, même en période de pandémie.
- Le 6 octobre 2021, l'OMS a recommandé l'utilisation du vaccin RTS,S pour prévenir le paludisme à *P. falciparum* chez les enfants vivant dans des zones de transmission modérée à élevée.

POIDS DU PALUDISME : ÉVOLUTION DU NOMBRE DE CAS ET DE DÉCÈS

Cas de paludisme

- Au niveau mondial, le nombre de cas de paludisme est estimé à 241 millions en 2020 dans 85 pays d'endémie palustre (y compris le territoire de la Guyane française), soit une hausse par rapport aux 227 millions de 2000. La plupart des cas supplémentaires sont estimés dans la région Afrique de l'OMS. Lors de la définition de la *Stratégie technique mondiale de lutte contre le paludisme 2016-2030* ([le] GTS) en 2015, le nombre de cas de paludisme était estimé à 224 millions.
- Le pourcentage des infections à *Plasmodium vivax* a diminué, passant de 8 % (18,5 millions) en 2000 à 2 % (4,5 millions) en 2020.
- L'incidence du paludisme (i.e. nombre de cas pour 1 000 habitants exposés au risque de paludisme) a reculé au niveau mondial, passant de 81 en 2000 à 59 en 2015, puis 56 en 2019 avant d'augmenter à nouveau pour atteindre 59 en 2020. L'augmentation de 2020 est due à la perturbation des services durant la pandémie de COVID-19.
- Vingt-neuf pays ont concentré 96 % du nombre total de cas de paludisme dans le monde. Six d'entre eux ont enregistré, à eux seuls, près de 55 % des cas : le Nigéria (27 %), la République démocratique du Congo (12 %), l'Ouganda (5 %), le Mozambique (4 %), l'Angola (3,4 %) et le Burkina Faso (3,4 %).
- La région Afrique de l'OMS représente à elle seule environ 95 % (228 millions) des cas estimés en 2020.
- Dans la région Afrique de l'OMS, l'incidence du paludisme a baissé de 368 à 222 cas pour 1 000 habitants exposés au risque de paludisme sur la période 2000-2019 avant de remonter à 232 en 2020, principalement en raison de la perturbation des services pendant la pandémie de COVID-19.
- La région Asie du Sud-Est de l'OMS a concentré près de 2 % des cas de paludisme dans le monde. Le nombre de cas y a chuté de 78 %, passant de 23 millions en 2000 à environ 5 millions en 2020. De même, l'incidence du paludisme dans cette région a diminué de 83 %, avec quelque 18 cas pour 1 000 habitants exposés au risque de paludisme en 2000, contre 3 en 2020.
- L'Inde a représenté à elle seule 83 % des cas de paludisme dans la région. Le Sri Lanka a été certifié exempt de paludisme par l'OMS en 2016 et la transmission n'y a pas repris.
- Dans la région Méditerranée orientale de l'OMS, le nombre de cas de paludisme a baissé de 38 %, passant de près de 7 millions en 2000 à quelque 4 millions en 2015. Entre 2016 et 2020, il a augmenté de 33 % pour atteindre 5,7 millions.
- Sur la période 2000-2020, l'incidence du paludisme dans la région Méditerranée orientale de l'OMS a diminué de 21 à 11 cas pour 1 000 habitants exposés au risque de paludisme. Avec quelque 56 % des cas, le Soudan est le pays le plus touché dans cette région. En 2020 et pour la troisième année consécutive, la République islamique d'Iran a rapporté zéro cas de paludisme indigène.
- Dans la région Pacifique occidental de l'OMS, 1,7 million de cas ont été estimés en 2020, soit une baisse de 39 % par rapport aux 3 millions de 2000. Sur la même période, l'incidence du paludisme est passée de quatre à deux cas pour 1 000 habitants exposés au risque de paludisme. La Papouasie-Nouvelle-Guinée a enregistré près de 86 % des cas dans cette région en 2020. En 2021, la Chine a été certifiée exempte de paludisme par l'OMS et, pour la troisième année de suite, la Malaisie n'a rapporté aucun cas de paludisme humain en 2020.

- Dans la région Amériques de l'OMS, le nombre de cas de paludisme a diminué de 58 % (passant de 1,5 million à 0,65 million) et l'incidence du paludisme de 67 % (de 14 à 5) entre 2000 et 2020. Les progrès réalisés dans cette région ces dernières années ont souffert de la forte hausse du paludisme au Venezuela (République bolivarienne du), qui avait recensé près de 35 500 cas en 2000 contre plus de 467 000 en 2019. En 2020, le nombre de cas y a été réduit de moitié (232 000) par rapport à 2019 et ce, pour deux raisons principales : la limitation des déplacements due à la pandémie de COVID-19 et la pénurie de carburant ayant affecté l'industrie minière qui contribue grandement à l'augmentation du paludisme dans le pays. Cette limitation des déplacements peut avoir freiné l'accès aux soins, réduisant ainsi le nombre de cas de paludisme rapportés par les établissements de santé.
- Les pays dans lesquels les cas de paludisme ont fortement augmenté entre 2019 et 2020 sont les suivants : Bolivie (État plurinational de), Haïti, Honduras, Nicaragua et Panama.
- Le Brésil, la Colombie et le Venezuela (République bolivarienne du) ont concentré plus de 77 % des cas dans cette région.
- L'Argentine, le Salvador et le Paraguay ont respectivement été certifiés exempts de paludisme par l'OMS en 2019, 2021 et 2018.
- Depuis 2015, la région Europe de l'OMS est exempte de paludisme.

Mortalité associée

- En 2019, l'OMS a mis à jour la distribution de la mortalité par causes de décès chez les enfants de moins de 5 ans. Cette nouvelle méthode a eu une incidence sur la part des décès attribuables au paludisme, faisant remonter les estimations de mortalité depuis l'année 2000. Elle n'a cependant pas eu beaucoup d'effet sur les tendances de mortalité liée au paludisme.
- Au niveau mondial, le nombre de décès dus au paludisme a baissé de façon régulière sur la période 2000-2019, passant de 896 000 en 2000 à 562 000 en 2015, puis 558 000 en 2019. En 2020, les décès ont augmenté de 12 % par rapport à 2019 pour atteindre 627 000 ; 68 % (47 000) des 69 000 décès supplémentaires sont liés à la perturbation des services durant la pandémie de COVID-19.
- Les enfants de moins de 5 ans représentaient 87 % des décès associés au paludisme en 2000, contre 77 % en 2020.
- La mortalité associée au paludisme (à savoir le nombre de décès pour 100 000 habitants exposés au risque de paludisme) a diminué de moitié au niveau mondial, passant de 30 en 2000 à 15 en 2015. La baisse s'est poursuivie à un rythme plus modeste pour atteindre 13 en 2019, avant de remonter à 15 en 2020.
- Au niveau mondial, près de 96 % des décès dus au paludisme ont été enregistrés dans 29 pays. Six pays ont concentré un peu plus de la moitié des décès dus au paludisme dans le monde en 2020 : le Nigéria (27 %), la République démocratique du Congo (12 %), l'Ouganda (5 %), le Mozambique (4 %), l'Angola (3 %) et le Burkina Faso (3 %).
- Dans la région Afrique de l'OMS, le nombre de décès dus au paludisme a diminué de 36 %, passant de 840 000 en 2000 à 534 000 en 2019 avant de remonter à 602 000 en 2020. Sur la même période 2000-2019, la mortalité associée a baissé de 63 %, chutant de 150 à 56 décès pour 100 000 habitants exposés au risque de paludisme. En 2020, elle s'établit à 62.
- Depuis 2018, le Cabo Verde et Sao Tomé-et-Principe ont rapporté zéro décès lié au paludisme indigène.
- Dans la région Asie du Sud-Est de l'OMS, le nombre de décès dus au paludisme a diminué de 75 %, avec 35 000 décès en 2000 contre 9 000 en 2020.
- L'Inde a concentré environ 82 % des décès dus au paludisme dans la région Asie du Sud-Est de l'OMS.
- Dans la région Méditerranée orientale de l'OMS, le nombre de décès dus au paludisme a diminué de 39 %, passant de 13 700 en 2000 à 8 300 en 2015. Il a ensuite augmenté de 49 % entre 2016 et 2020 pour atteindre 12 300. La plus grande partie de cette augmentation a été observée au Soudan, où plus de 80 % des cas sont des infections à *P. falciparum* dont le taux de létalité est supérieur aux infections à *P. vivax*.
- Dans la région Méditerranée orientale de l'OMS, la mortalité liée au paludisme a baissé de moitié entre 2000 et 2020, passant de 4 à 2 décès pour 100 000 habitants à risque.
- Dans la région Pacifique occidental de l'OMS, le nombre de décès dus au paludisme a diminué de 47 %, passant de 6 100 en 2000 à 3 200 en 2020. Sur la même période, la mortalité associée a baissé de 55 %, chutant de 0.9 à 0,4 décès pour 100 000 habitants exposés au risque de paludisme. Dans cette région, la Papouasie-Nouvelle-Guinée a enregistré près de 93 % des décès dus au paludisme en 2020.

- Dans la région Amériques de l'OMS, le nombre de décès dus au paludisme a diminué de 56 % (909 contre 409) et la mortalité associée de 66 % (0,8 contre 0,3). La plupart des décès (77 %) dans cette région ont été enregistrés parmi les adultes.

Nombre de cas de paludisme et de décès évités

- Selon les estimations, 1,7 milliard de cas de paludisme et 10,6 millions de décès associés ont été évités dans le monde entre 2000 et 2020.
- La plupart des cas (82 %) et des décès (95 %) évités l'auraient été dans la région Afrique de l'OMS, suivie par la région Asie du Sud-Est (10 % des cas et 2 % des décès).

Paludisme grave

- Les syndromes de paludisme grave sont multiples, souvent un paludisme cérébral, une anémie palustre grave et une détresse respiratoire.
- La mortalité est élevée si le paludisme grave n'est pas pris en charge, et traité rapidement et efficacement.
- Les syndromes de paludisme grave varient selon l'âge et l'intensité de la transmission, et dépendent principalement des changements de types d'immunité au niveau communautaire.
- Une analyse secondaire a été réalisée à partir des données démographiques et cliniques des enfants âgés de 1 mois à 14 ans provenant de 21 hôpitaux de surveillance en Afrique de l'Est.
- Douze des sites ont été décrits comme ayant une faible transmission (prévalence parasitaire à *P. falciparum* [*Pf*PR$_{2-10}$] < 5%), cinq comme ayant une transmission faible à modérée (*Pf*PR$_{2-10}$ comprise entre 5 % et 9 %), 20 comme ayant une transmission modérée (*Pf*PR$_{2-10}$ comprise entre 10 % et 29 %) et 12 comme ayant une transmission élevée (*Pf*PR$_{2-10}$ supérieure ou égale à 30 %).
- Dans toutes les zones de transmission d'Afrique de l'Est, le paludisme grave était concentré chez les enfants de moins de 5 ans, le nombre de cas de maladie grave augmentant parallèlement à l'intensité de la transmission. L'anémie sévère était la manifestation la plus courante du paludisme grave.
- Les données sur les enfants de moins de 15 ans admis pour paludisme à l'hôpital du district de Manhiça (Mozambique) entre 1997 et 2017 ont également été analysées. La transmission du paludisme ayant diminué sur cette période, l'âge moyen des enfants admis a évolué, avec un plus fort pourcentage d'enfants plus âgés admis pour un paludisme sévère. La plupart des décès dus au paludisme étaient cependant toujours recensés chez les enfants de moins de 5 ans, avec un risque de décès encore supérieur parmi les enfants de moins de 3 ans.

Poids du paludisme pendant la grossesse

- En 2020, sur les 33,8 millions de femmes enceintes vivant dans 33 pays de la région Afrique de l'OMS où la transmission est modérée à élevée, 11,6 millions (34 %) ont été exposées à une infection palustre durant leur grossesse.
- En détaillant les sous-régions de l'OMS, l'Afrique de l'Ouest a affiché la plus forte prévalence d'exposition au paludisme durant la grossesse (39,8 %), suivie de près par l'Afrique centrale (39,4 %), alors que la prévalence était de 22 % en Afrique de l'Est et en Afrique australe.
- Conséquence de ces infections pendant la grossesse, 819 000 enfants ont présenté un faible poids à la naissance dans ces 33 pays.
- Si toutes les femmes enceintes se rendant au moins une fois à une consultation prénatale recevaient une seule dose de traitement préventif intermittent pendant la grossesse (TPIp), en supposant qu'elles soient toutes éligibles et que le taux de couverture en TPIp par deux et trois doses restait aux niveaux actuels, 45 000 cas de faible poids à la naissance auraient été évités dans ces 33 pays.
- Si la couverture en TPIp par trois doses atteignait le taux de couverture des soins prénataux (une visite), et si ce taux de couverture était maintenu pour les consultations prénatales suivantes, 148 000 enfants supplémentaires ne présenteraient pas un faible poids à la naissance.
- Si 90 % des femmes enceintes recevaient trois doses de TPIp, 206 000 enfants supplémentaires ne présenteraient pas un faible poids à la naissance.
- Éviter l'insuffisance pondérale à la naissance, qui représente un risque important de mortalité néonatale et infantile, permettrait de sauver de nombreuses vies.

ÉLIMINATION DU PALUDISME ET PRÉVENTION DE SA RÉAPPARITION

- Au niveau mondial, le nombre de pays où le paludisme était endémique en 2000 et qui ont rapporté moins de 10 000 cas a augmenté, passant de 26 en 2000 à 47 en 2020.
- Au cours de la même période, les pays comptant moins de 100 cas de paludisme indigène sont passés de 6 à 26.
- Sur la période 2010-2020, le nombre total de cas de paludisme dans les 21 pays « visant l'élimination du paludisme d'ici 2020 » (initiative E-2020) a diminué de 84 %.
- Les Comores, le Mexique, la République de Corée, le Népal, Eswatini et le Costa Rica ont signalé moins de cas en 2020 qu'en 2019, avec respectivement 13 053, 262, 129, 54, 6 et 5 cas en moins. À l'inverse, les pays suivants ont rapporté davantage de cas en 2020 qu'en 2019 : l'Afrique du Sud (1 367 cas supplémentaires), le Botswana (715), l'Équateur (131), le Suriname (52), l'Arabie saoudite (45) et le Bhoutan (20).
- La République islamique d'Iran et la Malaisie ont rapporté zéro cas de paludisme indigène pour la troisième année consécutive. Le Timor-Leste avait rapporté zéro cas de paludisme indigène en 2018 et 2019, mais trois cas de paludisme indigène ont été signalés en 2020 suite à une flambée épidémique dans le pays.
- L'Azerbaïdjan et le Tadjikistan ont déposé une demande formelle de certification.
- S'appuyant sur les succès de l'initiative E-2020, la nouvelle initiative E-2025 a été lancée avec 25 pays ayant le potentiel pour interrompre la transmission du paludisme d'ici 2025. Tous les pays de l'initiative E-2020 n'ayant pas encore déposé une demande formelle de certification par l'OMS ont été automatiquement sélectionnés pour participer à cette nouvelle initiative, ainsi que les huit pays suivants : Guatemala, Honduras, Panama, République dominicaine, République populaire démocratique de Corée, Sao Tomé-et-Principe, Thaïlande et Vanuatu.
- Dans les six pays de la sous-région du Grand Mékong (Cambodge, Chine [province du Yunnan], Myanmar, République démocratique populaire lao, Thaïlande et Viet Nam), le nombre de cas de paludisme indigène à *P. falciparum* a diminué de 93 % entre 2000 et 2020, alors que le nombre total de cas de paludisme indigène a chuté de 78 %. Sur les 82 595 cas de paludisme indigène rapportés en 2020, 19 386 étaient dus à *P. falciparum*.
- Ce recul s'est accéléré depuis 2012, date à laquelle le programme « Mekong Malaria Elimination » (MME) a été lancé. Durant cette période, le nombre de cas de paludisme indigène a diminué de 88 % et les cas de paludisme indigène dus à *P. falciparum* ont baissé de 95 %.
- Dans l'ensemble, le Myanmar (71 %) et le Cambodge (19 %) ont concentré une large majorité des cas de paludisme indigène à *P. falciparum* dans la sous-région du Grand Mékong.
- Cette accélération de la baisse des cas dus à *P. falciparum* est particulièrement importante du fait de la résistance accrue aux médicaments. En effet, dans la sous-région du Grand Mékong, les parasites *P. falciparum* ont développé une résistance partielle à l'artémisinine, le composant principal des meilleurs médicaments antipaludiques disponibles.
- De 2000 à 2020, la transmission du paludisme n'est réapparue dans aucun des pays préalablement certifiés exempts de paludisme.

APPROCHE « HIGH BURDEN TO HIGH IMPACT »

- Depuis novembre 2018, les 11 pays de l'approche « high burden to high impact » (HBHI) ont mis en œuvre des activités en rapport avec les quatre éléments de riposte définis.
- En 2020 et 2021, l'OMS et le Partenariat RBM pour en finir avec le paludisme ont apporté leur soutien à ces pays afin qu'ils réalisent des auto-évaluations rapides sur les progrès accomplis dans l'atteinte des objectifs HBHI relatifs aux quatre éléments de riposte.
- Tous les pays HBHI ont consenti des efforts considérables pour maintenir les services de lutte contre le paludisme durant la pandémie de COVID-19. Les campagnes de CPS ont été menées à temps et les distributions de MII prévues en 2020 ont été effectuées dans la plupart des pays malgré quelques retards.
- Selon les résultats des enquêtes indicatives de l'OMS sur les services de santé essentiels, les pays HBHI ont signalé des niveaux modérés de perturbations de l'accès au diagnostic et au traitement du paludisme (entre 5 %et 50 % dans la majorité des cas).
- Entre 2019 à 2020, tous les pays HBHI, sauf l'Inde, ont rapporté une hausse du nombre de cas de paludisme et de décès associés (en Inde, le rythme de réduction a ralenti par rapport aux années précédant la pandémie). Le nombre total de cas de paludisme et de décès associés dans les pays HBHI est respectivement passé de 150 millions et 390 000 en 2015, à 154 millions et 398 000 en 2019, puis à 163 millions et 444 600 en 2020.
- Jusqu'en 2020, les pays HBHI ont représenté 67 % des cas de paludisme et 71 % des décès associés ; entre 2019 et 2020, ils ont aussi représenté 66 % du nombre de cas supplémentaires dans le monde et 67 % du nombre de décès associés en plus.

INVESTISSEMENTS DANS LES PROGRAMMES ET LA RECHERCHE ANTIPALUDIQUES

- Le GTS donne une estimation des fonds requis pour atteindre les objectifs intermédiaires de 2020, 2025 et 2030. Au total, les ressources annuelles nécessaires ont été estimées à US$ 4,1 milliards en 2016, avec une hausse à US$ 6,8 milliards en 2020. Toujours selon les estimations, US$ 850 000 millions supplémentaires seront requis chaque année pour la recherche et le développement (R&D) sur le paludisme au niveau mondial durant la période 2021-2030.
- En 2020, US$ 3,3 milliards ont été investis au total pour le contrôle et l'élimination du paludisme, contre US$ 3 milliards en 2019 et US$ 2,7 milliards en 2018. Les investissements de 2020 sont bien inférieurs aux US$ 6,8 milliards estimés nécessaires au niveau mondial pour rester sur la voie des objectifs du GTS.
- L'écart entre investissements et ressources nécessaires a augmenté de façon spectaculaire ces dernières années, passant de US$ 2,3 milliards en 2018 à US$ 2,6 milliards en 2019, puis à US$ 3,5 milliards en 2020.
- Les partenaires internationaux ont représenté 69 % du financement total pour le contrôle et l'élimination du paludisme sur la période 2010-2020, avec les États-Unis en tête, suivis par le Royaume-Uni de Grande-Bretagne et d'Irlande du Nord (Royaume-Uni) et la France.
- Sur les US$ 3,3 milliards investis en 2020, plus de US$ 2,2 milliards provenaient de bailleurs de fonds internationaux. Par ordre d'importance des contributions de la part des partenaires bilatéraux et multilatéraux, on retrouve le gouvernement des États-Unis (US$ 1,3 milliard), l'Allemagne et le Royaume-Uni (environ US$ 200 millions chacun), la France et le Japon (environ US$ 100 millions chacun), et d'autres pays membres du Comité d'aide au développement et bailleurs de fonds du secteur privé pour des contributions totales à hauteur de US$ 300 millions.
- Sur les dix dernières années, les contributeurs internationaux sont (par ordre d'importance) les États-Unis, le Royaume-Uni, la France, l'Allemagne et le Japon, suivis d'autres bailleurs de fonds.
- En 2020, les gouvernements des pays d'endémie ont contribué à hauteur d'un tiers du financement total, soit près de US$ 1,1 milliard. Sur ce montant, US$ 300 millions ont été investis dans la prise en

charge des cas de paludisme dans le secteur public et plus de US$ 700 millions dans d'autres activités de lutte contre le paludisme.

- Sur les US$ 3,3 milliards investis en 2020, près de US$ 1,4 milliard (42 %) ont transité par le Fonds mondial de lutte contre le sida, la tuberculose et le paludisme (Fonds mondial). Par rapport à 2019, les décaissements du Fonds mondial en faveur des pays d'endémie ont augmenté de près de US$ 200 millions en 2020.
- Sur les US$ 3,3 milliards investis en 2020, plus des trois quarts (79 %) ont été dirigés vers la région Afrique de l'OMS, suivie par les régions Asie du Sud-Est (7 %), Amériques, Pacifique occidental et Méditerranée orientale (4 % chacune).
- Les fonds dédiés à la recherche et au développement (R&D) ont atteint US$ 619 millions en 2020.
- En matière de R&D, les divers investissements de lutte contre le paludisme se sont surtout concentrés sur le développement de médicaments (US$ 226 millions, soit 37 %), la recherche fondamentale (US$ 176 millions, soit 28 %) et le domaine des vaccins (US$ 118 millions, soit 19 %) ; US$ 65 millions supplémentaires (soit 10 %) sont allés aux investissements dans les produits de lutte antivectorielle. Les investissements ont été plus modérés dans tous les autres produits, notamment les diagnostics (US$ 17 millions, soit 2,7 %), les produits biologiques (US$ 5,3 millions, soit 0,9 %) et d'autres produits non spécifiés (US$ 12 millions, soit 1,9 %).
- Au sein du secteur public et parmi tous les bailleurs de fonds engagés dans la recherche et le développement antipaludiques, les Instituts nationaux de santé américains (NIH) ont apporté la contribution la plus importante en 2020, en concentrant un peu plus de la moitié de leurs investissements de US$ 1,9 milliard dans la recherche fondamentale (soit US$ 1,02 milliard ou 54 % de leurs investissements totaux dans la lutte contre le paludisme entre 2007 et 2018).
- La Fondation Bill & Melinda Gates a également tenu un rôle important, en investissant US$ 1,8 milliard (soit 25 % de tous les financements de recherche et développement antipaludiques) entre 2007 et 2018, ainsi qu'en soutenant le développement clinique d'innovations essentielles, comme le vaccin RTS,S.
- En ce qui concerne les principaux bailleurs de fonds de la recherche et du développement contre le paludisme, les trois plus importants, à savoir les Instituts nationaux de santé américains (NIH), la Fondation Bill & Melinda Gates et les acteurs du secteur, ont maintenu leurs financements, cumulant une nouvelle fois plus des deux tiers des investissements dans toutes les activités de R&D contre le paludisme en 2020 (US$ 422 millions, soit 68 %), comme ils l'avaient déjà fait en 2019 (US$ 419 millions, soit 66 %), et ils ont ainsi conservé la position qu'ils occupent dans le peloton de tête des bailleurs de fonds depuis 2007.

DISTRIBUTION ET COUVERTURE DES OUTILS DE PRÉVENTION DU PALUDISME

- Les fabricants de MII ont indiqué en avoir livré près de 2,3 milliards dans le monde entre 2004 et 2020, dont 2 milliards (86 %) en Afrique subsaharienne.
- En 2020, ces fabricants ont livré près de 229 millions de MII à des pays d'endémie. Sur ces 229 millions, 19,4 % étaient des moustiquaires imprégnées de butoxyde de pipéronyle (PBO) (12,4 % de plus qu'en 2019) et 5,2 % des MII à double substance active (3,6 % de plus qu'en 2019). Près de 91 % de ces MII ont été livrées dans des pays d'Afrique subsaharienne.
- En 2020, 65 % des ménages vivant en Afrique subsaharienne disposaient d'au moins une MII, contre 5 % environ en 2000. Le pourcentage des ménages disposant d'au moins une MII pour deux membres du foyer est passé de 1 % en 2000 à 34 % en 2020. Durant la même période, le pourcentage de la population ayant accès à une MII dans son foyer a augmenté de 3 % à 50 %.
- Le pourcentage de la population dormant sous MII a aussi considérablement augmenté entre 2000 et 2020, qu'il s'agisse de la population dans son ensemble (de 2 % à 43 %), des enfants de moins de 5 ans (de 3 % à 49 %) ou des femmes enceintes (de 3 % à 49 %).
- Cependant, depuis 2017, les indicateurs sur l'accès aux MII et sur leur utilisation sont en baisse pour l'Afrique subsaharienne.

- Au niveau mondial, le pourcentage de la population à risque protégée par PID dans les pays d'endémie a reculé de 5,8 % en 2010 à 2,6 % en 2020. Le pourcentage de la population protégée par PID est stable depuis 2016, avec moins de 6 % dans chacune des régions de l'OMS.
- Au niveau mondial, le nombre de personnes protégées a chuté de 161 millions en 2010 à 127 millions en 2015, puis à 87 millions en 2020.
- Le nombre d'enfants protégés par au moins une dose de CPS n'a cessé d'augmenter, passant de quelque 0,2 million en 2012 à environ 33,5 millions en 2020.
- Dans les 13 pays ayant mis en œuvre la CPS, près de 31,2 millions d'enfants ont été ciblés en 2020. Au total, 33,5 millions d'enfants ont reçu un traitement.
- Le pourcentage d'utilisation (par nombre de doses) du TPIp a été calculé sur la base des données provenant de 33 pays d'Afrique. En 2020, 74 % des femmes enceintes ont reçu des soins prénataux au moins une fois durant leur grossesse. Environ 57 % des femmes enceintes ont reçu une dose de TPIp, alors que 46 % ont reçu deux doses, et 32 % trois doses.

DISTRIBUTION ET COUVERTURE DES OUTILS DE DIAGNOSTIC ET DE TRAITEMENT DU PALUDISME

- De 2010 à 2020, 3,1 milliards de tests de diagnostic rapide (TDR) du paludisme ont été vendus dans le monde, dont 81 % à destination des pays d'Afrique subsaharienne. Durant la même période, 2,2 milliards de TDR ont été distribués par les programmes nationaux de lutte contre le paludisme (PNLP), dont 88 % en Afrique subsaharienne.
- En 2020, 419 millions de TDR ont été vendus par les fabricants et 275 millions distribués par les PNLP.
- Entre 2010 et 2020, plus de 3,5 milliards de traitements par ACT ont été vendus dans le monde. Sur ces ventes, près de 2,4 milliards de traitements ont été destinés au secteur public des pays d'endémie, alors que le reste correspond à des co-paiements publics ou privés (voire les deux), ou exclusivement au secteur du commerce de détail privé.
- Les données nationales rapportées par les PNLP montrent que, de 2010 à 2020, 2,1 milliards de traitements par ACT ont été livrés à des prestataires de santé chargés de traiter des patients au sein d'un établissement public.
- En 2020, quelque 243 millions de traitements par ACT ont été vendus par les fabricants au secteur public. Cette même année, les PNLP ont distribué 191 millions de traitements par ACT dans ce secteur, dont 96 % en Afrique subsaharienne.
- Les données compilées à partir d'enquêtes réalisées auprès des ménages entre 2005 et 2019 dans 20 pays d'Afrique subsaharienne (ayant mené au moins deux enquêtes sur cette période, l'une entre 2005-2011 pour servir de référence et l'autre entre 2015-2019 pour les plus récentes) ont permis d'analyser le taux de sollicitation de traitement, la couverture en diagnostic et l'utilisation des ACT chez les enfants de moins de 5 ans.
- En comparant enquêtes de référence et enquêtes plus récentes, peu de différences sont apparues concernant la prévalence de la fièvre dans les 2 semaines précédant les enquêtes (médiane de 25 % contre 20 %) et la sollicitation de traitement en cas de fièvre (médiane de 65 % contre 69 %).
- Les comparaisons de la source du traitement entre enquêtes de référence et enquêtes plus récentes indiquent une médiane de 62 % contre 71 % pour les soins reçus dans des établissements de santé publics, et une médiane de 40 % contre 31 % pour les soins administrés dans le secteur privé. Le recours aux agents de santé communautaires a été faible sur ces deux périodes, avec une médiane de moins de 2 %.
- Le taux de couverture en diagnostic chez les enfants de moins de 5 ans avec de la fièvre et pour lesquels des soins ont été sollicités a largement progressé, d'une médiane de 21,1 % au départ à 39 % dans les dernières enquêtes.
- L'utilisation des ACT parmi les enfants fiévreux pour lesquels des soins ont été sollicités a également augmenté, passant de 39 % à 76 % dans les dernières enquêtes.
- Parmi les enfants fiévreux ayant subi un prélèvement sanguin au doigt ou au talon, le recours aux ACT a atteint 29 % d'après l'enquête la plus récente.

PROGRÈS VERS L'ATTEINTE DES OBJECTIFS DU GTS POUR 2020

- Le GTS vise à réduire l'incidence du paludisme et la mortalité associée d'au moins 40 % d'ici 2020, 75 % d'ici 2025 et 90 % d'ici 2030 en se basant sur les données de référence de 2015.
- Le nombre de pays ayant atteint les objectifs du GTS pour 2020 a été extrapolé à partir des estimations officielles du poids du paludisme plutôt qu'à partir de projections, contrairement à la méthode utilisée dans le *Rapport sur le paludisme dans le monde 2020*.
- Cette année, les estimations tiennent compte de l'effet des perturbations des services antipaludiques durant la pandémie et sont basées sur une nouvelle méthode de quantification de la part des décès attribuables au paludisme.
- En dépit des progrès considérables accomplis depuis 2000, les objectifs intermédiaires du GTS pour 2020 relatifs à la morbidité et la mortalité n'ont pas été atteints au niveau mondial.
- En 2020, l'incidence du paludisme s'est établie à 59 cas pour 1 000 habitants à risque, au lieu des 35 cas représentés par l'objectif intermédiaire de morbidité fixé dans le GTS. En d'autres termes, nous sommes à 40 % en deçà de notre objectif.
- Même si la baisse de la mortalité est plus nette, relativement, que la baisse de l'incidence, l'objectif intermédiaire du GTS pour 2020 défini à 8,9 décès pour 100 000 habitants exposés au risque de paludisme était 42 % en deçà de la mortalité réellement établie au niveau mondial à 15,3 pour 100 000 en 2020.
- Sur les 93 pays où le paludisme était endémique en 2015 (y compris le territoire de la Guyane française), 30 (32 %) ont atteint l'objectif intermédiaire pour 2020 en matière de morbidité. En effet, ils ont réduit leur incidence de 40 % ou plus, ou ont rapporté zéro cas de paludisme.
- Vingt-quatre pays (26 %) ont réussi à faire baisser l'incidence du paludisme, mais pas suffisamment pour atteindre l'objectif intermédiaire du GTS.
- Trente-deux pays (34 %) ont enregistré une hausse de l'incidence, et dans 17 pays (18 %) elle était en hausse de 40 % ou plus en 2020 par rapport à 2015.
- Dans sept pays (7,5 %), l'incidence du paludisme en 2020 a été estimée à un niveau équivalent à celui de 2015.
- Quarante pays (43 %) où le paludisme était endémique en 2015 ont atteint l'objectif intermédiaire du GTS pour 2020 en matière de mortalité, et 32 d'entre eux ont rapporté zéro cas de paludisme.
- Quinze pays (16 %) ont réduit la mortalité due au paludisme, mais leurs progrès sont restés en deçà de l'objectif de 40 %.
- En 2020, la mortalité due au paludisme est restée au même niveau qu'en 2015 dans 14 pays (15 %) ; elle a augmenté dans 24 autres pays (26 %), et de 40 % ou plus dans 12 d'entre eux.
- La région Asie du Sud-Est de l'OMS a atteint les objectifs intermédiaires du GTS à la fois en matière de morbidité et de mortalité pour 2020. Tous les pays de la région, à l'exception du Bhoutan et de l'Indonésie, ont réduit l'incidence et la mortalité de 40 % ou plus.

MENACES BIOLOGIQUES

Suppression des gènes *pfhrp2/3* du parasite

- La suppression des gènes *pfhrp2* et *pfhrp3* (*pfhrp2/3*) du parasite rendent ces derniers indétectables par les TDR basés sur la protéine riche en histidine 2 (HRP2).
- L'OMS a recommandé aux pays rapportant des suppressions des gènes *pfhrp2/3* ou à leurs pays voisins de mener des études de référence représentatives sur les cas suspectés de paludisme, afin de déterminer si la prévalence des suppressions *pfhrp2/3* causant des « faux » résultats de TDR négatifs avait atteint un seuil qui nécessite un changement de TDR (suppressions du gène *pfhrp2* > 5 % causant des faux résultats de TDR négatifs).
- Les alternatives aux TDR (par exemple, basées sur la détection du lactate déshydrogénase du parasite [pLDH]) sont limitées. Il n'existe à l'heure actuelle aucune combinaison de tests non-HRP2 préqualifiée par l'OMS, capable de faire la distinction entre *P. falciparum* et *P. vivax*.

- L'OMS effectue un suivi des rapports publiés sur les suppressions des gènes *pfhrp2/3* par le biais de l'outil de cartographie Carte des menaces du paludisme, et encourage une approche harmonisée de cartographie et de signalement des suppressions des gènes *pfhrp2/3* grâce à des protocoles d'enquête accessibles au public.
- Le Groupe consultatif sur la politique de lutte contre le paludisme (MPAG) de l'OMS a lancé un appel d'urgence pour faire face à la hausse de la prévalence des suppressions du gène *pfhrp2* dans tous les pays d'endémie et, encore plus rapidement dans la Corne de l'Afrique.
- Entre septembre 2020 et septembre 2021, des enquêtes sur la suppression des gènes *pfhrp2/3* ont été rapportées dans 17 publications émanant de 13 pays. Parmi ces études, les suppressions du gène *pfhrp2* ont été confirmées au Brésil, à Djibouti, en Éthiopie, au Ghana, en Ouganda, en République démocratique du Congo, en République-Unie de Tanzanie et au Soudan.
- En se basant sur les données de ces publications, y compris la Carte des menaces du paludisme, une forme d'enquête a été menée dans 44 pays, et la présence de suppressions a été confirmée dans 37 d'entre eux.

Résistance des parasites aux antipaludiques

- L'efficacité des médicaments antipaludiques fait l'objet d'une surveillance par le biais d'études relatives à l'efficacité thérapeutique, qui suivent les résultats cliniques et parasitologiques parmi les patients recevant des médicaments antipaludiques.
- La résistance partielle à l'artémisinine est surveillée grâce à une liste établie de marqueurs *PfKelch13* candidats et validés, associés à une baisse du niveau de sensibilité à l'artémisinine.
- Dans la région Afrique de l'OMS, les traitements de première intention contre les infections à *P. falciparum* sont à base d'artéméther-luméfantrine (AL), d'artésunate-amodiaquine (AS-AQ), d'artésunate-pyronaridine (AS-PY) et de dihydroartémisinine-pipéraquine (DHA-PPQ). Les études relatives à l'efficacité thérapeutique menées selon le protocole standard de l'OMS entre 2015 et 2020 ont démontré une efficacité élevée parmi les ACT utilisés pour traiter les infections à *P. falciparum*. Il existe désormais des preuves de l'expansion clonale des mutations du gène *PfKelch13* au Rwanda (R561H) et en Ouganda (C469Y etA675V). Les taux d'échec au traitement au Rwanda et en Ouganda restent inférieurs à 10 %, car le médicament partenaire reste efficace. De plus, R622I, un marqueur candidat de résistance partielle à l'artémisinine, a été détecté dans un plus grand pourcentage d'échantillons provenant de la Corne de l'Afrique, plus particulièrement d'Érythrée. D'autres études sont nécessaires pour déterminer l'étendue de la propagation des polymorphismes des gènes *PfKelch13* en Afrique de l'Est, ainsi que pour étudier tout changement de durée de clairance parasitaire et de résistance in vitro.
- Les traitements de première intention contre les infections à *P. falciparum* dans la région Amériques de l'OMS sont à base d'AL, d'artésunate-méfloquine (AS-MQ) et de chloroquine (CQ). Les études relatives à l'efficacité thérapeutique de l'AL conduites entre 2015 et 2020 au Brésil et en Colombie ont démontré une efficacité élevée. La prévalence de la mutation C580Y n'affiche aucune hausse au Guyana.
- Les traitements de première intention contre les infections à *P. falciparum* dans la région Asie du Sud-Est de l'OMS sont à base d'AL, AS-MQ, AS-PY, artésunate-sulfadoxine-pyriméthamine (AS+SP) et de DHA-PPQ. Les études relatives à l'efficacité thérapeutique de l'AL conduites entre 2015 et 2020 au Bangladesh, en Inde et au Myanmar ont constaté l'efficacité élevée de tous les traitements. En Inde, bien que les taux d'échec au traitement par AS+SP restent faibles, une étude dans l'État du Chhattisgarh a détecté une forte prévalence de *dhfr* et *dhps*, ce qui indique une baisse du niveau de sensibilité au médicament partenaire, la SP. Les études relatives à l'efficacité thérapeutique de la DHA-PPQ menées en Indonésie et au Myanmar ont démontré de forts taux d'efficacité, avec des taux d'échec inférieurs à 5 %. En Thaïlande, où l'efficacité des médicaments est évaluée grâce à une surveillance intégrée de l'efficacité thérapeutique, les taux d'échec au traitement par DHA-PPQ et primaquine en 2018, 2019 et 2020 étaient tous inférieurs à 10 %, sauf dans la province du Sisaket, où ils étaient plus élevés. Cette province a donc modifié son traitement de première intention pour adopter l'AS-PY en 2020.
- Dans la sous-région du Grand Mékong, les mutations du gène *PfKelch13* associées à une résistance partielle à l'artémisinine atteignent une prévalence élevée. Parmi les échantillons prélevés au Myanmar et dans l'ouest de la Thaïlande entre 2015 et 2020, des parasites de types sauvages *PfKelch13* ont été détectés dans 65,5 % des cas. Deux mutations, R539T et C580Y, sont prévalentes dans toute la sous-région du Grand Mékong, avec une prévalence plus élevée à l'Est.

- Dans la région Méditerranée orientale de l'OMS, les traitements à base d'AL et d'AS+SP restent efficaces dans les pays qui les utilisent en tant que traitement de première intention.
- Dans la région Pacifique occidental de l'OMS, les traitements de première intention sont à base d'AL, AS-MQ, AS-PY et DHA-PPQ. Les études relatives à l'efficacité thérapeutique menées entre 2015 et 2020 ont constaté l'efficacité élevée des traitements à base d'AL, AS-MQ et AS-PY dans tous les pays soumis à étude. Au Viet Nam, les traitements de première intention à base de DHA-PPQ ont été remplacés par l'AS-PY dans les provinces où des taux élevés d'échec au traitement ont été observés.
- Au Cambodge, la sensibilité aux médicaments antipaludiques continue d'évoluer : une analyse des marqueurs moléculaires a permis de constater que le pourcentage d'échantillons présentant une mutation C580Y du gène *PfKelch13* et plusieurs nombres de copies de la protéase *Pfplasmepsin* diminue, alors que le pourcentage d'échantillons avec plusieurs nombres de copies de *Pfmdr1* et un parasite de type sauvage *PfKelch13* est élevé. La présence de plusieurs nombres de copies de *Pfmdr1* n'a jusqu'à présent pas affecté l'efficacité des traitements à base d'AS-MQ.
- Toutes les études citées en référence sont également publiées dans la Carte des menaces du paludisme.

Résistance des vecteurs aux insecticides

- De 2010 à 2020, quelque 88 pays ont transmis à l'OMS des données de surveillance sur la résistance aux insecticides, y compris sur l'intensité de la résistance aux pyréthoïdes (38 pays), ainsi que sur la capacité du butoxyde de pipéronyle (PBO) à restaurer la sensibilité aux pyréthoïdes (32 pays).
- En 2020, de nouveaux dosages discriminants et de nouvelles procédures de surveillance de la résistance des vecteurs du paludisme au chlorofénapyr, à la clothianidine, à la transfluthrine, au flupyradifurone et au pyriproxyfène ont été mis à disposition. Par ailleurs, les dosages discriminants pour le pyrimiphos-méthyl et l'alpha-cyperméthrine ont été révisés. Les pays doivent ajuster la surveillance de la résistance des vecteurs du paludisme aux insecticides conformément à ces nouvelles procédures. L'OMS n'a pas reçu de données sur la résistance des vecteurs à la transfluthrine, au flupyradifurone et au pyriproxyfène. Même si l'OMS a reçu quelques données sur la surveillance de la résistance au chlorfénapyr et à la clothianidine, ces données restent insuffisantes pour évaluer toute résistance potentielle à l'un de ces deux insecticides.
- Sur les 88 pays d'endémie ayant fourni des données pour la période 2010-2020, 78 ont détecté une résistance à au moins une des classes d'insecticides chez l'un des vecteurs du paludisme et sur un site de collecte. Par ailleurs, 29 pays ont constaté une résistance aux pyréthoïdes, aux organochlorés, aux carbamates et aux organophosphorés sur différents sites, et 19 pays ont confirmé la résistance à ces quatre classes d'insecticides chez au moins un des vecteurs du paludisme et au moins un site de collecte.
- Au niveau mondial, la résistance aux pyréthoïdes, la principale classe d'insecticides actuellement utilisés dans les MII, est largement répandue. Elle a été détectée chez au moins un des vecteurs du paludisme sur 68 % des sites pour lesquels des données sont disponibles. La résistance aux organochlorés a été rapportée sur 64 % des sites. La résistance aux carbamates et aux organophosphorés a été moins prévalente, mais a été détectée, respectivement, sur 34 % et 28 % des sites disposant de données de surveillance.
- Sur les 38 pays ayant fourni des données sur l'intensité de la résistance aux pyréthoïdes, une résistance de forte intensité a été observée sur 293 sites répartis dans 27 pays.
- Depuis 2010, il a été noté que le butoxyde de pipéronyle (PBO) avait complètement restauré la sensibilité aux pyréthoïdes sur 283 sites répartis dans 29 pays.
- Pour orienter la gestion de la résistance, les pays doivent développer et mettre en œuvre des plans nationaux de suivi et de gestion de la résistance aux insecticides, en se basant sur le Cadre conceptuel d'un plan national de suivi et de gestion de la résistance aux insecticides chez les vecteurs du paludisme élaboré par l'OMS. Le nombre de pays ayant établi un tel plan est passé de 53 en 2019 à 67 en 2020.
- Un support technique et financier est nécessaire pour aider les pays à surveiller et à gérer la résistance aux insecticides.
- Toutes les données standard sur la résistance aux insecticides rapportées à l'OMS sont intégrées à la base de données mondiales de l'OMS sur la résistance aux insecticides chez les vecteurs du paludisme, et leur accès à des fins d'exploration est possible via la Carte des menaces du paludisme.

Prefacio

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El *Informe mundial sobre malaria* de este año examina el alcance de los daños causados por la pandemia de COVID-19 en la respuesta contra la malaria en el mundo, y expone lo que se necesita para retomar el rumbo y acelerar los progresos en la lucha contra una de nuestras enfermedades más antiguas y mortales.

Se estima que en 2020 se produjeron 14 millones de casos y 47.000 muertes de malaria más que en 2019, debido a los trastornos sufridos por los servicios de salud durante la pandemia. Sin embargo, este aumento podría haber sido mucho peor si no fuera por los esfuerzos por mantener los servicios por parte de los países donde la malaria es endémica.

Incluso antes de la pandemia, el progreso mundial contra la malaria se estaba estabilizando y los países con una alta carga de la enfermedad estaban perdiendo terreno. Desde 2015, la línea de base de la estrategia mundial contra la malaria de la OMS, 24 países han registrado *aumentos* en la mortalidad por malaria. En el 2020 no se alcanzaron los objetivos críticos previstos para este año por la estrategia mundial contra la malaria de la OMS y, sin una acción inmediata y dramática, tampoco se cumplirán las metas para el 2030.

Para enfatizar aún más la necesidad de una acción urgente, este informe también incluye nuevas y aleccionadoras estimaciones del número de víctimas de la malaria en los niños menores de 5 años en el África subsahariana, donde la gran mayoría de las muertes por malaria ocurren cada año. Usando mejores datos y una metodología más precisa, se estima que la enfermedad ha cobrado muchas más vidas jóvenes en las últimas dos décadas de lo que se informó anteriormente.

La situación actual es especialmente precaria. Sin una acción acelerada, corremos el riesgo de ver un resurgimiento inmediato de la enfermedad, especialmente en África. Como se indica en el informe, esto se debe a una convergencia de amenazas – desde los brotes de COVID-19 y Ébola hasta las inundaciones y otras emergencias humanitarias– que han provocado alteraciones en los servicios de malaria en varios países africanos con alta carga. El surgimiento de la resistencia a los medicamentos antimaláricos en África Oriental también es una preocupación considerable.

A pesar de los desafíos provocados por la COVID-19, también hemos visto tendencias positivas este año. En 2021, la OMS certificó como libres de malaria a dos países, China y El Salvador-, y otros 25 países de todo el mundo están en vías de acabar con la transmisión de la malaria para el 2025.

Este año también pasará a la historia como el año en el que la OMS recomendó el uso generalizado de la primera vacuna contra la malaria. Si introucida de forma generalizada y urgente, la vacuna RTS,S podría salvar la vida de decenas de miles de niños cada año.

Aun así, seguimos necesitando nuevas herramientas para acabar con la malaria, y una mayor inversión en investigación y desarrollo. También necesitamos utilizar la financiación con la que contamos actualmente de forma más eficiente, al tiempo que movilizamos urgentemente recursos adicionales para cubrir el déficit actual. Los aproximadamente 3.300 millones de dólares gastados en la lucha contra la malaria en 2020 tendrán que triplicarse con creces en los próximos 10 años para aplicar con éxito nuestra estrategia mundial.

La malaria ha afligido a la humanidad durante milenios. Ahora tenemos las herramientas y la estrategia para salvar muchas vidas y, con nuevas herramientas, empezar a soñar con un mundo libre de malaria.

El informe de este año de un vistazo

EVENTOS CLAVE EN 2020-2021

Interrupciones de los servicios de malaria

- En abril de 2020, durante los primeros meses de la pandemia de coronavirus (COVID-19), el análisis de la Organización Mundial de la Salud (OMS) y sus colaboradores había proyectado una duplicación de las muertes por paludismo si se producía el peor escenario de interrupción de los servicios.
- Con el apoyo de sus colaboradores a nivel global, regional y nacional, los países han organizado una respuesta extraordinaria para adaptar y aplicar las orientaciones de la OMS sobre el mantenimiento de los servicios esenciales contra la malaria durante la pandemia.
- En general, la mayoría de los países donde la malaria es endémica experimentaron niveles moderados de interrupciones en la prestación de servicios de malaria.
- De los 31 países que tenían previstas campañas de mosquiteros tratados con insecticida (MTI) en 2020, 18 (58%) completaron sus campañas a finales de año. El 72% (159 millones) de los mosquiteros tratados con insecticida previstos en la campaña se distribuyeron a finales de 2020.
- Trece países (42%) distribuyeron en 2021 63 millones de MTIs previstos inicialmente para su distribución en 2020. De ellos, 6 (46%) habían distribuido menos del 50% de sus MTI a finales de 2020. En octubre de 2021, Kenia y Sudán del Sur todavía no habían terminado la distribución de todos los MTIs inicialmente planificados para el 2020.
- La distribución de la quimio-prevención estacional de la malaria (QEM) se realizó como previsto en 2020, protegiéndose 11.8 millones de niños más que en 2019, principalmente debido a la expansión de esta intervención a nuevas zonas de Nigeria.
- Excepto por retrasos puntuales, la mayoría de las campañas de rociado residual intradomiciliar (RRI) planificadas para el 2020 se realizaron en base a lo previsto.
- En general, los datos de las encuestas y los datos de rutina sugieren que hubo niveles moderados de interrupciones al acceso a los servicios clínicos en la mayoría de los países con una carga de malaria moderada y alta en 2020.
- Durante la pandemia de COVID-19, hasta 122 millones de personas de 21 países con malaria necesitaron ayuda de emergencia debido a otras emergencias humanitarias no relacionadas con la pandemia.

Surgimiento de la resistencia parcial a la artemisinina en África

- Las recientes pruebas de la aparición independiente de resistencia parcial a la artemisinina en la región africana de la OMS son motivo de gran preocupación a nivel global.
- Las terapias combinadas a base de artemisinina (TCA) siguen siendo eficaces en esta región, por lo que no debería haber un impacto inmediato para los pacientes.
- En la subregión del Gran Mekong (SGM), es probable que la resistencia parcial a la artemisinina haya sido uno de los causantes de la propagación de la resistencia a los fármacos asociados a las TCA, y preocupa que pueda ocurrir lo mismo en la Región Africana de la OMS.
- La OMS trabajará con los países para desarrollar un plan regional de respuesta coordinada a esta amenaza. Una prioridad inmediata es mejorar la eficacia terapéutica y la vigilancia genotípica, para trazar mejor el alcance de la resistencia.

Recomendación de la OMS sobre el uso de la vacuna contra la malaria RTS,S/AS01

- En enero de 2016, la OMS recomendó una mayor evaluación de la RTS,S/AS01 (RTS,S) en una serie de implementaciones piloto, abordando varias lagunas de conocimiento, antes de considerar una introducción más amplia a nivel de país.
- Como parte del Programa de Implementación de la Vacuna contra la Malaria, enero de 2016, la OMS recomendó la vacuna contra la malaria RTS,S para su introducción piloto en áreas seleccionadas de tres países africanos: Ghana, Kenia y Malawi.
- Los datos de las introducciones piloto han demostrado que la vacuna tiene un perfil de seguridad favorable; reduce significativamente la malaria grave y potencialmente mortal; y puede administrarse eficazmente en entornos de vacunación infantil reales, incluso durante una pandemia.
- El 6 de octubre de 2021, la OMS recomendó el uso de la vacuna RTS,S para la prevención de la malaria por *P. falciparum* en niños que viven en regiones con una transmisión moderada a alta.

TENDENCIAS EN LA CARGA DE MALARIA

Casos de malaria

- A nivel mundial, hubo 241 millones de casos estimados de malaria en 2020 en 85 países endémicos de malaria (incluido el territorio de la Guayana Francesa), lo que representa un aumento con respecto a los 227 millones de casos estimados en 2019. La mayor parte de este aumento provino de países de la Región de África de la OMS. En la línea de base de 2015 de la Estrategia técnica mundial para la malaria 2016-2030 (ETM), se estimaron 224 millones de casos de malaria.
- La proporción de casos debidos a *Plasmodium vivax* se redujo de cerca del 8% (18.5 millones) en el año 2000 al 2% (4.5 millones) en 2020.
- La incidencia de casos de malaria (es decir, casos por 1000 habitantes en riesgo) se redujo de 81 en el 2000 a 59 en 2015 y a 56 en 2019, aumentando de nuevo a 59 en 2020. El aumento en 2020 se asoció a alteraciones en los servicios de prevención, diagnóstico y tratamiento de malaria debido a la pandemia deCOVID-19.
- El 96% de los casos de malaria a nivel mundial se concentró en 29 países, y en seis - Nigeria (27%), la República Democrática del Congo (12%), Uganda (5%), Mozambique (4%), Angola (3.4%) y Burkina Faso (3.4%) - se presentaron alrededor del 55% de todos los casos a nivel mundial.
- La Región de África de la OMS, con un estimado de 228 millones de casos en 2020, presentó alrededor del 95% de los casos.
- Entre el 2000 y el 2019 la incidencia de casos en la Región de África de la OMS se redujo de 368 a 222 por 1000 habitantes en riesgo, pero aumentó a 232 en 2020 debido, en gran medida, a alteraciones de los servicios durante la pandemia de COVID-19.
- La Región de Asia Sudoriental de la OMS representó aproximadamente el 2% de la carga de casos de malaria a nivel mundial. Los casos de malaria se redujeron en un 78%, de 23 millones en el año 2000 a aproximadamente 5 millones en 2020. La incidencia de casos de malaria en esta región se redujo en un 83%, de aproximadamente 18 casos por 1000 habitantes en riesgo en el 2000 a aproximadamente tres casos en 2020.
- India representó el 83% de los casos en la región. Sri Lanka fue certificado como libre de malaria en 2016 y sigue estando libre de malaria.
- Los casos de malaria en la Región del Mediterráneo Oriental de la OMS se redujeron en un 38%, de unos 7 millones de casos en 2000 a unos 4 millones en 2015. Entre 2016 y 2020 los casos aumentaron un 33% a 5.7 millones.
- Durante el período 2000-2020, la incidencia de casos de malaria en la Región del Mediterráneo Oriental de la OMS disminuyó de 21 a 11 casos por 1000 habitantes en riesgo. Sudán es el principal contribuyente a la malaria en esta región, y representa alrededor del 56% de los casos. En 2020, la República Islámica de Irán no tuvo casos autóctonos de malaria durante 3 años consecutivos.
- La Región del Pacífico Occidental de la OMS tuvo un estimado de 1.7 millones de casos en 2020, una disminución del 39% de los 3 millones de casos en el año 2000. Durante el mismo período, la incidencia de casos de malaria se redujo de cuatro a dos casos por 1 000 habitantes en riesgo. Papua Nueva Guinea representó casi el 86% de todos los casos en esta región en 2020. China se declaró libre de malaria y Malasia no ha tenido casos de malaria no-enzoótica durante 3 años consecutivos.

- En la Región de las Américas de la OMS, los casos de malaria se redujeron en un 58% (de 1.5 millones a 0.65 millones) y la incidencia de casos en un 67% (de 14 a 5) entre los años 2000 y el 2020. El progreso de la región en los últimos años se ha visto afectado por el importante aumento de la malaria en la República Bolivariana de Venezuela la cual tuvo cerca de 35 500 casos en el 2000, llegando a más de 467 000 casos en 2019. En 2020, los casos se redujeron en más de la mitad en comparación con 2019, a 232000, debido a las restricciones de movimiento durante la pandemia de COVID-19 y a la escasez de combustible, lo que afectó a la industria minera, que es el principal contribuyente al aumento reciente de malaria en el país. Estas restricciones también pueden haber afectado el acceso a la atención sanitaria, lo que puede haber causado una reducción en el número de casos reportados por los centros de salud.
- Los países que experimentaron aumentos sustanciales en la región en 2020 en comparación con 2019 fueron Haití, Honduras, Nicaragua, Panamá y el Estado Plurinacional de Bolivia.
- La República Bolivariana de Venezuela, Brasil, y Colombia representaron más del 77% de todos los casos de esta región.
- Argentina, El Salvador y Paraguay se certificaron como libres de malaria en 2019, 2021 y 2018, respectivamente. Belice notificó cero casos autóctonos de malaria por segundo año consecutivo.
- Desde el año 2015, la Región de Europa de la OMS está libre de malaria.

Muertes por malaria

- En 2019, la OMS actualizó la distribución de la mortalidad en niños menores de cinco años por causa de muerte. Esto afectó a la fracción de la causa de muerte por malaria (CdM), elevando la estimación de la mortalidad por malaria desde el año 2000, pero sin afectar en gran medida la tendencia de la misma.
- A nivel mundial, las muertes por malaria disminuyeron continuamente durante el período 2000-2019, de 896 000 en el año 2000 a 562 000 en 2015 y a 558 000 en 2019. En 2020, las muertes por malaria aumentaron en un 12% en comparación con el 2019, hasta un estimado de 627 000. Se estima que 47 000 (68%) de las 69 000 muertes adicionales se debieron a alteraciones de los servicios de malaria durante la pandemia de COVID-19.
- El porcentaje del total de muertes por malaria en niños menores de 5 años se redujo del 87% en el año 2000 al 77% en 2020.
- A nivel mundial, la tasa de mortalidad por malaria (es decir, muertes por cada 100 000 habitantes en riesgo) se redujo a la mitad, de aproximadamente 30 en el año 2000 a 15 en 2015 y continuó disminuyendo, pero a un ritmo más lento, llegando a 13 en 2019. En 2020, la tasa de mortalidad volvió a aumentar a 15.
- Aproximadamente el 96% de las muertes por malaria de todo el mundo se produjeron en 29 países. Nigeria (27%), la República Democrática del Congo (12%), Uganda (5%), Mozambique (4%), Angola (3%) y Burkina Faso (3%) representaron algo más de la mitad de todas las muertes por malaria a nivel mundial en 2020.
- Las muertes por malaria en la Región de África de la OMS se redujeron en un 36%, de 840 000 en el 2000 a 534 000 en el 2019, antes de aumentar a 602 000 en 2020. La tasa de mortalidad por malaria se redujo en un 63% entre el 2000 y el 2019, de 150 a 56 por 100 000 habitantes en riesgo, antes de llegar a 62 en 2020.
- Cabo Verde y Santo Tomé y Príncipe han reportado cero muertes autóctonas desde 2018.
- En la Región de Asia Sudoriental de la OMS, las muertes por malaria se redujeron en un 75%, de unas 35 000 en el año 2000 a 9 000 en 2020.
- India representó aproximadamente el 82% de todas las muertes por malaria en la Región de Asia Sudoriental de la OMS.
- En la Región del Mediterráneo Oriental de la OMS, las muertes por malaria se redujeron en un 39%, de alrededor de 13 700 en el año 2000 a 8 300 en 2015, y luego aumentó en un 49% entre 2016 y 2020 a 12 300 muertes en 2020. La mayor parte del aumento se observó en Sudán, donde más del 80% de los casos se deben a *P. falciparum*, que se asocia con una tasa de letalidad más alta que los casos de *P. vivax*.
- En la Región del Mediterráneo Oriental de la OMS , la tasa de incidencia de mortalidad por malaria se redujo en un 50%, de cuatro a dos muertes por 100 000 habitantes en riesgo.

- En la Región del Pacífico Occidental de la OMS, las muertes por malaria se redujeron en un 47%, de cerca de 6 100 casos en el año 2000 a 3 200 en 2020, y la tasa de mortalidad se redujo en un 55% durante el mismo periodo, pasando de 0.9 a 0.4 muertes por malaria por 100 000 habitantes en riesgo. En Papua Nueva Guinea sucedieron más del 93% de las muertes por malaria en 2020.
- En la Región de las Américas de la OMS, las muertes por malaria se redujeron en el 56% (de 909 a 409) y la tasa de mortalidad en un 66% (de 0.8 a 0.4). La mayoría de las muertes en esta región ocurrieron en adultos (77%).

Casos de malaria y muertes evitadas

- A nivel mundial, se estima que se han evitado 1.700 millones de casos y 10.6 millones de muertes por malaria en el período 2000-2020.
- La mayoría de los casos (82%) y muertes (95%) evitados fueron en la Región de África de la OMS, seguida de la Región de Asia Sudoriental de la OMS (10% de los casos y 2% de las muertes).

Malaria severa

- La malaria grave es multisindrómica y suele manifestarse como malaria cerebral, anemia palúdica grave y dificultad respiratoria.
- La mortalidad por malaria grave es elevada si no se trata con prontitud y eficacia.
- La distribución de los síndromes de malaria grave varía según la edad y la intensidad de la transmisión, influida principalmente por los cambios en los patrones de inmunidad de la comunidad.
- Un análisis secundario de los datos demográficos y clínicos de niños de 1 mes a 14 años de 21 hospitales de vigilancia en África oriental se presenta en este reporte.
- Doce de los centros se describieron como de baja transmisión (Prevalencia por a *P. falciparum* en los niños de 2 a 10 años [*Pf*PR_{2-10}] <5%), cinco como de transmisión baja a moderada (*Pf*PR_{2-10} 5-9%), 20 como de transmisión moderada (*Pf*PR_{2-10} 10-29%) y 12 como de transmisión alta (*Pf*P_{R2-10} ≥30%).
- En todos los contextos de transmisión, la malaria grave se concentró en los niños menores de 5 años. El número de casos de enfermedad grave aumenta con la intensidad de la transmisión. La presentación clínica más común de malaria grave fue la anemia grave asociada a la malaria.
- Fueron analizados también los datos de niños menores de 15 años ingresados por malaria en el Hospital de Distrito de Manhiça (Mozambique) durante 1997-2017. Los resultados sugieren que, a medida que la transmisión disminuía durante este periodo, la edad media de ingreso por malaria parecía cambiar, con una proporción relativamente mayor de niños mayores ingresados por malaria grave; sin embargo, la mayoría de las muertes por malaria seguían produciéndose en niños menores de 5 años, y el riesgo de muerte se concentraba aún más en los menores de 3 años.

Carga de malaria en el embarazo

- En 2020, en 33 países con transmisión moderada y alta en la Región de África de la OMS, hubo aproximadamente 33.8 millones de mujeres embarazadas, de las cuales 11.6 millones (35%) estuvieron expuestas a la infección por malaria durante el embarazo.
- Por subregión de la OMS, África occidental tuvo la mayor prevalencia de exposición a la malaria durante el embarazo (40%), seguida de cerca por África central (39%), mientras que la prevalencia fue del 22% en África Oriental y en África del Sur.
- Se estima que la infección por malaria durante el embarazo en estos 33 países resultó en 819 000 niños con bajo peso al nacer.
- Si todas las mujeres embarazadas que utilizaron los servicios de atención prenatal hubieran recibido una sola dosis de tratamiento preventivo intermitente (TPI1) durante el embarazo, asumiendo que todas fueran elegibles y que las coberturas de la segunda (TPI2) y tercera dosis (TPI3) se mantuvieron estables, se habrían evitado adicionalmente 45 000 nacimientos de bajo peso en estos 33 países.
- Si la cobertura del TPI3 se elevara a los mismos niveles que la cobertura de las mujeres embarazadas que utilizan los servicios de atención prenatal al menos una vez durante el embarazo (CPN), suponiendo que las visitas de las clínicas prenatales posteriores fueran igual de elevadas, se evitarían otros 148 000 recién nacidos con bajo peso al nacer.

- Si la cobertura del TPI3 se optimizara hasta el 90% de todas las mujeres embarazadas, se evitarían 206 000 recién nacidos con bajo peso al nacer.
- Dado que el bajo peso al nacer es un importante factor de riesgo para la mortalidad neonatal e infantil, evitar un número considerable de recién nacidos con bajo peso al nacer salvará muchas vidas.

ELIMINACIÓN DE MALARIA Y PREVENCIÓN DE SU RESTABLECIMIENTO

- A nivel mundial, el número de países que eran endémicos de malaria en el 2000 y que notificaron menos de 10 000 casos de malaria aumentó de 26 en el año 2000 a 47 en 2020.
- En el mismo periodo, el número de países con menos de 100 casos autóctonos aumento de seis a 26.
- En el periodo 2010-2020, el total de casos de malaria en los 21 países que formaban parte de la iniciativa "Eliminación 2020" (E-2020) se redujo en un 84%.
- Las Comoras, México, la República de Corea, Nepal, Eswatini y Costa Rica vieron una reducción de casos en 2020 en comparación con 2019, con reducciones de 13053, 262, 129, 54, 6 y 5, respectivamente. Los siguientes países tuvieron más casos en 2020 que en 2019: Sudáfrica (1367 casos adicionales), Botsuana (715), Ecuador (131), Surinam (52), Arabia Saudita (45) y Bután (20).
- La República Islámica de Irán y Malasia notificaron cero casos de malaria por tercer año consecutivo. Timor-Leste notificó cero casos autóctonos de malaria en 2018 y 2019; sin embargo, en 2020, se notificaron tres casos autóctonos tras un brote de malaria en el país.
- Azerbaiyán y Tayikistán han presentado oficialmente una solicitud formal de certificación de la eliminación de la malaria dentro de sus fronteras.
- Sobre la base y el éxito de la iniciativa E-2020, se lanzó la nueva iniciativa E-2025, que identifica un conjunto de 25 países con el potencial de detener la transmisión de la malaria para 2025. Todos los países de E-2020 que aún no han solicitado la certificación de países libres de malaria de la OMS ha sido seleccionados automáticamente para participar en la iniciativa E-2025 junto con otros ocho países: República Popular Democrática de Corea, República Dominicana, Guatemala, Honduras, Panamá, Santo Tomé y Príncipe, Tailandia y Vanuatu.
- Entre 2000 y 2020, en los seis países de SGM - Camboya, China (provincia de Yunnan), República Democrática Popular Lao, Myanmar, Tailandia y Vietnam - los casos de malaria por *P. falciparum* disminuyeron en un 93%, mientras que todos los casos de malaria se redujeron en un 78%. De los 82 595 casos autóctonos de malaria notificados en 2020, 19 389 fueron casos de *P. falciparum*.
- La tasa de disminución ha sido más rápida desde 2012, cuando se lanzó el programa de Eliminación de la Malaria del Mekong. Durante este periodo, los casos de malaria se redujeron en 88%, mientras que los casos de *P. falciparum* se redujeron en 95%.
- En general, Myanmar (71%) y Camboya (19%) representaron la mayoría de los casos autóctonos por *P. falciparum* de la SGM.
- Esta disminución acelerada de *P. falciparum* es especialmente crítica debido al aumento de la resistencia a los medicamentos. En la SGM, los parásitos *P. falciparum* han desarrollado una resistencia parcial a la artemisinina, el compuesto principal de los mejores fármacos antimaláricos disponibles.
- Entre los años 2000 y 2020, no se ha restablecido la transmisión de la malaria en ningún país certificado como libre de malaria.

ENFOQUE “DE ALTA CARGA A ALTO IMPACTO”

- Desde noviembre de 2018, los 11 países de alta carga a alto impacto (ACAI) han implementado actividades relacionadas con ACAI en los cuatro elementos de la respuesta.
- En 2020 y 2021, la OMS y el Partenariado RBM apoyaron a los países para implementar autoevaluaciones rápidas sobre el progreso hacia los objetivos de ACAI en los cuatro elementos de la respuesta.
- Todos los países de ACAI realizaron esfuerzos considerables para mantener los servicios de malaria durante la pandemia de COVID-19. Las campañas de quimio-prevención estacional de la malaria se llevaron a cabo a tiempo, y los planes de distribución de MTI en 2020 se ejecutaron en la mayoría de los países, a pesar de sufrir algunos atrasos.
- Los resultados de las encuestas de la OMS sobre servicios de salud esenciales mostraron que los países de ACAI informaron niveles moderados de interrupción del acceso al diagnóstico y tratamiento de la malaria (en su mayoría de entre el 5% y el 50%).
- Entre 2019 y 2020, todos los países de ACAI, excepto India, reportaron aumentos en los casos y muertes (en India, la tasa de reducción disminuyó en comparación con los años pre-pandémicos). En general, los casos de malaria en los países de ACAI aumentaron de 150 millones de casos y 390 000 de muertes en 2015 a 154 millones de casos y 398 000 muertes en 2019 y a 163 millones de casos y 444 600 de muertes en 2020.
- En 2020, los países de ACAI representaron el 67% y el 71% de los casos y muertes por malaria, respectivamente; también representaron el 66% y el 67% de los aumentos en los casos de malaria y las muertes entre 2019 y 2020, respectivamente.

INVERSIÓN EN PROGRAMAS E INVESTIGACIÓN SOBRE MALARIA

- La Estrategia Técnica Mundial (ETM) estima la financiación necesaria para alcanzar los hitos para 2020, 2025 y 2030. Los recursos anuales totales necesarios se estimaron en 4.1 mil millones de dólares en 2016, aumentando a 6.8 mil millones de dólares en 2020. Se estima que se necesitará anualmente una adición de 0.85 mil millones de dólares para investigación y desarrollo global en malaria (I + D) durante el período 2021-2030.
- La financiación total para el control y eliminación de malaria en 2020 se estimó en 3.3 mil millones de dólares, en comparación con 3.0 mil millones en 2019 y 2.7 mil millones en 2018. La cantidad invertida en 2020 no alcanza los 6.8 mil millones estimados requeridos a nivel mundial para mantenerse encaminado hacia los objetivos de la ETM.
- La brecha de financiación entre el monto invertido y los recursos necesarios se ha ampliado drásticamente en los últimos años, pasando de 2.3 mil millones de dólares en 2018 a 2.6 mil millones en 2019 y 3.5 mil millones en 2020.
- Durante el período 2010-2020, los financiadores internacionales proporcionaron el 69% de la financiación total para el control y eliminación de la malaria, encabezadas por los Estados Unidos de América, el Reino Unido de Gran Bretaña e Irlanda del Norte (Reino Unido) y Francia.
- De los 3.300 millones de dólares invertidos en 2020, más de 2.200 millones provinieron de financiadores internacionales. La mayor contribución de los desembolsos bilaterales y multilaterales fue la del gobierno de Estados Unidos (1.300 millones de dólares), seguido por Alemania y el Reino Unido, con unos 200 millones de dólares cada uno, 100 millones de dólares cada uno de Francia y Japón, y un total de 300 millones de dólares de otros países miembros del Comité de Ayuda al Desarrollo y de contribuyentes del sector privado.
- La mayor proporción de contribuciones en los últimos 10 años de fuentes internacionales provino de los Estados Unidos, el Reino Unido, Francia, Alemania y Japón, seguidos de otros donantes.
- Los gobiernos de los países donde la malaria es endémica contribuyeron con casi un tercio del financiamiento total en 2020, con inversiones cercanas a los 1,1 mil millones de dólares. De esta

cantidad, se gastó aproximadamente 300 millones en el manejo de casos de malaria en el sector público y más de 700 millones en otras actividades de control de la malaria.

- De los 3.300 millones invertidos en 2020, casi 1.400 millones (42%) se canalizaron a través del Fondo Mundial de Lucha contra el SIDA, la Tuberculosis y la Malaria (Fondo Mundial). En comparación con 2019, los desembolsos del Fondo Mundial a países donde la malaria es endémica aumentaron en alrededor de 200 millones de dólares en 2020.
- De los 3.300 millones invertidos en 2020, más de las tres cuartas partes (79%) se destinaron a la Región de África, el 7% a la Región de Asia Sudoriental y el 4% a la Región de las Américas, Región del Pacífico Occidental y Región del Mediterráneo.
- La financiación total para I + D en malaria fue de 619 millones de dólares en 2020.
- El panorama de la financiación para I + D contra la malaria ha estado liderado por la inversión en medicamentos (226 millones de dólares, 37%), seguida por la investigación básica (176 millones de dólares, 28%) y la I + D de vacunas (118 millones de dólares, 19%). Otro 10% se destinó a productos para el control de vectores (65 millones de dólares). Todos los demás productos registraron inversiones más pequeñas, incluidos el diagnóstico (17 millones, 2.7%), biológicos (5,3 millones, 0.9%) y productos no especificados (12 millones, 1.9%).
- Dentro del sector público y entre todos los financiadores de I + D contra la malaria, los Institutos Nacionales de Salud de los Estados Unidos (NIH) fueron los mayores contribuyentes en 2020, con algo más de la mitad de su inversión de 1.900 millones de dólares para investigación básica (1.020 millones de dólares, 54% de su inversión total en malaria entre 2007 y 2018).
- La Fundación Bill & Melinda Gates ha sido otro actor fundamental, invirtiendo 1.800 millones de dólares (el 25% de todos los fondos para I + D contra la malaria) entre 2007 y 2018, y apoyando el desarrollo clínico de innovaciones clave como la vacuna RTS,S.
- Con respecto a los principales patrocinadores de I + D para malaria, los tres principales - NIH de los Estados Unidos, Fundación Bill & Melinda Gates y la industria - se han mantenido estables, representando más de dos tercios de la inversión en I + D para malaria en 2020 (422 millones, 68%), como lo hicieron en 2019 (419 millones, 66%), y conservando los primeros puestos como entidades financiadoras que han ocupado desde 2007.

DISTRIBUCIÓN Y COBERTURA DE LA PREVENCIÓN DE LA MALARIA

- Los datos de entrega de los fabricantes para 2004–2020 muestran que se suministraron casi 2.3 mil millones de mosquiteros tratados con insecticidas en todo el mundo en ese período, de los cuales 2 mil millones (86%) se suministraron al África subsahariana.
- Los fabricantes entregaron alrededor de 229 millones de mosquiteros tratados con insecticidas a países con malaria endémica en 2020. De estos, el 19,4% fueron mosquiteros de piretroide-butóxido de piperonilo (PBO) (12,4% más que en 2019) y el 5,2% fueron MTI de doble ingrediente activo (3,6% más que en 2019). Aproximadamente el 91% de estos mosquiteros tratados con insecticidas se entregaron a países del África subsahariana.
- En el 2020, el 65% de los hogares en África subsahariana tenían al menos un MTI, en comparación con aproximadamente el 5% en 2000. El porcentaje de hogares que poseen al menos un MTI por cada dos personas aumentó del 1% en 2000 al 34% en 2020. En el mismo período, el porcentaje de población con acceso a un MTI dentro de su hogar aumentó de 3% a 50%.
- El porcentaje de la población que duerme bajo un MTI también aumentó considerablemente entre 2000 y 2020, para toda la población (del 2% al 43%), para los niños menores de 5 años (del 3% al 49%) y para las mujeres embarazadas (del 3% al 49%).
- Sin embargo, desde 2017, los indicadores de acceso y uso de los mosquiteros en el África subsahariana han disminuido.
- A nivel mundial, el porcentaje de la población en riesgo protegida por el RRI en los países donde la malaria es endémica disminuyó del 5,8% en 2010 al 2,6% en 2020. El porcentaje de la población protegida por el RRI se ha mantenido estable desde 2016, con menos del 6% de la población protegida en cada región de la OMS.

- El número de personas protegidas a nivel mundial se redujo de 161 millones en 2010 a 127 millones en 2015, y se redujo aún más a 87 millones en 2020.
- El número de niños a los que se llegó con al menos una dosis de quimio-prevención estacional de la malaria (QPE) aumentó de manera constante, de aproximadamente 0,2 millones en 2012 a aproximadamente 33,5 millones en 2020.
- En los 13 países que implementaron QPE, un total de aproximadamente 31,2 millones de niños fueron cubiertos por la intervención en 2020. En promedio, 33.5 millones de niños recibieron tratamiento.
- Utilizando datos de 33 países africanos, se calculó el porcentaje de uso del Tratamiento Preventivo Intermitente de la malaria durante el Embarazo por dosis. En 2020, el 74% de las mujeres embarazadas utilizaron los servicios de atención prenatal al menos una vez durante el embarazo. Aproximadamente el 57% de las mujeres embarazadas recibió una dosis de TPI, el 46% recibió dos dosis y el 32% recibió tres dosis.

DISTRIBUCIÓN Y COBERTURA DEL DIAGNÓSTICO Y TRATAMIENTO DE LA MALARIA

- A nivel mundial, los fabricantes vendieron 3.100 millones de pruebas de diagnóstico rápido (PDR) para la malaria entre 2010 y 2020, y casi el 81% de estas ventas se realizaron en países del África subsahariana. En el mismo período, los programas nacionales de malaria (PNM) distribuyeron 2.200 millones de PDR, el 88% en África subsahariana.
- En 2020, los fabricantes vendieron 419 millones de PDR y los PNM distribuyeron 275 millones.
- Los fabricantes vendieron en todo el mundo más de 3.500 millones de tratamientos TCA en 2010-2020. Aproximadamente 2.400 millones de estas ventas fueron al sector público en países donde la malaria es endémica; el resto se vendió mediante copagos del sector público o privado (o ambos), o exclusivamente a través del sector minorista privado.
- Los datos nacionales notificados por los PNM en 2010-2020 muestran que se entregaron 2.100 millones de TCA a los proveedores de servicios de salud para tratar a los pacientes con malaria en el sector público.
- En 2020, los fabricantes vendieron unos 243 millones de TCA para uso en el sector público de salud. En ese mismo año, los PNM distribuyeron 191 millones de TCA a este sector, de los cuales el 96% fueron al África subsahariana.
- Los datos agregados de las encuestas de hogares realizadas en África subsahariana entre 2005 y 2019 en 20 países con al menos dos encuestas (línea de base 2005-2011 y más reciente 2015-2019) en este período se utilizaron para analizar la cobertura de la búsqueda de tratamiento, el diagnóstico y uso de TCA en niños menores de 5 años.
- Al comparar la línea de base y las últimas encuestas, hubo pocos cambios en la prevalencia de fiebre dentro de las 2 semanas anteriores a las encuestas (mediana 25% versus 20%) y en la búsqueda de tratamiento para la fiebre (mediana 65% versus 69%).
- Las comparaciones de la fuente de tratamiento entre la línea de base y las encuestas más recientes muestran que una mediana del 62% frente al 71% recibió atención en establecimientos públicos de salud, y una mediana del 40% frente al 31% recibió atención en el sector privado. El uso de trabajadores de salud comunitarios fue bajo en ambos períodos, con una mediana de menos del 2%.
- La tasa de diagnóstico entre los niños menores de 5 años con fiebre y para quienes se buscó atención aumentó considerablemente, de una mediana del 21,1% al inicio, al 39% en las últimas encuestas de hogares.
- El uso de TCA entre aquellos para quienes se buscó atención también aumentó, del 39% al inicio, al 76% en las últimas encuestas.
- Entre aquellos para quienes se buscó atención y que recibieron un pinchazo en el dedo o el talón, el uso de TCA fue del 29% en la encuesta más reciente.

PROGRESO HACIA LOS OBJETIVOS DE LA ESTRATEGIA TÉCNICA MUNDIAL (ETM) DE 2020

- La ETM tiene como objetivo una reducción en la incidencia de casos de malaria y en la tasa de mortalidad de al menos un 40% para 2020, un 75% para 2025 y un 90% para 2030 comparados con la línea de base de 2015.
- El número de países que alcanzaron las metas de la ETM para el 2020 se derivó de estimaciones oficiales de la carga de malaria, en lugar de utilizar proyecciones como se hizo en el *Informe mundial de la malaria 2020*.
- Este año, las estimaciones incluyeron el efecto de las alteraciones de los servicios de malaria durante la pandemia y se basaron en un nuevo método para cuantificar la fracción de CdM.
- A pesar de los considerables avances logrados desde el año 2000, las metas de morbilidad y mortalidad de la ETM del 2020 no se alcanzaron a nivel mundial.
- La incidencia de casos de malaria de 59 casos por 1000 habitantes en riesgo en 2020 en lugar de los 35 casos por 1000 esperados si el mundo estuviera en camino hacia la meta de morbilidad de la ETM de 2020 significa que, a nivel mundial, estamos desviados en un 40%.
- Aunque el progreso relativo en la tasa de mortalidad es mayor que en la incidencia de casos, la meta de la ETM de 8.9 muertes por malaria por 100 000 habitantes en riesgo en 2020 fue un 42% menor que la tasa de mortalidad observada en el mismo año de 15.3.
- De los 93 países que eran endémicos de malaria (incluido el territorio de la Guayana Francesa) en todo el mundo en 2015, 30 (32%) alcanzaron la meta de morbilidad de la ETM para 2020, habiendo logrado una reducción del 40% o más en la incidencia de casos o habiendo notificado cero casos de malaria.
- Veinticuatro países (26%) lograron avances en la reducción de la incidencia de casos de malaria, pero no alcanzaron las metas de la ETM.
- Treinta y dos países (34%) tuvieron una mayor incidencia de casos, y 17 países (18%) tuvieron un aumento del 40% o más en la incidencia de casos de malaria en 2020 en comparación con 2015.
- En siete países (7.5%), la incidencia de casos de malaria en 2020 fue similar a la de 2015.
- Cuarenta países (43%) que eran endémicos de malaria en 2015 lograron el hito de mortalidad de la ETM para 2020, y 32 de ellos notificaron cero casos de malaria.
- Quince países (16%) lograron reducciones en las tasas de mortalidad por malaria, pero por debajo de la meta del 40%.
- Las tasas de mortalidad por malaria se mantuvieron al mismo nivel en 2020 que en 2015 en 14 países (15%), mientras que las tasas de mortalidad aumentaron en otros 24 países (26%), 12 de los cuales tuvieron aumentos del 40% o más.
- La Región de Asia Sudoriental de la OMS cumplió con los hitos de mortalidad y morbilidad de la ETM 2020. Todos los países de la región, excepto Bután e Indonesia, redujeron la incidencia de casos y la mortalidad en un 40% o más.

AMENAZAS BIOLÓGICAS

Deleciones en los genes pfhrp2 / 3 de los parásitos

- Las deleciones en los genes del parásito pfhrp2 y pfhrp3 (pfhrp2 / 3) hacen que los parásitos sean indetectables por las PDR basadas en la proteína 2 rica en histidina (HRP2).
- La OMS ha recomendado que los países con informes de deleciones de pfhrp2 / 3 o los países vecinos deben realizar encuestas de línea de base representativas en los casos sospechosos de malaria para determinar si la prevalencia de deleciones de pfhrp2 / 3 que causan resultados de falsos negativos de la PDR ha alcanzado un umbral para el cambio de PDR (> 5 % de deleciones de pfhrp2 que causan resultados de falsos negativos en PDR).

- Las opciones alternativas de las PDR (por ejemplo, basadas en la detección de la lactato deshidrogenasa) son limitadas; en particular, actualmente no existen pruebas precalificadas por las OMS que no sean pruebas de combinación de HRP2 que puedan detectar y distinguir entre *P. falciparum* y *P. vivax*.
- La OMS está rastreando reportes publicados de deleciones de pfhrp2 / 3 utilizando la aplicación Mapa de los Desafíos de la Malaria (Malaria Threats Map) y está fomentando un enfoque armonizado para mapear y notificar las deleciones de pfhrp2 / 3 a través de protocolos de encuestas disponibles públicamente.
- El Grupo Asesor de Políticas de Malaria de la OMS emitió una declaración en la que pedía medidas urgentes para abordar el aumento de la prevalencia de las deleciones de pfhrp2 en todos los países endémicos y, particularmente, en el Cuerno de África.
- Entre septiembre del 2020 y septiembre del 2021, se informaron investigaciones de deleciones de pfhrp2 / 3 en 17 publicaciones de 13 países. Entre estos estudios, se confirmaron deleciones de pfhrp2 en Brasil, la República Democrática del Congo, Djibouti, Etiopía, Ghana, Sudán, Uganda y la República Unida de Tanzania.
- Con base en los datos de las publicaciones incluidas en el Mapa de los Desafíos de la Malaria, se ha realizado algún tipo de investigación en 44 países, entre los cuales se ha confirmado la presencia de deleciones en 37.

Resistencia de los parásitos a los medicamentos antimaláricos

- La eficacia de los medicamentos antimaláricos se vigila mediante estudios de eficacia terapéutica (EET), que rastrean los resultados clínicos y parasitológicos entre los pacientes que reciben tratamiento antimalárico.
- La resistencia parcial a la artemisinina se vigila mediante una lista establecida de marcadores PfKelch13 validados y candidatos asociados con una sensibilidad disminuida a la artemisinina.
- En la Región de África de la OMS, los tratamientos de primera línea para *P. falciparum* incluyen arteméter-lumefantrina (AL), artesunato-amodiaquina (AS-AQ), artesunato-pironaridina (AS-PY) y dihidroartemisinina-piperaquina (DHA-PPQ). Los EET realizados de acuerdo con el protocolo estándar de la OMS entre 2015 y 2020 han demostrado una alta eficacia entre los derivados de la artemisinina utilizados para tratar *P. falciparum*. Ahora hay evidencia de la expansión clonal de mutaciones de *PfKelch13* en Ruanda (R561H) y Uganda (C469Y y A675V). Las tasas de fallas del tratamiento en Ruanda y Uganda permanecen por debajo del 10%, porque el fármaco asociado sigue siendo eficaz. Además, se ha encontrado el R622I, un marcador candidato de resistencia parcial a la artemisinina, en una proporción cada vez mayor en muestras del Cuerno de África, particularmente en Eritrea. Se necesitan más estudios para determinar el alcance de la propagación de los polimorfismos *PfKelch13* en África oriental e investigar cualquier cambio en el tiempo de eliminación del parásito y la resistencia in vitro.
- En la Región de las Américas de la OMS, el tratamiento de primera línea para *P. falciparum* incluye AL, artesunato-mefloquina (AS-MQ) y cloroquina (CQ). Los EET de AL realizados entre 2015 y 2020 en Brasil y Colombia demostraron una alta eficacia. No ha habido un aumento en la prevalencia de la mutación C580Y en Guyana.
- En la Región de Asia Sudoriental de la OMS, los tratamientos de primera línea para *P. falciparum* incluyen AL, AS-MQ, AS-PY, artesunato más sulfadoxina-pirimetamina (AS + SP) y DHA-PPQ. Los EET de AL realizados en Bangladesh, India y Myanmar entre 2015 y 2020 encontraron una alta eficacia de todos los tratamientos. En India, aunque las tasas de fallas terapéuticas con AS + SP se mantuvieron bajas, un estudio del estado de Chhattisgarh detectó una alta prevalencia de *dhfr* y *dhps*, lo que indica una menor sensibilidad al fármaco asociado, SP. El EET de DHA-PPQ realizado en Indonesia y Myanmar demostró altas tasas de eficacia, con tasas de falla terapéutica de menos del 5%. En Tailandia, donde la eficacia de los medicamentos se evalúa con una vigilancia integrada de la eficacia de medicamentos, las tasas de falla terapéutica del tratamiento con DHA-PPQ más primaquina en 2018, 2019 y 2020 fueron menores al 10%, excepto en la provincia de Sisaket, donde las tasas de falla fueron altas. Esto llevó a la provincia a cambiar su terapia de primera línea a AS-PY en 2020.
- En la subregión del Gran Mekong, las mutaciones de *PfKelch13* asociadas con la resistencia parcial a la artemisinina han alcanzado una alta prevalencia. Entre las muestras recolectadas en Myanmar y el oeste de Tailandia entre 2015 y 2020, se encontraron parásitos de tipo salvaje *PfKelch13* en el 65.5% de las muestras. Dos mutaciones, R539T y C580Y, prevalecen en toda la SGM, con una mayor prevalencia en la parte oriental de la subregión.

- En la Región del Mediterráneo Oriental de la OMS, AL y AS + SP siguen siendo eficaces en los países que los utilizan como tratamiento de primera línea.
- En la Región del Pacífico Occidental de la OMS, los tratamientos de primera línea incluyen AL, AS-MQ, AS-PY y DHA-PPQ. Los EET realizados entre 2015 y 2020 encontraron una alta eficacia con AL, AS-MQ y AS-PY en todos los países donde se realizaron los estudios. En Vietnam, el tratamiento de primera línea de DHA-PPQ fue reemplazado por AS-PY en provincias donde se observaron altas tasas de fracaso del tratamiento.
- Las tendencias en la sensibilidad a los fármacos antimaláricos en Camboya continúan evolucionando: un análisis de marcadores moleculares encontró que el porcentaje de muestras con la mutación C580Y de *PfKelch13* y números de copias múltiples de *Pf plasmepsina* está disminuyendo, mientras que hay un alto porcentaje de muestras con números de copias múltiples de *Pfmdr1* y *PfKelch13* tipo salvaje. La presencia de múltiples copias de *Pfmdr1* hasta ahora no ha afectado la eficacia de AS-MQ.
- Todos los estudios mencionados aquí también están publicados en el Mapa de los Desafíos de la Malaria (Malaria Threats Map).

Resistencia de los vectores a los insecticidas

- De 2010 a 2020, 88 países notificaron a la OMS datos sobre la vigilancia de la resistencia a los insecticidas, incluidos 38 sobre la intensidad de la resistencia a los piretroides y 32 sobre la capacidad del PBO para restaurar la susceptibilidad a los piretroides.
- En 2020, se dispuso de nuevas concentraciones discriminantes y procedimientos para monitorear la resistencia en los vectores de la malaria contra clorfenapir, clotianidina, transflutrina, flupiradifurona y piriproxifeno, y se revisaron las concentraciones discriminantes para pirimifos-metil y alfa-cipermetrina. Los países deben ajustar su vigilancia de la resistencia a los insecticidas en los vectores de la malaria de acuerdo con estos nuevos procedimientos. La OMS no ha recibido datos de vigilancia de la resistencia de los vectores a la transflutrina, la flupiradifurona y el piriproxifeno. Aunque la OMS ha recibido algunos datos de monitoreo de resistencia para clorfenapir y clotianidina, estos datos son insuficientes para evaluar la presencia potencial de resistencia a cualquiera de estos dos insecticidas.
- De los 88 países con malaria endémica que proporcionaron datos para 2010-2020, 78 han detectado resistencia a al menos una clase de insecticida en al menos un vector de la malaria y un sitio de recolección, 29 ya han detectado resistencia a piretroides, organoclorados, carbamatos y organofosforados en diferentes sitios, y 19 han confirmado la resistencia a estas cuatro clases en al menos un sitio y al menos un vector local.
- A nivel mundial, la resistencia a los piretroides, la principal clase de insecticida que se utiliza actualmente en los mosquiteros tratados con insecticidas, está muy extendida, detectándose en al menos un vector de la malaria en el 68% de los sitios para los que se dispone de datos. Se reportó resistencia a los organoclorados en el 64% de los sitios. La resistencia a carbamatos y organofosforados fue menos prevalente, detectándose en 34% y 28% de los sitios que reportaron datos de vigilancia, respectivamente.
- De los 38 países que reportaron datos sobre la intensidad de la resistencia a los piretroides, se detectó resistencia de alta intensidad en 27 países y 293 sitios.
- Desde 2010, se ha observado que el PBO restaura completamente la susceptibilidad en 283 sitios en 29 países.
- Para informar el manejo de la resistencia a los insecticidas, los países deben desarrollar e implementar planes nacionales de vigilancia y manejo de ésta, basándose en el Marco de la OMS para los planes nacionales para la vigilancia y manejo de la resistencia a los insecticidas en los vectores de malaria. El número de países que informaron tener un plan de este tipo aumentó de 53 en 2019 a 67 en 2020.
- Se requiere de apoyo técnico y financiero para ayudar a los países a vigilar y manejar la resistencia a los insecticidas.
- Los datos de resistencia a los insecticidas notificados a la OMS se incluyen en la base de datos mundial de la OMS sobre la resistencia a los insecticidas en los vectores de malaria y están disponibles para su exploración a través del el Mapa de los Desafíos de la Malaria.

1 INTRODUCTION

The world malaria report tracks progress in several important health and development goals in the global efforts to reduce the burden of malaria overall and eliminate the disease where possible. These goals are outlined in the Sustainable Development Goals (SDGs) framework (*1*), the World Health Organization (WHO) *Global technical strategy for malaria 2016–2030* (GTS) (*2*) and the RBM Partnership to End Malaria *Action and investment to defeat malaria 2016–2030* (*3*).

The *World malaria report 2020* provided a detailed review of the key events since 1990 that have contributed to the fight against malaria *(4)*. One key analysis from that report was progress towards global targets for reducing the burden of malaria cases and deaths. The analysis was based on projected trends from the estimates for the period 2000–2019, to measure progress in malaria case incidence and mortality rate for the 2020 milestone year, as well as 2025 and 2030. This year's world malaria report, however, includes actual estimates of the malaria burden for the target year 2020, with the 2000-2020 estimates used to re-analyse progress towards global targets. The estimates of cases and deaths reported for 2020 also include the impact of service disruptions during the coronavirus disease (COVID-19) pandemic on malaria. Further, WHO has changed its method for quantifying the "cause of death" fraction in children aged under 5 years (**Annex 1**, **Section 3**), which has increased the estimated number of malaria deaths across the period 2000–2020, independent of the impact of malaria service disruptions during the coronavirus disease (COVID-19) pandemic.

A summary of the highlights in 2020 and 2021 tracking some of the key events that are relevant to the global state of malaria, including the response to malaria during the COVID-19 pandemic, is provided in **Section 2**. **Section 3** presents the global trends in malaria morbidity and mortality, and estimates of the burden of malaria during pregnancy. The analysis of malaria during pregnancy is expanded to include the potential burden of low birthweights averted if coverage of intermittent preventive treatment in pregnancy (IPTp) was matched to coverage of at least one antenatal care (ANC) visit or scaled up to 90% effective coverage. **Section 3** includes a new subsection on severe malaria in children, looking at variation in clinical features by endemicity and changing age patterns as a result of changing malaria transmission. Progress towards elimination, including the launch of the "eliminating countries for 2025" (E-2025) initiative and the malaria free certification of China and El Salvador, is presented in **Section 4**. **Section 5** presents an update on the trends and response in the 11 highest burden countries, and **Section 6** focuses on the total funding for malaria control and elimination, and for malaria research and development. The supply of key commodities to endemic countries and the population-level coverage achieved through these investments are presented in **Section 7**. **Section 8** summarizes global progress, by region and country, towards the GTS milestones for 2020 and the trajectory towards 2025 and 2030. **Section 9** describes the threats posed by *Plasmodium falciparum* parasites that no longer express histidine-rich protein 2 (HRP2), which is the target antigen for the most widely used malaria rapid diagnostic test (RDT), and the threats posed by drug and insecticide resistance. **Section 10** summarizes the findings of the report and presents concluding remarks.

The main text is followed by annexes that contain data sources and methods, regional profiles and data tables. Country profiles are presented online.[1]

[1] See https://www.who.int/teams/global-malaria-programme/reports.

2 OVERVIEW OF KEY EVENTS IN 2020–2021

The *World malaria report 2020* presented a detailed review of the key malaria milestones in the past 2 decades and the preceding events that laid the foundation for those milestones. This section presents the key events relevant to the global malaria response that occurred in 2020 and 2021, including the updating of the GTS, information on new strategies from key malaria partners, the emergence of partial artemisinin resistance in the WHO African Region, the release of the new policy recommendation for the vaccine RTS,S/AS01 (RTS,S), and the global and national response to malaria during the COVID-19 pandemic.

2.1 GLOBAL STRATEGIES

In 2020 and 2021, WHO and key multilateral and bilateral partners either updated their global strategies or developed new ones in the fight against malaria. Many of these strategies are interconnected and include lessons learned in the past 20 years, the recent stalling of global malaria progress, the high burden to high impact (HBHI) approach, the increasing threat of resistance by malaria vectors and parasites, and the challenges of the COVID-19 pandemic. Common themes across these strategies include the importance of country leadership and systems, the meaningful engagement of communities, an emphasis on data driven approaches, the need for the development and introduction of new tools, and the importance of adequate funding.

2.1.1 GTS

The GTS was adopted by the World Health Assembly in May 2015 (*2*). It provides a comprehensive framework to guide countries in their efforts to accelerate progress towards malaria elimination. The strategy sets the target of reducing global malaria incidence and mortality rates by at least 90% by 2030 (**Fig. 2.1**).

In 2019, the Strategic Advisory Group on malaria eradication assessed progress and identified several areas where there was room for improvement in the current GTS. These concerns were reinforced by lessons learned from the HBHI approach (**Section 5**) and the COVID-19 pandemic (**Section 10**). It became clear that countries need to be able to adapt the global strategy to their local context and to maximize the implementation of measures known to be effective – a difficult challenge in countries where health systems are weak. Community engagement and national leadership were highlighted as critical, as were improved surveillance systems and strengthened workforce capacity. In many cases, funding was the factor that limited full implementation of national strategic plans.

The GTS update process was launched in 2020 to reflect on progress against the 2020 milestones, incorporate lessons learned and highlight unforeseen challenges (e.g. COVID-19); the aim was to achieve impact and accelerate towards the burden reduction milestones of 2025. The GTS was updated through a consultative process that involved WHO regional offices; national malaria programmes (NMPs); global, regional and national partners; and research groups and academia. The updated GTS was presented and discussed in an open session at the Malaria Policy Advisory Group (MPAG) meeting in April 2021.

The updated GTS (*5*) was endorsed by the World Health Assembly in May 2021, through resolution WHA74.9. Although the milestones and targets remain the same, some of the approaches to tackling the disease have evolved to keep pace with the changing malaria landscape. The key updates in the GTS are as follows:

- The principles have been revised to emphasize country leadership, the strategic use of data to inform programme implementation and the need for resilient health systems (referencing the impact over the past 5 years, including the COVID-19 pandemic).
- The GTS is now explicitly aligned with universal health coverage (UHC), integration of essential health services and a multisectoral response.
- There is greater emphasis on strengthened national capacity to generate, analyse and use high-quality surveillance data to tailor responses to maximize impact.
- The GTS now identifies the need for participatory analyses of health barriers or disparities to ensure equitable access to services.
- The GTS now highlights the need for accelerating innovation to achieve the targets.
- The costing analysis has been updated to US$ 9.3 billion per year by 2025 and US$ 10.3 billion by 2030.

FIG. 2.1.

GTS at a glance *Source: extracted from the GTS (5).*

VISION – A WORLD FREE OF MALARIA

GOALS	MILESTONES		TARGETS
	2020	2025	2030
1. Reduce malaria mortality rates globally compared with 2015	At least 40%	At least 75%	At least 90%
2. Reduce malaria case incidence globally compared with 2015	At least 40%	At least 75%	At least 90%
3. Eliminate malaria from countries in which malaria was transmitted in 2015	At least 10 countries	At least 20 countries	At least 35 countries
4. Prevent re-establishment of malaria in all countries that are malaria-free	Re-establishment prevented	Re-establishment prevented	Re-establishment prevented

PRINCIPLES

- Country ownership and leadership, with involvement and meaningful participation of communities, are essential to accelerating progress through a multisectoral approach.
- All countries can accelerate efforts towards elimination through combinations of interventions tailored to local context.
- Improve impact through the use of data to stratify and tailor interventions to the local context.
- Equity in access to quality health services, especially for populations experiencing disadvantage, discrimination and exclusion, is essential.
- Innovation in interventions will enable countries to maximize their progression along the path to elimination.
- A resilient health system underpins the overall success of the malaria response.

STRATEGIC FRAMEWORK

– comprising three major pillars, with two supporting elements: (1) innovation and research, and (2) a strong enabling environment

Maximize impact of today's life-saving interventions

- **Pillar 1.** Ensure access to malaria prevention, diagnosis and treatment as part of universal health coverage
- **Pillar 2.** Accelerate efforts towards elimination and attainment of malaria-free status
- **Pillar 3.** Transform malaria surveillance into a key intervention

Supporting element 1. Harnessing innovation and expanding research

- Basic research to foster innovation and the development of new and improved interventions
- Implementation research to optimize impact and cost-effectiveness of existing interventions
- Action to facilitate rapid uptake of new interventions

Supporting element 2. Strengthening the enabling environment

- Strong political and financial commitments
- Multisectoral approaches, and cross-border and regional collaborations
- Stewardship of entire health system including the private sector, with strong regulatory support
- Capacity development for both effective programme management and research

GTS: Global technical strategy for malaria 2016–2030.

2.1.2 RBM Partnership to End Malaria

In 2020, the RBM Partnership to End Malaria launched its Strategic Plan 2021–2025 (*6*) with a vision of "a world free from the burden of malaria" and a mission to convene and coordinate an inclusive, multisectoral response to control, eliminate and ultimately eradicate malaria. The strategy was to be guided by the principle that "ending malaria is central to achieving UHC and global health security, and reducing poverty and inequality" (*6*). The strategic plan, which was developed through a consultative process, has three strategic objectives: optimize the quality and effectiveness of countries and regional programming; maximize levels of financing; and facilitate the deployment and scale-up of new products, techniques or implementation strategies (**Fig. 2.2**).

2.1.3 The Global Fund strategy

In November 2021, the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) launched its strategy for 2023–2028 (*7*). The new strategy aims to rapidly accelerate progress towards the 2030 HIV, tuberculosis (TB) and malaria goals, and to contribute to better, equitable health for all.

To accelerate progress towards the 2030 malaria goals, the Global Fund partnership will support countries to increase the efficiency and effectiveness of people-centred, human rights based and gender-responsive integrated malaria interventions. These interventions are tailored to subnational levels, and are responsive to local contexts and to barriers to access to and quality of services (**Fig. 2.3**). The strategy focuses on five subobjectives concerning malaria:

FIG. 2.2.

RBM Partnership to End Malaria 2021–2025 strategy framework *Source: a 2020 RBM Partnership publication (6).*

Vision

A world free from the burden of malaria

Mission	Principle
To convene and coordinate an inclusive, multisectoral response to control, eliminate and ultimately eradicate malaria	**Ending malaria is central to achieving UHC and global health security, and reducing poverty and inequality.**

Strategic objectives and strategic actions	**SO1. Optimize the quality and effectiveness of country and regional programming**	**SO2. Maximize levels of financing**
	1.1 Support countries in the design of quality, prioritized programmes 1.2 Support countries in the use of real-time subnational data in planning, implementation and monitoring 1.3 Facilitate timely access to implementation support to address bottlenecks and gaps 1.4 Support building local management and technical capacity 1.5 Support countries to strengthen multi-stakeholder partnership coordination at the national and subnational level 1.6 Leverage regional alliances and initiatives to ensure cross-border and cross-sectoral coordination and coherence	2.1 Advocate for optimizing global resource envelopes from existing donors and new channels of financing 2.2 Support countries with mobilizing and prioritizing domestic and other resources for malaria and health **SO3. Facilitate the deployment and scale-up of new products, techniques or implementation strategies** 3.1 Promote and support the inclusion of new interventions in the design and delivery of programmes 3.2 Foster peer learning and knowledge exchange to facilitate deployment and scale-up of new products, techniques or implementation strategies

Cross-cutting strategic enablers

Data-sharing and use	**SE1:** Open and timely sharing of quality data to drive decision-making, build transparency and foster accountability.
Effective partnership	**SE2:** Meaningful engagement of partners at the global, regional and national level to leverage their unique capabilities, expertise and perspectives.
Targeted advocacy and communications	**SE3:** Targeted advocacy and communications to keep malaria high on global health and development agendas to drive leadership, commitment, and change.
Focused Secretariat	**SE4:** A Secretariat that energizes the partnership to deliver the strategy.

SE: strategic enabler; SO: strategic objective.

1. Ensure optimal effective vector control coverage.
2. Expand equitable access to quality early diagnosis and treatment of malaria, through health facilities, at the community level and in the private sector.
3. Implement malaria interventions, tailored to subnational level, using granular data, and capacitating decision-making and action.
4. Drive towards malaria elimination and facilitate prevention of re-establishment.
5. Accelerate reductions in malaria in high-burden areas and achieve subregional elimination in select area(s) of sub-Saharan Africa to demonstrate the path to eradication.

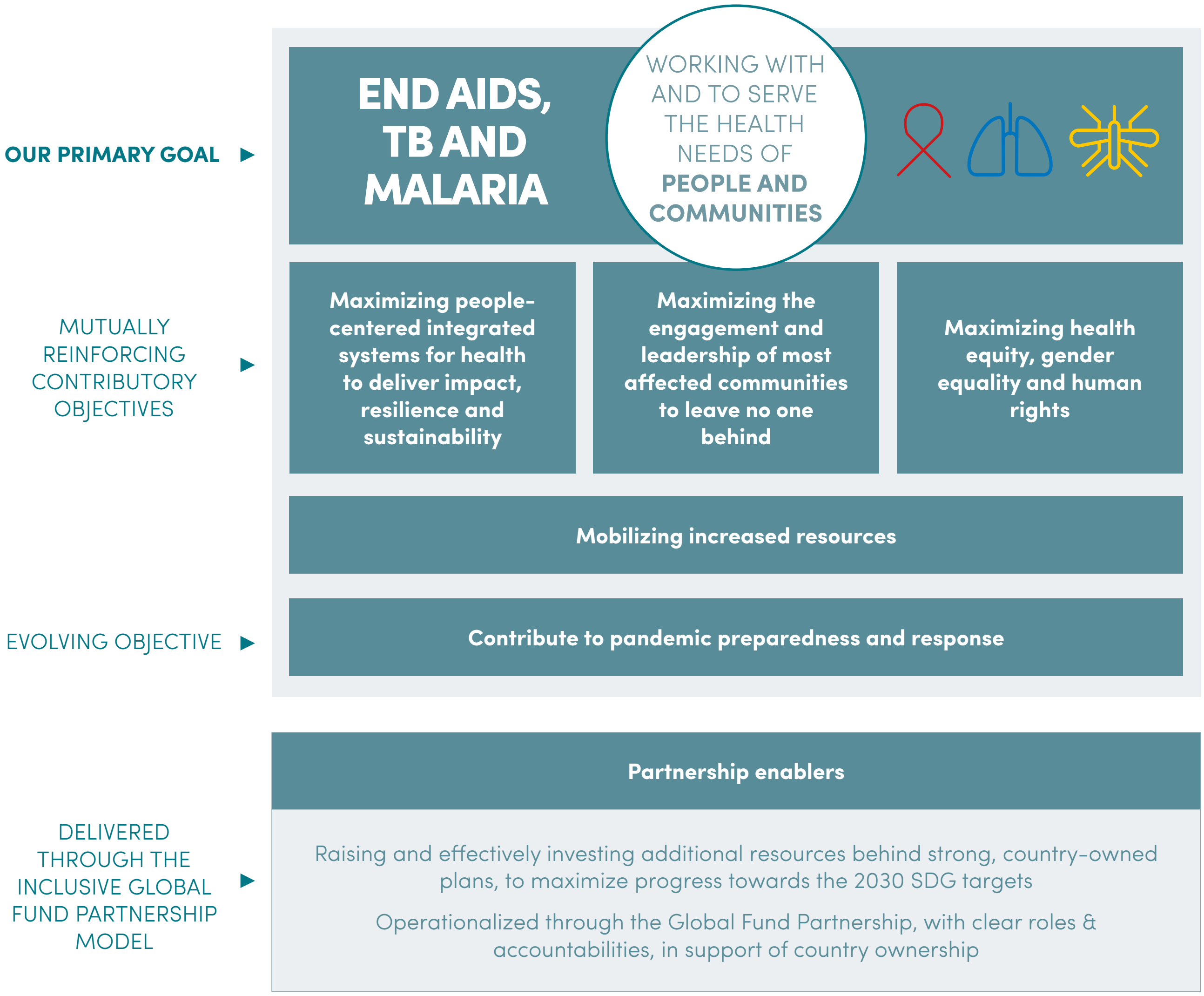
To achieve the strategy's primary goal of ending AIDS, TB and malaria, it is underpinned by four mutually reinforcing contributory objectives, which are:

- maximizing people-centred, integrated systems for health to deliver impact, resilience and sustainability;
- maximizing the engagement and leadership of most affected communities to leave no one behind;
- maximizing health equity, gender equality and human rights; and
- mobilizing increased resources.

The Global Fund strategy has an evolving objective to contribute to pandemic preparedness and response, working in partnership with other global health actors to strengthen the resilience of HIV, TB and malaria programmes and systems for health in the face of pandemic threats.

FIG. 2.3.

Summary of the Global Fund Strategy 2023–2028 *Source: a 2021 Global Fund publication (7).*



AIDS: acquired immunodeficiency syndrome; Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; SDG: Sustainable Development Goal; TB: tuberculosis.

2.1.4 United States President's Malaria Initiative

The United States President's Malaria Initiative (PMI) supports the response to malaria in 27 countries that account for 80% of the global burden of malaria (*8*). On 6 October 2021, PMI launched its strategy for the period 2021–2026 (**Fig. 2.4**). Titled "End Malaria Faster", the strategy aims to greatly reduce malaria deaths and cases in the 27 countries that PMI supports (*9*).

The strategy has three objectives: reduce malaria mortality by 33% from 2015 levels in high-burden PMI partner countries achieving a greater than 80% reduction compared with 2000; reduce malaria morbidity by 40% from 2015 levels in PMI partner countries with a high or moderate malaria burden; and bring at least 10 PMI partner countries towards national or subnational elimination and assist at least one country in the Greater Mekong subregion (GMS) to eliminate malaria. The following strategic approaches are outlined to reach these objectives:

- *reach the unreached* – achieve, sustain and tailor deployment and uptake of high-quality, proven interventions with a focus on hard-to-reach populations;
- *strengthen community health systems* – transform and extend community and frontline health systems to end malaria;
- *keep malaria services resilient* – adapt malaria services to increase resilience against shocks, including COVID-19 and emerging biological threats, conflict and climate change;
- *invest locally* – partner with countries and communities to lead, implement and fund malaria programmes; and
- *innovate and lead* – leverage new tools, optimize existing tools and shape global priorities to end malaria faster.

FIG. 2.4.

PMI's strategic framework *Source: a 2021 PMI publication (9).*

VISION

A world free of malaria within our generation

GOALS

Prevent malaria cases, reduce malaria deaths and illness, and eliminate malaria in PMI partner countries

OBJECTIVES 2021–2026

1. Reduce malaria mortality by 33 percent from 2015 levels in high-burden PMI partner countries, achieving a greater than 80 percent reduction from 2000
2. Reduce malaria morbidity by 40 percent from 2015 levels in PMI partner countries with high and moderate malaria burden
3. Bring at least ten PMI partner countries toward national or subnational elimination and assist at least one country in the Greater Mekong Subregion to eliminate malaria

FOCUS AREA

1. REACH THE UNREACHED
   Achieve, sustain, and tailor deployment and uptake of high-quality, proven interventions with a focus on hard-to-reach populations
2. STRENGTHEN COMMUNITY HEALTH SYSTEMS
   Transform and extend community and frontline health systems to end malaria
3. KEEP MALARIA SERVICES RESILIENT
   Adapt malaria services to increase resilience against shocks, including COVID-19 and emerging, biological threats, conflict, and climate change
4. INVEST LOCALLY
   Partner with countries and communities to lead, implement, and fund malaria programs
5. INNOVATE AND LEAD
   Leverage new tools, optimize existing tools, and shape global priorities to end malaria faster

PMI: United States President's Malaria Initiative.

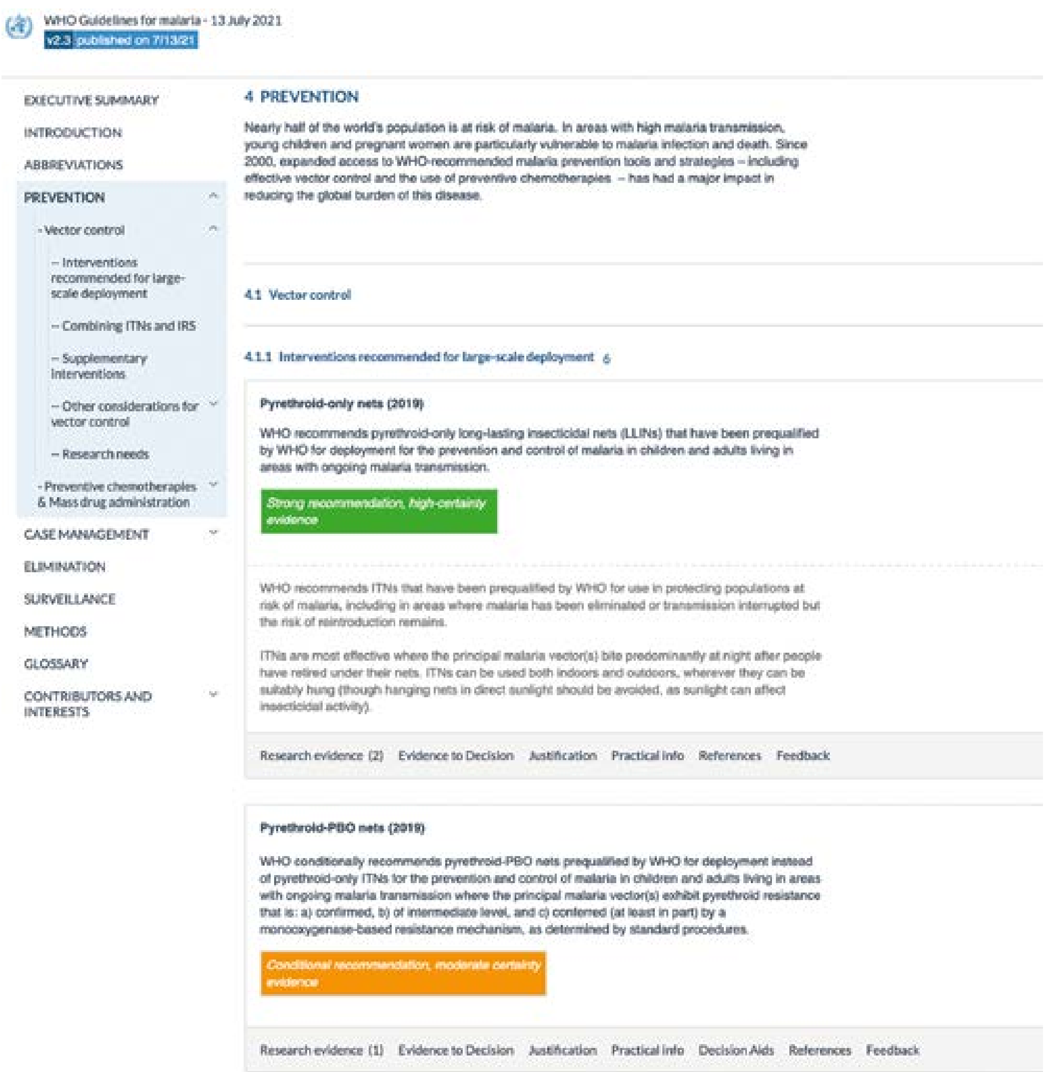
2.2 GUIDELINE DEVELOPMENT PROCESS AND THE CONSOLIDATED *WHO GUIDELINES FOR MALARIA*

The consolidated *WHO guidelines for malaria* was launched in February 2021, to make it easier and more efficient for malaria-affected countries to access and use the guidelines in their efforts to reduce and, ultimately, eliminate malaria. The consolidated guidelines are available on MAGICapp (*10*), which brings together WHO's most up-to-date recommendations for malaria in an online platform that is user-friendly and easy to navigate. MAGICapp currently provides all WHO recommendations for malaria prevention (vector control and preventive chemotherapies) and case management (diagnosis and treatment). Recommendations for elimination settings and the malaria vaccine are in development. MAGICapp includes links to other resources, such as guidance on the strategic use of information to drive impact; guidance on surveillance, monitoring and evaluation; operational manuals, handbooks and frameworks; and a glossary of key terms and definitions. The structure of WHO malaria recommendations on the MAGICapp platform is shown in **Fig. 2.5**.

Currently, the Global Malaria Programme has convened four guideline development groups to update or develop new recommendations. These consultations are focusing on vector control, chemoprevention, treatment and elimination strategies. The new and updated recommendations will be published on the MAGICapp platform and disseminated to countries, regions and partners through the newsletter and news updates.

FIG. 2.5.

The consolidated *WHO guidelines for malaria*: examples of two vector control interventions recommended for large-scale deployment *Source: MAGICapp platform (10).*



WHO: World Health Organization.

2.3 WHO RECOMMENDATION ON THE USE OF THE RTS,S MALARIA VACCINE

In January 2016, WHO recommended further evaluation of RTS,S in a series of pilot implementations, addressing several gaps in knowledge, before considering its introduction at country level (*11*). The Malaria Vaccine Implementation Programme (MVIP) evaluation was designed to address several outstanding questions related to the public health use of RTS,S: the feasibility of administering the recommended four doses of the vaccine, the vaccine's role in reducing childhood deaths and its safety in the context of routine use. Data from the pilot introductions have shown that the vaccine has a favourable safety profile; significantly reduces severe, life-threatening malaria; and can be delivered effectively in real-life childhood vaccination settings, even during a pandemic (**Fig. 2.6**).

On 6 October 2021, WHO's top advisory bodies for immunization and malaria – the Strategic Advisory Group of Experts on Immunization (SAGE) and the Malaria Policy Advisory Group (MPAG) – jointly convened to review the full package of evidence on RTS,S. The aim was to provide advice on a WHO recommendation for the potential wider use of this malaria vaccine for children in areas of moderate and high *P. falciparum* transmission.

The primary results of the evaluation, combined with further modelling analysis, showed that the vaccine:

- could be delivered through the national routine immunization systems, achieving effective and equitable coverage among target children;
- added protection to those not protected by other preventive measures, with two thirds of children who did not sleep under an insecticide-treated mosquito net (ITN) benefiting from the vaccine;
- was safe and effective, with a favourable safety profile among children who received the 2.3 million doses of the vaccine administered to that point in the pilot countries;
- showed no negative impact on uptake of ITNs, other childhood vaccinations or health seeking behaviour for febrile illness;
- reduced admission for severe malaria by about 30% among children who were age-eligible for the vaccine, even when introduced in areas where ITNs are widely used and there is good access to diagnosis and treatment; and
- based on modelling estimates, is highly cost-effective in areas of moderate to high malaria transmission (**Fig. 2.6**).

Following advice from SAGE and MPAG based on the results of the evaluation, WHO recommended that the RTS,S malaria vaccine be used for the prevention of *P. falciparum* malaria in children living in regions with moderate to high transmission as defined by WHO (*12*). This is the first vaccine against a human parasite to receive a WHO recommendation, and WHO advises countries to consider the vaccine when deciding the optimal mix of interventions subnationally for maximum impact.

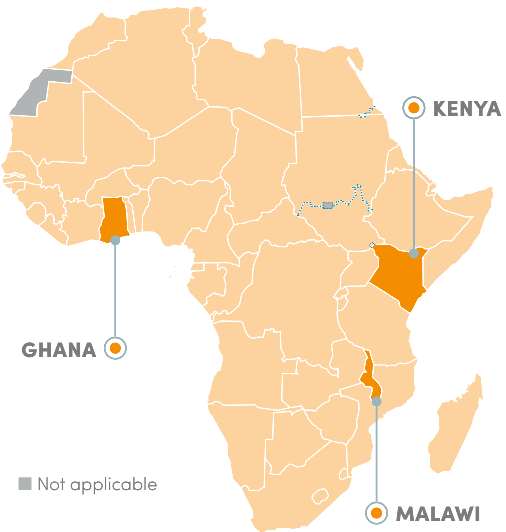
Initially, supply is limited, and WHO is working with countries and partners on a framework for allocation of the vaccine, through a global, regional and national consultative process that covers five core areas:

- *market dynamics* – anticipating supply from 2022 and planning accordingly;
- *learning from experience* – using lessons learned from the vaccine evaluation pilot countries and lessons learned from the management of supply chain constraints for other vaccines and malaria control tools;
- *maximizing impact* – using lessons learned from the HBHI approach of subnational tailoring of interventions to optimally target the vaccine within the current mix of interventions;
- *implementation considerations* – understanding and addressing issues related to systems, political feasibility and community readiness, and acceptance of the vaccines; and
- *social values* – focusing on ensuring fairness, reciprocity, accessibility and equity in the scale-up of the vaccine.

FIG. 2.6.

RTS,S malaria vaccine evaluation pilots and main results *Source: a 2021 WHO publication (13).*

Significantly reduces malaria and life-threatening severe malaria. Since 2019, delivered in childhood vaccination in three country-led pilots.



IN 2+ YEARS
2.4 million+
DOSES

830K+ CHILDREN VACCINATED

Estimated to be cost-effective in areas of moderate to high malaria transmission

30 YEARS The result of 30 years of research and development

The RTS,S vaccine can be delivered through the existing platform for childhood vaccination that reaches more than 80% of children.

What we know about the RTS,S malaria vaccine in routine use in Africa

Feasibility

- Delivery of the vaccine is feasible
- High, equitable vaccine coverage shown in routine use indicates community demand and the capacity of countries to effectively deliver the vaccine
- There is no negative impact of vaccination on ITN use, uptake of other childhood vaccines or care seeking behaviour

Equity

- Increases equity in access to malaria prevention: in routine use, the vaccine reached more than two thirds of children who were not sleeping under an ITN
- Layering the tools results in over 90% of children benefiting from at least one preventive intervention (ITN or the malaria vaccine)

Impact

- 1 life saved for every 200 children vaccinated
- 40% reduction in malaria episodes
- Substantial reduction in deadly severe malaria in routine use
- Impact optimized in highly seasonal malaria settings by providing doses before peak "rainy" season

To date, more than 2.3 million doses of the vaccine have been administered – the vaccine has a favourable safety profile.

ITN: insecticide-treated mosquito net; RTS,S: RTS,S/AS01.

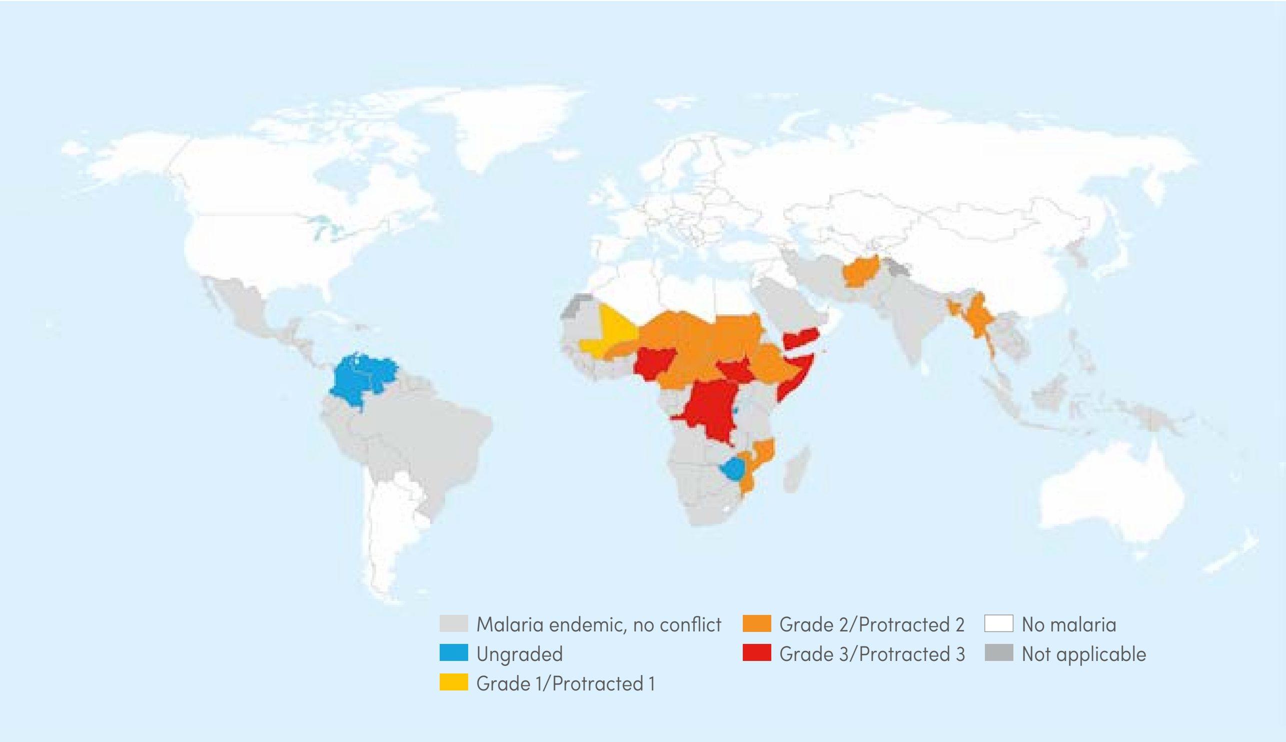
2.4 EMERGENCE OF ARTEMISININ PARTIAL RESISTANCE IN THE WHO AFRICAN REGION

Detailed information on the status of antimalarial drug resistance and other biological threats across WHO regions is provided in **Section 9**. Of great global concern is recent evidence of artemisinin partial resistance emerging independently in the WHO African Region, with clonal expansions of *PfKelch13* mutations detected in Rwanda and Uganda (*14, 15*). Artemisinin-based combination therapies (ACTs) remain efficacious in these countries; thus, there should be no immediate impact for patients. However, it is concerning that parasites have emerged that have partial resistance to artemisinin derivatives used to treat millions of malaria patients across the WHO African Region. In the GMS, artemisinin partial resistance is likely to have been involved in the spread of resistance to ACT partner drugs, and there are concerns that the same could happen in the WHO African Region.

In response to the emergence of artemisinin partial resistance, there is a need to ensure that efficacious treatments remain available. WHO will work with countries to develop a regional plan for a coordinated response. An immediate priority is to improve the therapeutic efficacy and genotypic surveillance, to better map the extent of the resistance (*16*). Additionally, a response plan is needed to identify and address factors that may have hastened the emergence of resistance and could speed its spread, including overuse of drugs, inappropriate use of monotherapies, lack of access to quality treatment and poor adherence to treatment. ACTs remain the best available treatment for uncomplicated *P. falciparum* malaria, and it is imperative that the emergence of artemisinin partial resistance does not lead health care providers or patients to hesitate to prescribe or use ACTs to treat confirmed malaria.

FIG. 2.7.

Map of ongoing armed conflicts as of October 2021 The grading reflects the highest level of emergency grade per country for ongoing health events and emergencies excluding COVID-19. A protracted emergency is defined as "an environment in which a significant proportion of the population is actually vulnerable to death and disruption of livelihood over a prolonged period of time". If a graded emergency persists for more than 6 months it may become a protracted emergency. *Source: WHO country health cluster / sector dashboard (17).*



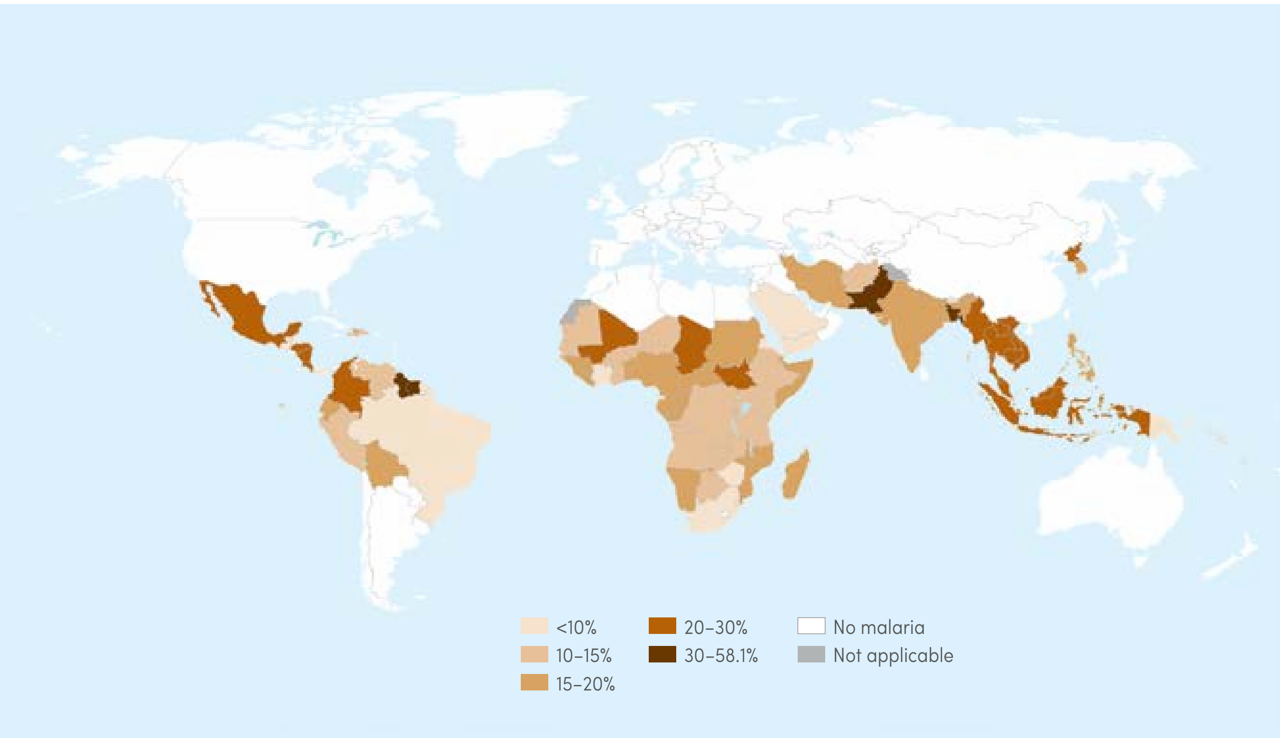
WHO: World Health Organization.

2.5 HUMANITARIAN AND HEALTH EMERGENCIES

Section 2.6 presents an update on the malaria response during the COVID-19 pandemic, and reported disruptions to the provision of malaria services and their estimated impact on malaria mortality. Although the COVID-19 pandemic has dominated global health discourse in 2020 and 2021, many malaria endemic countries have also been dealing with considerable additional humanitarian and health emergencies, both before and during the pandemic (**Fig. 2.7**). In 2020 and 2021, about 122 million people in 21 malaria endemic countries needed assistance owing to health and humanitarian emergencies, irrespective of the COVID-19 pandemic (*17*). The level and impact of these complex emergencies on health and health care are not routinely quantified, but they are highly disruptive. For example, there have been Ebola outbreaks in both the Democratic Republic of the Congo (2020 and 2021) and Guinea (2021) (*18*). Guinea also experienced an outbreak of the Marburg virus in August 2021, which was declared as being over in September 2021. Although these outbreaks have been successfully controlled or are currently being responded to, their indirect impact on the malaria burden remains unknown. In addition, several malaria endemic countries experienced natural disasters such as flooding in 2020 (**Fig. 2.8**), leading to population displacements and service disruptions, and potentially increasing the risk of exposure to malaria infection.

FIG. 2.8.

Relative population exposure to 15 cm or more flood inundation risk at the country level (percentage)
Relative exposure of 15 cm or more is considered to pose significant risk to lives, especially among vulnerable population groups. *Source: Rentschler and Salhab, 2020 (19).*



2.6 MALARIA RESPONSE DURING THE COVID-19 PANDEMIC

2.6.1 The COVID-19 pandemic in malaria endemic countries

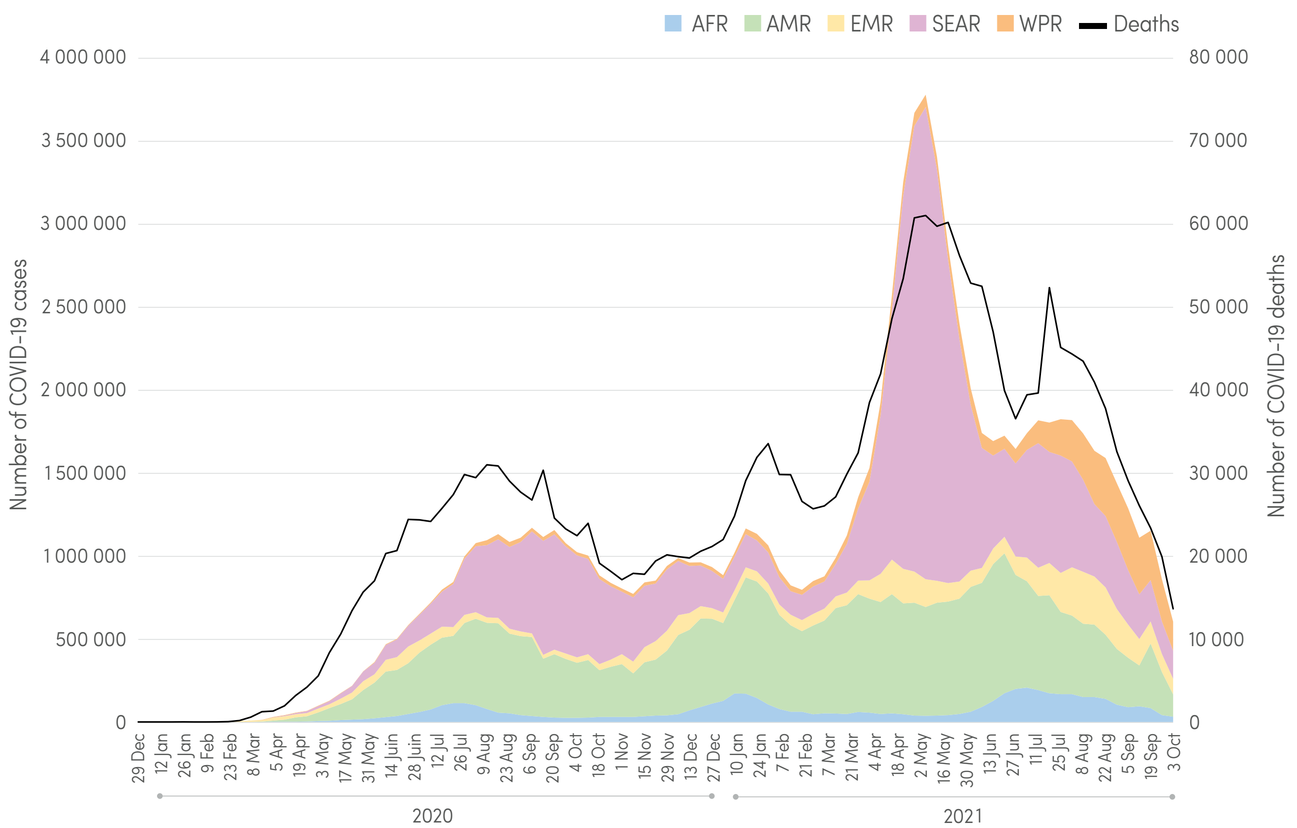
Almost 2 years since the start of the COVID-19 pandemic, which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), malaria endemic countries have reported more than 101 million cases and 2.4 million deaths due to COVID-19 (**Fig. 2.9**). In sub-Saharan Africa, where about 95% of the global burden of malaria is concentrated (**Section 3.1**), reported data on COVID-19 is thought to be vastly underestimated (*20*). In December 2020, WHO approved the first vaccine against COVID-19 (*21*). Since then, several vaccines have been given full or interim approval by WHO (*21*). Despite global initiatives to promote access to vaccines for low- and middle-income countries (LMIC) (*22*), progress has been poor. So far, in most malaria endemic countries, less than 5% of the population has been fully vaccinated (**Fig. 2.10**); this has led to continued service disruptions as multiple waves of the coronavirus transmission have put increasing strain on the health and economies of these countries.

2.6.2 Global malaria response during the COVID-19 pandemic

By March 2020, discussions had begun at the global level on how to support countries to maintain essential malaria services during the COVID-19 pandemic. This led to the release of WHO guidance to countries for tailoring the malaria response to the COVID-19 pandemic (*24*). This document, developed with malaria partners, formed part of the broader guidance on maintaining essential health services in the COVID-19 response (*25*). To reinforce the call to maintain essential health services, WHO and partners conducted a modelling analysis of the impact of various levels of service disruptions on the burden of malaria, and the analysis was used successfully for advocacy (*26*). Donors helped countries to maintain essential health services by providing greater flexibility in the allocation of disease-specific funds. With support from global, regional and local partners, malaria endemic countries were able to launch concerted efforts to mitigate disruptions to malaria services during the COVID-19 pandemic.

FIG. 2.9.

Trends in COVID-19 cases and deaths in malaria endemic countries globally and by WHO region (as of 3 October 2021) *Source: WHO COVID-19 dashboard (23).*



AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; SEAR: WHO South-East Asia Region; WHO: World Health Organization; WPR: WHO Western Pacific Region.

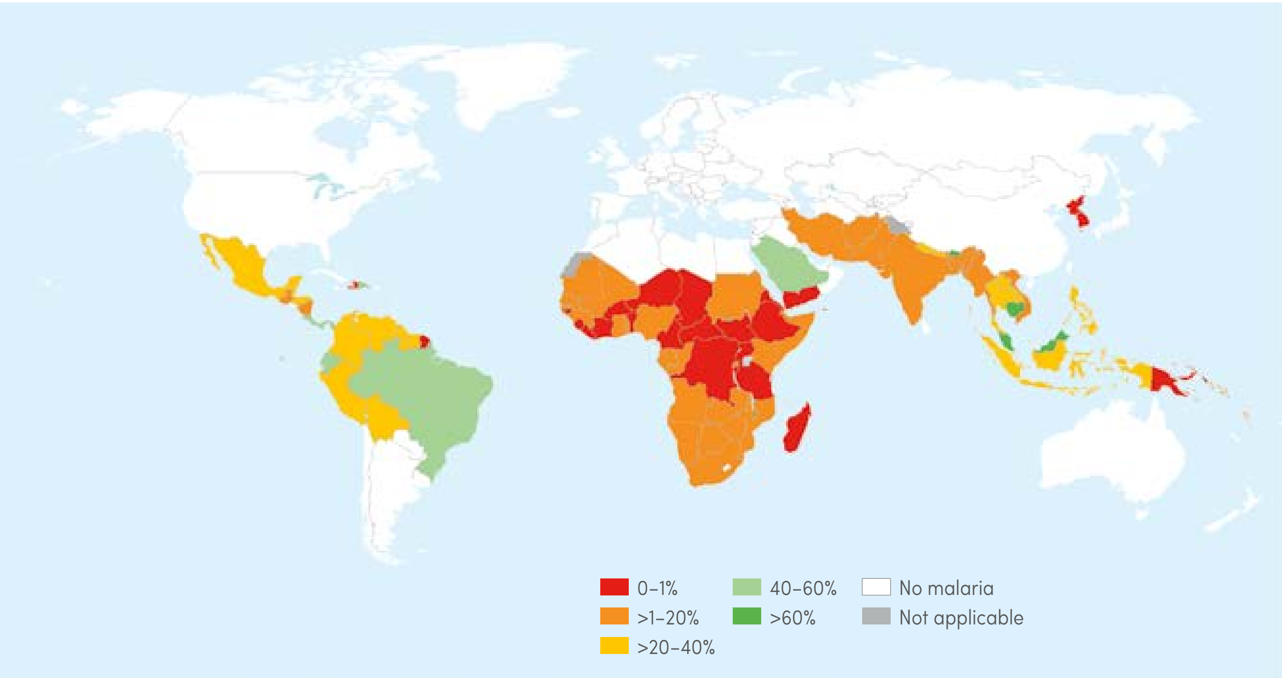
In March 2021, the government of the United States of America (USA) approved US$3.5 billion in emergency funding to the Global Fund, followed by pledges from Germany, the Netherlands and Switzerland, to support the COVID-19 response in LMIC (*27*). Under the COVID-19 Response Mechanism (C19RM) (*28*), the Global Fund is supporting countries by focusing on three broad areas of investment: the COVID-19 response, COVID-19-related adaptations of programmes to fight HIV, tuberculosis and malaria and strengthening health and community systems. The areas also incorporate cross-cutting interventions in support of community responses to COVID-19. As of November 2021, 96% of C19RM 2021 funding has been awarded or recommended for Board approval to 121 applicants. Investments are directed towards expanding testing capacity, treatments and medical supplies, protecting frontline health workers, adapting lifesaving HIV, TB and malaria programmes and reinforcing systems for health.

PMI has provided support across its 27 partner countries with their efforts to mitigate the disruption of services during the COVID-19 pandemic. This included support for safe distribution of ITNs in 15 countries, 17 indoor residual spraying (IRS) campaigns, and seasonal malaria chemoprevention (SMC) distributions in nine countries. PMI has also supported specific adaptations to mitigate disruptions in case management, including delivery of kiosks to facilitate fever screening and triage in Kenya and Malawi, and packages to sustain care seeking and ANC attendance in Kenya and Nigeria. In addition, PMI has supported training programmes in the safe deployment of community health workers, and safe implementation of surveys in several countries, focusing on understanding the scale of service disruptions and the behavioural factors that affect the use of preventive measures and treatment services.

Partners such as the RBM Partnership to End Malaria and the Alliance for Malaria Prevention provided support, including regular calls with countries to identify bottlenecks (e.g. delays in campaigns and case management stockouts) and to mobilize resources including working with countries to develop C19RM funding requests. The RBM Partnership to End Malaria also implemented high-level advocacy and enhanced partner collaboration and coordination.

FIG. 2.10.

Percentage of the population fully vaccinated against COVID-19 by 25 October 2021 *Source: adapted from Our world in data (29).*



2.6.3 Levels of service disruption by country and implications for delivery of interventions

Despite concerted efforts by countries and support from global partners, delivery of malaria services has been challenging during the COVID-19 pandemic. In particular, the supply chain systems for health commodities have experienced disruptions to transport from the site of manufacturing to countries and then within countries. Costs for purchasing, shipping and distribution have increased considerably. However, as the regulations of the COVID-19 pandemic have evolved and countries have experienced fluctuations in SARS-CoV2 transmission, the levels of disruption to malaria systems have also varied over time; hence, the impact of disruptions on malaria disease burden is difficult to quantify.

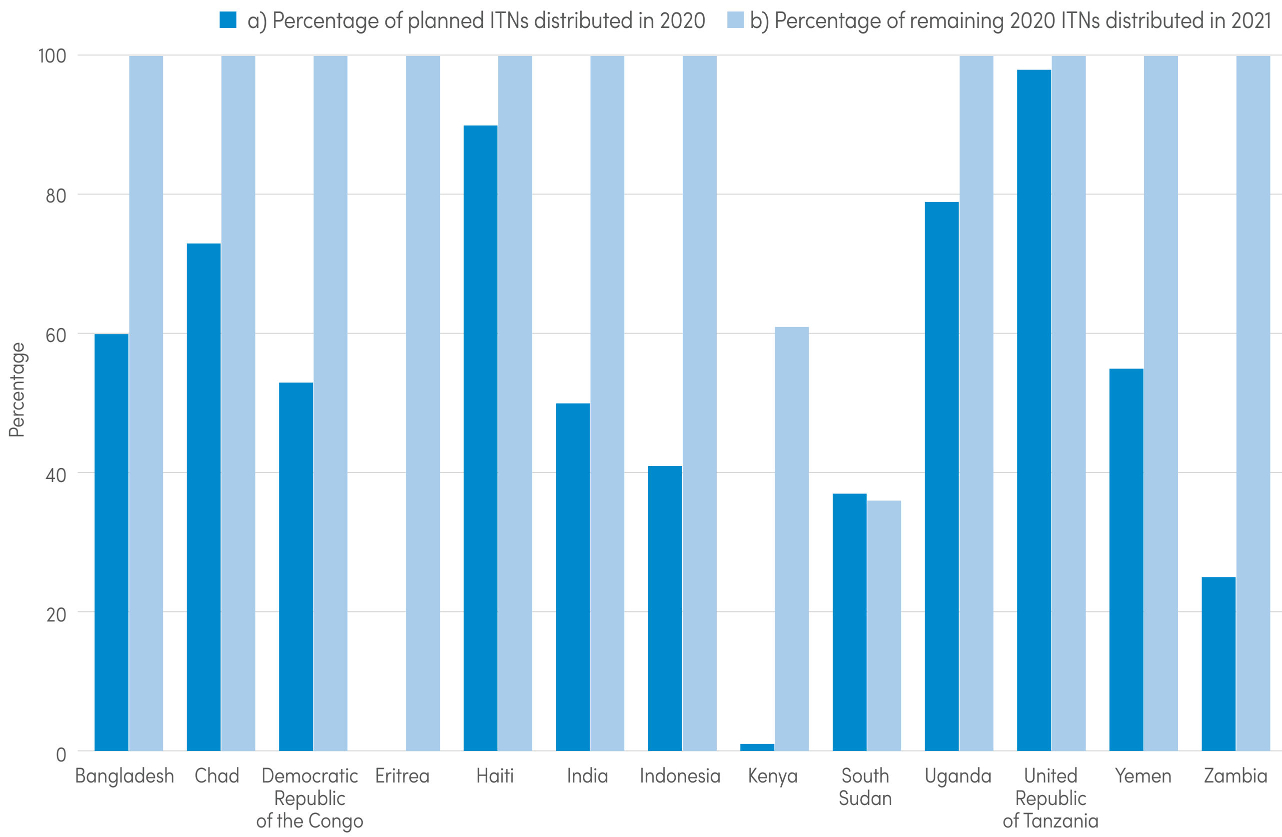
Service disruption tracking processes have been established by WHO (*30*), the Global Fund (*31*) and the RBM Partnership to End Malaria (*32*). In addition, PMI has implemented several studies in its partner countries to understand the scale of service disruptions (*33*).

2.6.3.1 Malaria prevention services

Country data assembled by the Alliance for Malaria Prevention (*34*) and the RBM Partnership to End Malaria were used to track disruptions in ITN, IRS and SMC distributions. Of the countries that had started planned distributions in 2020, five countries had completed on time (i.e. within the planned period before the pandemic), seven had completed with minor delays (i.e. within the second quarter of the original planned period), 11 completed their campaigns with moderate delays, and another eight had campaigns in progress

FIG. 2.11.

A graph of data from 13 out of 31 countries that had planned ITN distribution campaigns in 2020 but had not completed them by the end of this year showing a) percentage of ITNs planned for distribution in 2020 that were distributed by the end of 2020 (dark bars), and b) percentage of ITNs from 2020 that were distributed in 2021 (lighter bars) *Source: NMP reports, Alliance for Malaria Prevention and RBM Partnership to End Malaria.*



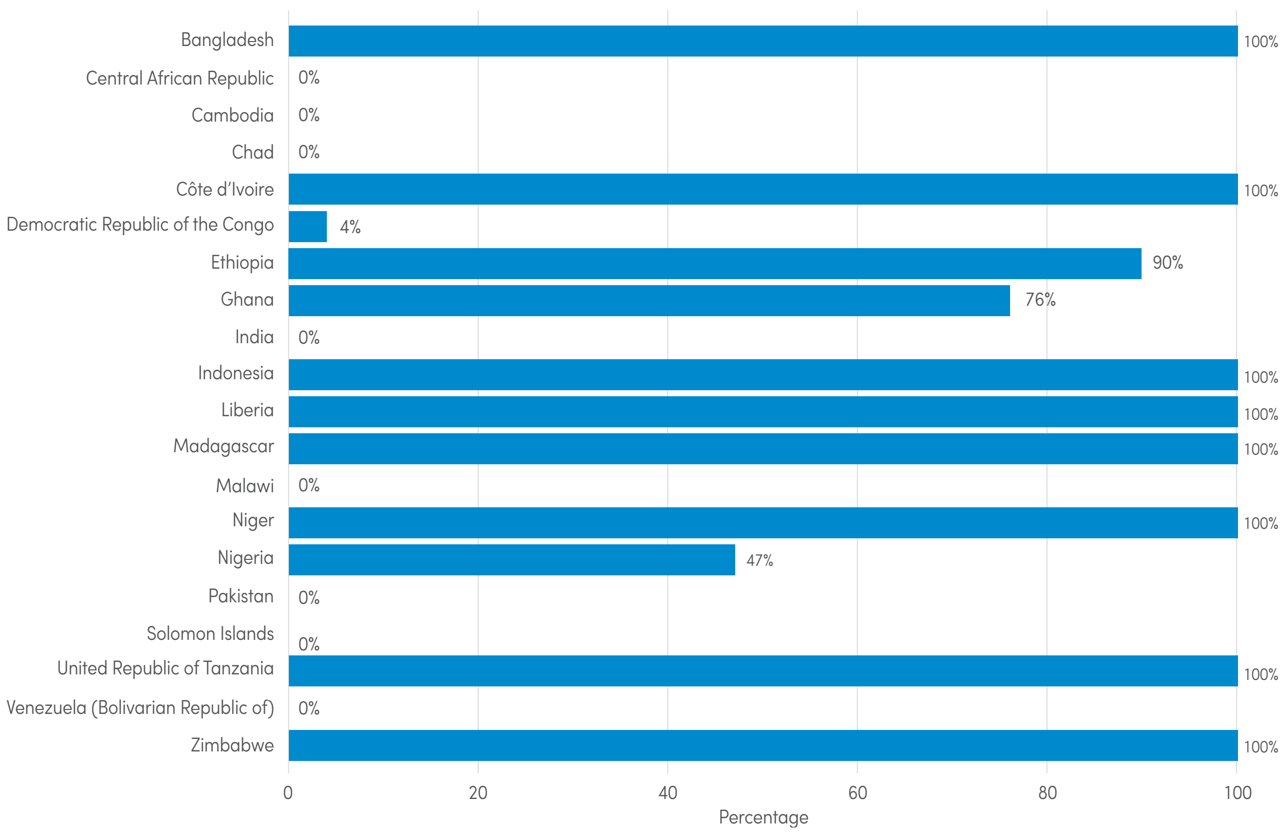
ITN: insecticide-treated mosquito net; NMP: national malaria programme.

but with major delays (i.e. beyond the second quarter of the original planned period) (*4*). As of end of December 2020, 72% of all ITNs planned for distribution in 31 malaria endemic countries in 2020 had been distributed (**Annex 2**, **Fig. 2.11**). Countries where less than 50% of ITNs had been distributed by the end of 2020 were Eritrea (0%), Kenya (1%), Zambia (25%), South Sudan (37%), Indonesia (41%) and India (50%). Also, in four countries – Bangladesh, Chad, the Democratic Republic of the Congo and Yemen – more than a quarter of the ITNs planned for distribution in 2020 had not been distributed by the end of the year. Of the countries that had distributed less than 50% of the ITNs planned for distribution in 2020, Kenya and South Sudan distributed about 61% and 36% of the remaining 2020 ITNs, respectively, in 2021. As of the end of October 2021, only 14% of ITNs carried over from 2020 that had been planned for distribution in 13 malaria endemic countries were yet to be distributed, while 53% of ITNs originally planned for mass campaign distribution in 2021 were yet to reach target communities (**Annex 2**, **Fig. 2.12**).

Of the 37 countries that reported plans to implement IRS in 2020, 25 either had completed spraying or were on target to do so. In Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Honduras, Mozambique, Somalia and Zimbabwe, IRS activities were at risk of delays, while activities were off track in Namibia and the Sudan. SMC implementation in 2020 was on target in the 13 west and central African countries that have scaled up implementation, except in the Gambia, where only about 60% of targeted treatment doses were delivered (**Section 7.3**).

FIG. 2.12.

Percentage of ITNs planned for distribution in 2021 that were distributed to communities by October 2021
Source: NMP reports, Alliance for Malaria Prevention and RBM Partnership to End Malaria.



ITN: insecticide-treated mosquito net; NMP: national malaria programme.
Note: Malawi is scheduled to complete its 2021 ITN campaign by the end of the year.

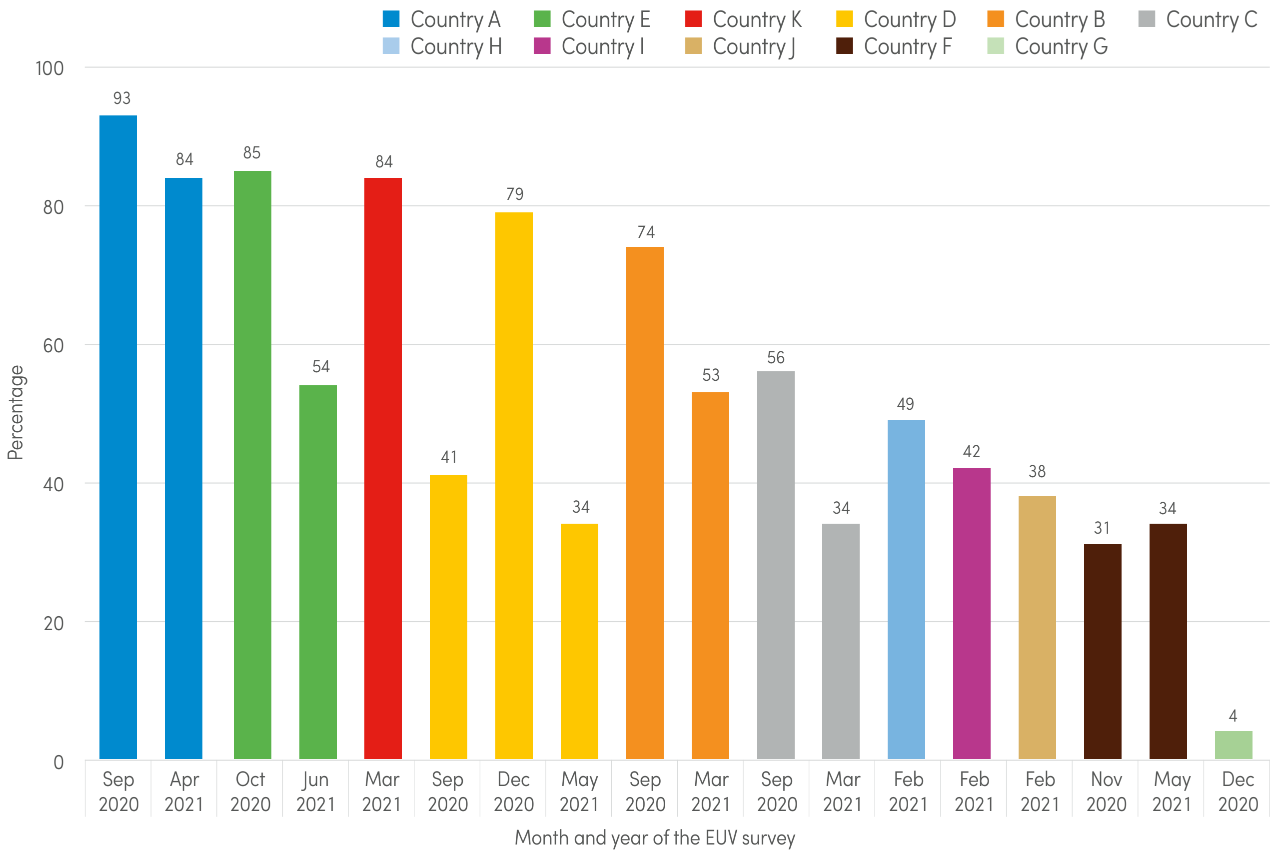
2.6.3.2 Malaria diagnosis and treatment services

Understanding disruptions to malaria case management is difficult because it requires data on treatment seeking for fever combined with information at the health facility level about changes in outpatient visits and hospital admission, and capacity to manage patients with uncomplicated and severe disease. These data should be combined with detailed country information on supply chains and stockouts of diagnosis and treatment commodities. Because of limitations in data quality, triangulations across different data sources were used to describe the disruptions to malaria diagnosis and treatment during the COVID-19 pandemic.

PMI has been implementing end-use verification (EUV) surveys as a quick point-in-time assessment of the availability of malaria commodities at central warehouses and health facilities in the countries it supports (*33*). EUVs are conducted once or twice a year, with sampling approaches varying by country, and a nationally representative sampling approach has been in place since 2019. The EUV collects

FIG. 2.13.

Percentage of service delivery points that experienced disruptions to clinical services per country (same coloured bars) *Source: PMI EUV surveys.*

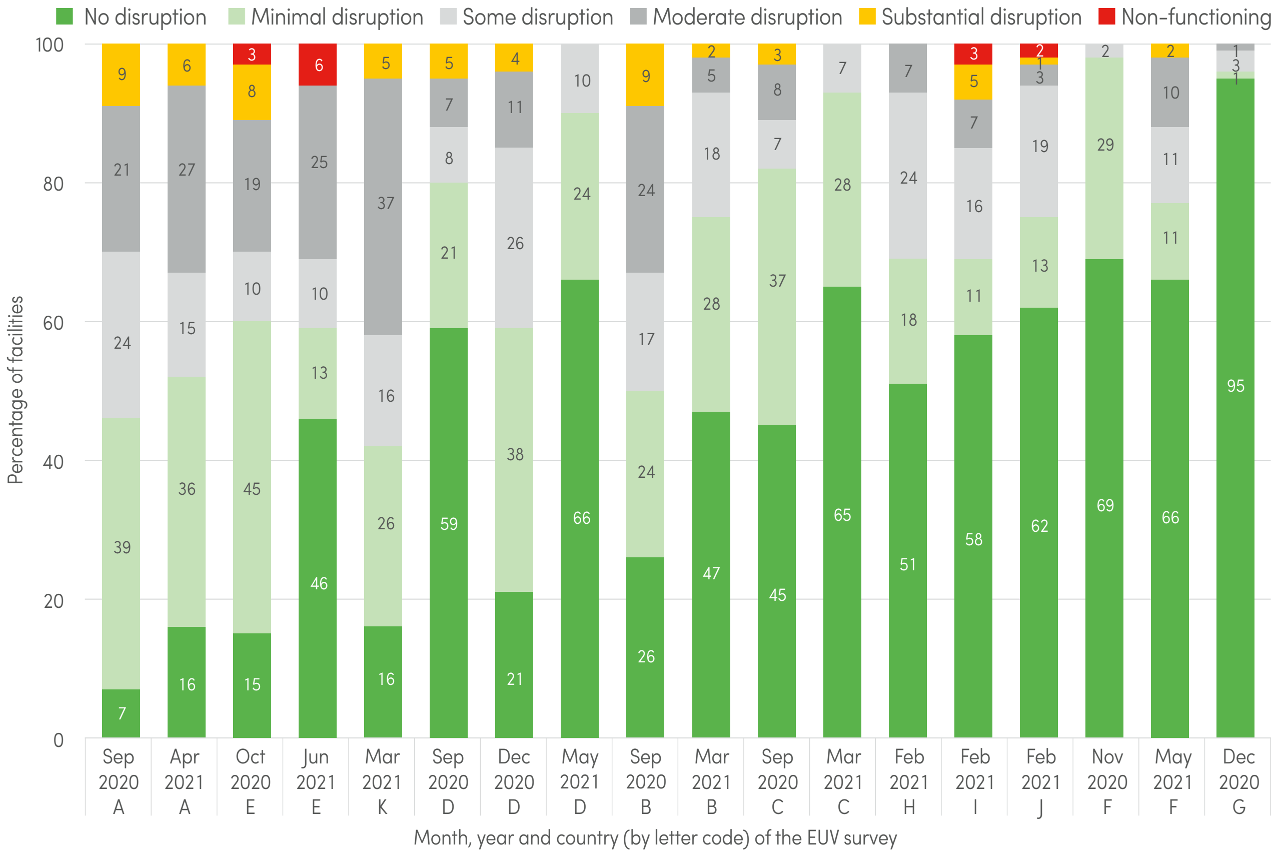


EUV: end-use verification; PMI: United States President's Malaria Initiative.

information on malaria commodity availability on the day of the assessment, plus information on storeroom conditions, stock management challenges and malaria case management (e.g. method of diagnosis and whether malaria cases are treated with ACTs). In 2020, EUVs were expanded to include a module on continuity of care in the context of COVID-19. Eighteen surveys in 11 countries (Angola, Benin, Burkina Faso, Ethiopia, Ghana, Guinea, Liberia, Mali, the Niger, Nigeria and Zimbabwe) were implemented with the new module from September 2020 through to the end of July 2021. Data were obtained from a total of 1578 service delivery points across the 11 countries. Respondents at service points were asked whether there were disruptions. Those who responded that they had experienced disruptions were then asked to rank them on a scale of 1 to 5 (where 1=minimal, 2=some, 3=moderate, 4=substantial and 5=nonfunctioning). The percentage of service delivery points with disruptions to the provision of clinical services varied by survey and country (**Fig. 2.13**), ranging from 4% to 93% in the period September 2020 to June 2021. In most countries, less than 30% of service delivery points experienced moderate to substantial disruptions (**Fig. 2.14**).

FIG. 2.14.

Percentage of facilities experiencing different levels of disruptions to clinical services *Source: PMI EUV surveys.*



EUV: end-use verification; PMI: United States President's Malaria Initiative.

Monthly routine aggregate data from April 2019 to March 2021 from a sample of health facilities in 23 sub-Saharan Africa countries, reported by countries to the Global Fund as part of implementation tracking, were analysed to determine variation over time in all-cause outpatient attendances, malaria tests and malaria positive cases among these patients (**Fig. 2.15**). The data were then compared with monthly data on COVID-19 cases at the start of the pandemic in each country. Although potentially biased by many factors related to the quality of the country's surveillance system and the representativeness of selected health facilities, these routine data can add value to our understanding of disruptions to clinical services. In this case, data were consistently reported from the same health facilities, making comparisons over time more reliable. Most of the countries showed reductions in outpatient attendances and malaria testing during the initial phase of the pandemic, recovering towards the end of the year, with reductions in most countries coinciding with peaks in the transmission of the coronavirus. Using these data, a comparison of malaria tests performed across similar periods, from April 2019 to March 2021, is shown in **Table 2.1**. Comparisons of the period April to June in 2019 and 2020 show that, overall, in selected health facilities that were tracked in 23 countries, there was a 22% reduction in malaria test performed, with 19 countries reporting declines of between 4% and more than 78%. For the period July to September 2019 compared with 2020, the number of malaria tests performed was 15% lower, with 20 countries showing reductions. Comparisons of November to December 2019 compared with 2020, and of January to March 2020 compared with 2021, showed that differences in the number of tests performed were much lower, suggesting that diagnosis and treatment services had begun to stabilize. Nevertheless, seven countries – Chad, Ethiopia, Kenya, Nigeria, Rwanda, Zambia and Zimbabwe – still had reductions of more than 30% in malaria testing.

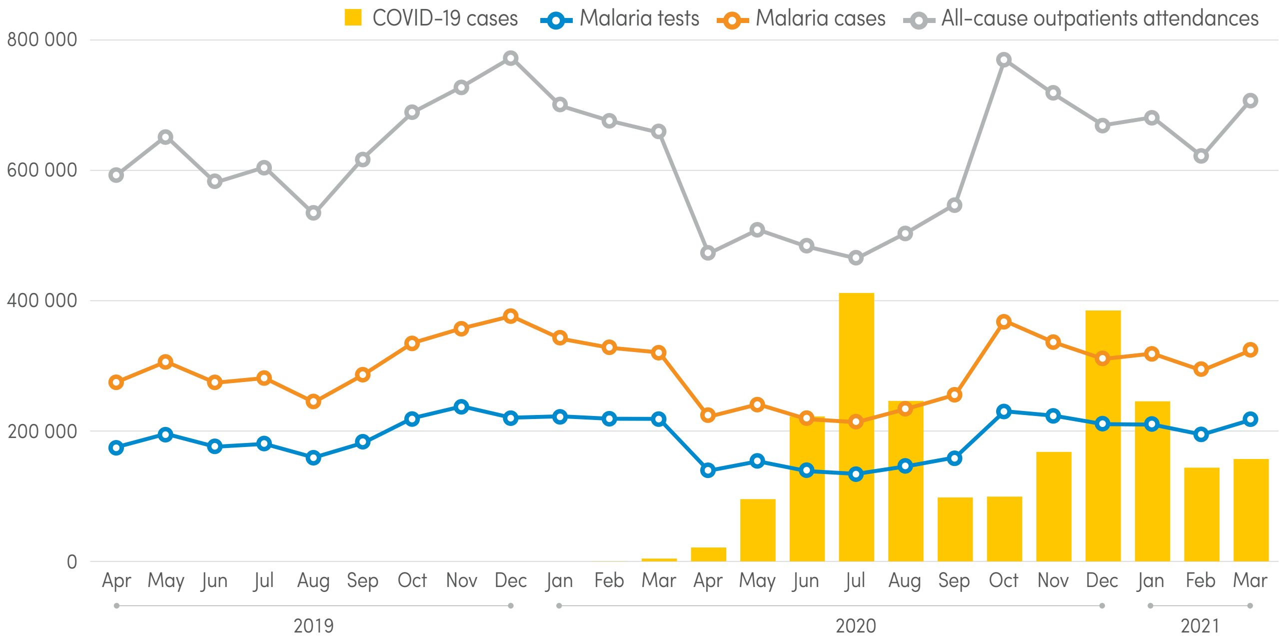
TABLE 2.1.

Differences in the number of malaria tests performed across similar periods using data from selected health facilities in 23 malaria endemic countries in sub-Saharan Africa, April 2019 to March 2021
Source: NMP reports to the Global Fund and WHO COVID-19 dashboard.

Country	April–June			July–September		
	2019	2020	Change	2019	2020	Change
Burkina Faso[a]	15 179	20 080	+32.3%	6 235	40 429	+548.4%
Burundi	27 955	26 007	-7.0%	21 384	17 210	-19.5%
Cameroon	17 583	13 214	-24.8%	13 695	12 027	-12.2%
Central African Republic	22 499	23 900	+6.2%	28 277	26 540	-6.1%
Chad	16 689	12 917	-22.6%	23 521	21 069	-10.4%
Democratic Republic of the Congo	19 173	7 664	-60.0%	14 630	11 330	-22.6%
Côte d'Ivoire	21 220	11 947	-43.7%	27 399	18 612	-32.1%
Ethiopia	4 405	1 391	-68.4%	4 681	1 774	-62.1%
Ghana	16 927	10 648	-37.1%	20 609	16 205	-21.4%
Guinea	24 065	18 338	-23.8%	37 179	31 410	-15.5%
Kenya	14 496	10 486	-27.7%	9 872	7 623	-22.8%
Madagascar	2 255	2 037	-9.7%	2 756	1 243	-54.9%
Malawi	84 578	81 178	-4.0%	38 103	38 359	+0.7%
Mali	11 798	7 137	-39.5%	16 866	14 923	-11.5%
Mozambique	54 202	57 197	+5.5%	67 513	40 999	-39.3%
Niger	9 445	5 405	-42.8%	30 505	32 066	+5.1%
Nigeria	30 512	23 352	-23.5%	31 307	14 946	-52.3%
Rwanda	22 923	5 128	-77.6%	17 953	5 667	-68.4%
Sierra Leone	21 141	11 545	-45.4%	21 635	15 636	-27.7%
Togo	16 346	12 521	-23.4%	20 631	14 400	-30.2%
United Republic of Tanzania	66 914	31 458	-53.0%	46 780	41 802	-10.6%
Zambia	14 007	20 814	+48.6%	5 097	7 362	+44.4%
Zimbabwe	1 076	1 285	+19.4%	392	198	-49.5%
Total	**535 388**	**415 649**	**-22.4%**	**507 020**	**431 830**	**-14.8%**

FIG. 2.15.

Trends in the number of outpatients (all causes), malaria tests performed and malaria treatments prescribed in selected health facilities in 23 malaria endemic countries in sub-Saharan Africa, April 2019 to March 2021 *Source: NMP reports to the Global Fund and WHO COVID-19 dashboard.*



Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; WHO: World Health Organization.

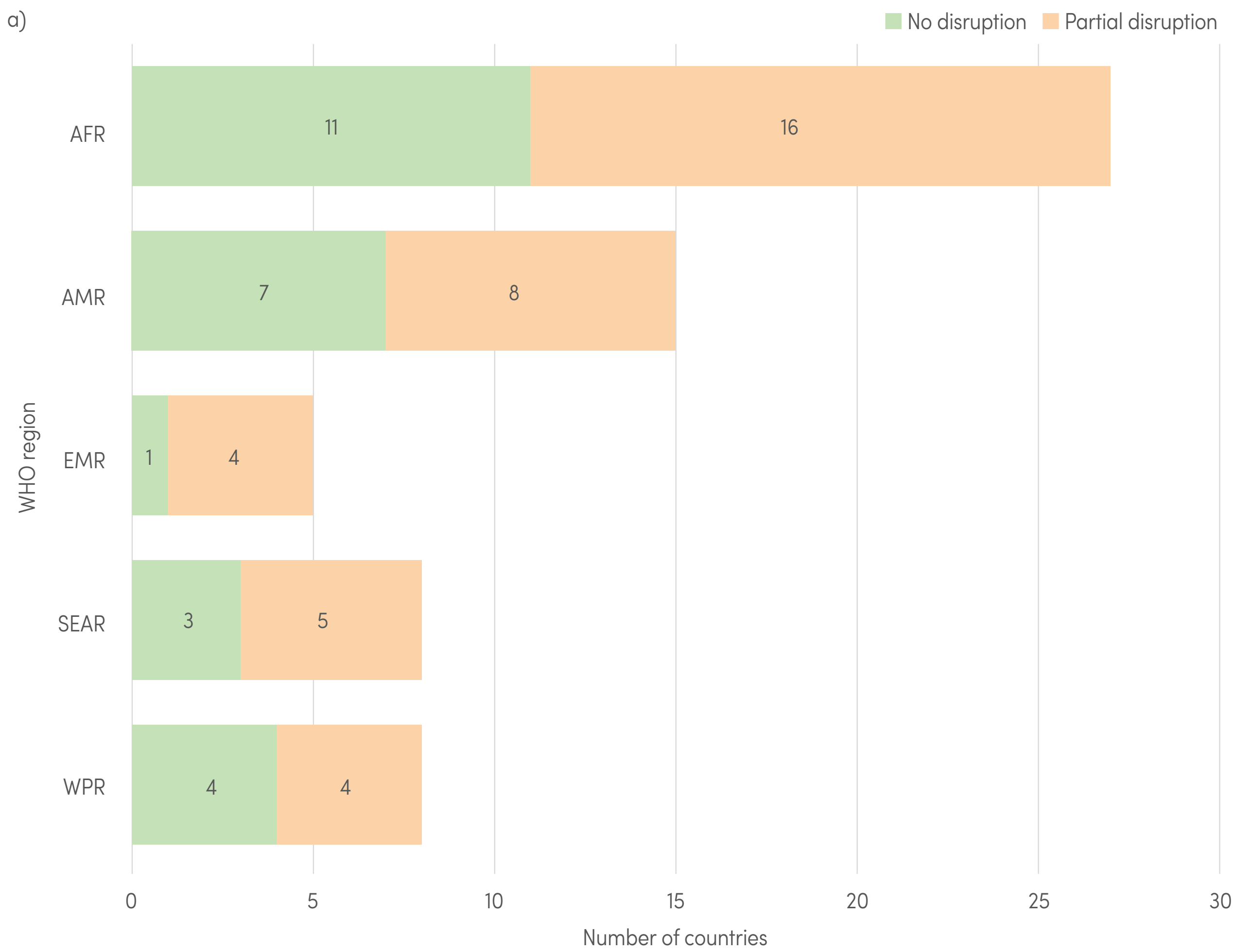
Country	November–December			January–March		
	2019	2020	Change	2020	2021	Change
Burkina Faso[a]	58 129	77 081	+32.6%	40 498	42 598	+5.2%
Burundi	25 486	23 380	-8.3%	37 637	31 019	-17.6%
Cameroon	6 653	6 841	+2.8%	7 213	7 733	+7.2%
Central African Republic	46 150	62 067	+34.5%	59 096	50 458	-14.6%
Chad	29 484	24 467	-17.0%	21 777	13 869	-36.3%
Democratic Republic of the Congo	28 317	30 816	+8.8%	29 531	28 041	-5.0%
Côte d'Ivoire	38 000	28 084	-26.1%	26 534	32 427	+22.2%
Ethiopia	4 581	2 052	-55.2%	2 211	1 479	-33.1%
Ghana	20 520	19 790	-3.6%	10 292	11 970	+16.3%
Guinea	53 694	47 020	-12.4%	41 308	50 357	+21.9%
Kenya	10 126	18 002	+77.8%	12 938	9 018	-30.3%
Madagascar	2 052	1 676	-18.3%	3 955	2 964	-25.1%
Malawi	75 235	85 694	+13.9%	117 184	126 472	+7.9%
Mali	46 299	35 636	-23.0%	21 913	20 812	-5.0%
Mozambique	41 444	31 229	-24.6%	35 751	56 465	+57.9%
Niger	33 929	33 438	-1.4%	10 956	13 295	+21.3%
Nigeria	36 495	27 277	-25.3%	31 157	20 092	-35.5%
Rwanda	31 293	21 778	-30.4%	38 086	20 086	-47.3%
Sierra Leone	12 178	13 817	+13.5%	10 606	14 934	+40.8%
Togo	15 536	12 057	-22.4%	11 615	9 340	-19.6%
United Republic of Tanzania	43 011	43 032	0.0%	47 659	40 748	-14.5%
Zambia	10 253	15 147	+47.7%	29 406	15 996	-45.6%
Zimbabwe	2 767	1 958	-29.2%	5 495	1 614	-70.6%
Total	**671 632**	**662 339**	**-1.4%**	**652 818**	**621 787**	**-4.8%**

Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; WHO: World Health Organization.
[a] A health worker strike in 2019 affected patient care and data reporting during this year.

In 2020 and 2021, WHO conducted essential health service (EHS) pulse surveys (*30, 35*). The 2020 survey (Round 1) was implemented in malaria endemic countries (including non-endemic countries not yet certified malaria free) from mid-May to the end of May 2020, except in the countries of the WHO Region of the Americas, where responses were received in September 2020. The second survey (Round 2) was implemented from December 2020 to March 2021. The findings suggest that, among the 65 malaria endemic countries that responded in Round 1 (a response rate of 73%), 37 experienced partial disruption (of 5–50%) and 28 experienced little or no disruption (<5%) of malaria diagnosis and treatment (**Fig. 2.16a**). In Round 2, however, among the 48 malaria endemic countries that responded to the survey, six countries reported severe disruptions (≥50%), 15 had partial disruptions and 27 had no disruptions (**Fig. 2.16b**). Caution should be taken when comparing these analyses for the WHO African Region, which had different countries participating in Round 1 compared with Round 2 (16 countries participated in both). In the WHO Eastern Mediterranean Region, three additional countries participated in Round 2. For all other regions, the same countries were compared between rounds where countries continued to participate in Round 2. In Round 2, the responses from countries were not being compared at one point in time (as was the case for Round 1).

FIG. 2.16.

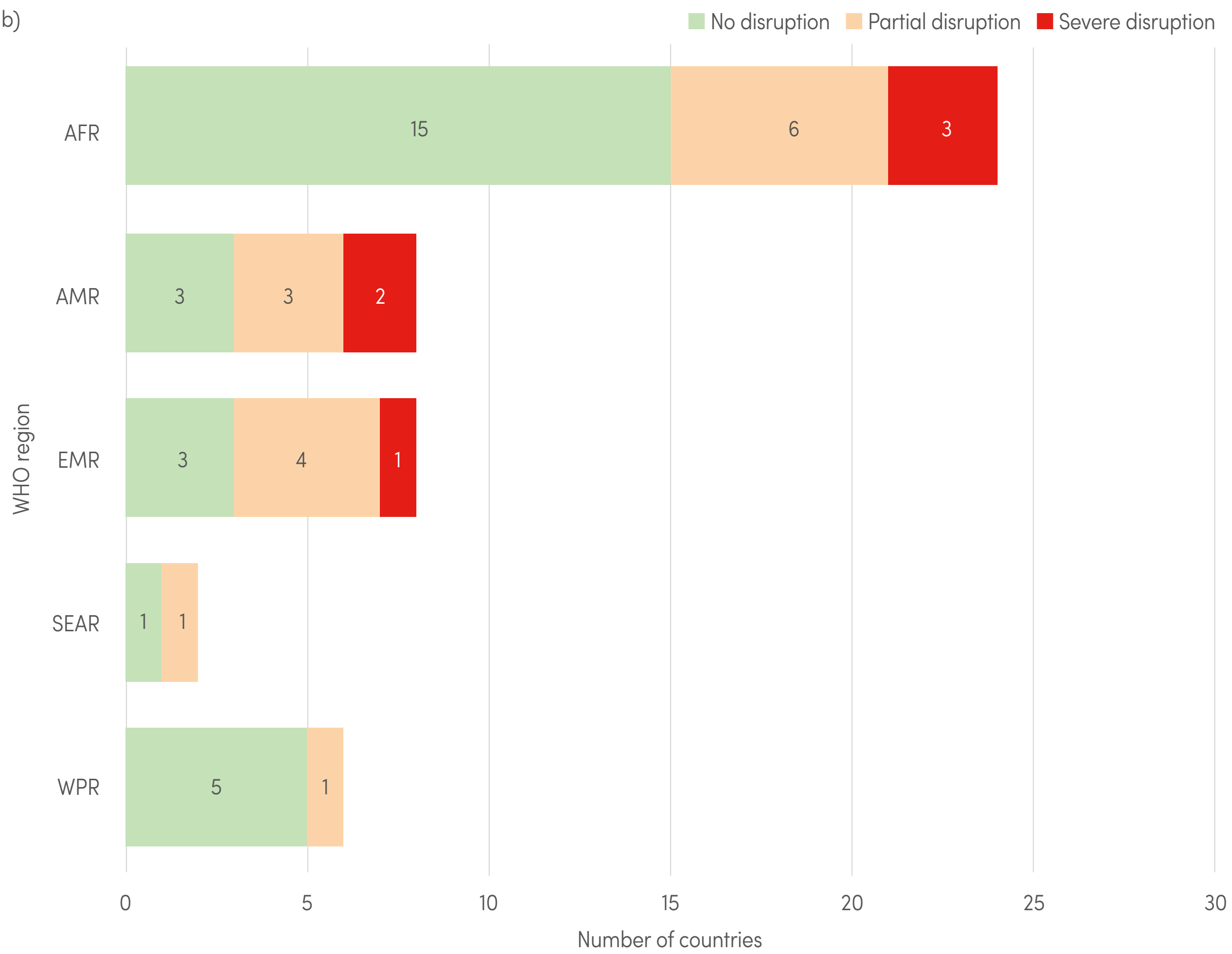
Results from WHO surveys on the number of countries experiencing disruptions to malaria diagnosis and treatment services during the COVID-19 pandemic: a) Round 1 survey (conducted May-September 2020) and b) Round 2 survey (conducted December 2020-March 2021) No disruption (<5%), partial disruption (<50%) or severe disruption (≥50%). Surveys were conducted in May–September 2020 *Source: WHO Integrated Health Services Department.*



2.6.3.3 Use of information on disruptions in burden estimation

The application of service disruption information in burden estimation is described in detail in **Annex 1**. The results are presented in **Section 3**. Briefly, available information on malaria service disruptions show that many countries have mounted strong measures to prevent major disruptions. However, the data on prevention intervention tracking, the trends in core service use indicators, and the EUV and EHS surveys all indicate that many countries have experienced moderate levels of disruptions at various points during the pandemic. The data on disruptions in malaria prevention, which show amounts of actual intervention distributions during the pandemic, were used directly in modelling of malaria prevention coverage and burden in the affected countries. Further analysis of the effect of malaria treatment disruption was estimated from the EHS surveys. This was partly for consistency of measurement and partly because the health facility data from the EUV surveys by PMI or tracking of service use trends assembled by the Global Fund were all from selected sets of service provider points and were not available across countries. Where a country had responded to both rounds of EHS surveys, the middle point of the range of disruptions was used. For the countries where information was available for only one round of EHS survey, the middle of the reported range of disruption was used as the point estimate for 2020. The lower and upper ranges of reported disruptions were used as the bounds of malaria treatment disruptions.

b)



AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; SEAR: WHO South-East Asia Region; WHO: World Health Organization; WPR: WHO Western Pacific Region.

3 GLOBAL TRENDS IN THE BURDEN OF MALARIA

This section presents the number of malaria cases and deaths estimated to have occurred between 2000 and 2020, and the case incidence and malaria mortality rates for the same period. These estimates were then used to compute the number of cases and deaths averted, globally and by WHO region, since 2000. A new section on clinical manifestations of severe malaria, variations in age pattern across transmission intensities and shift in age patterns as transmission declines has been added to this report. The section on malaria in pregnancy presents an updated analysis of the prevalence of exposure to malaria and low birthweights and burden of low birthweights averted under different scenarios of IPTp coverage.

The methods used to estimate the burden of malaria cases and deaths depend on the quality of the national surveillance systems and the availability of data over time (**Annex 1**). Most of the global malaria burden is accounted for by countries with moderate to high transmission in sub-Saharan Africa; however, these countries generally have weak surveillance systems. Case estimates for these countries are calculated using an approach that transforms modelled community parasite prevalence into case incidence within a geospatial framework. Malaria deaths for these countries are also estimated from a cause of death (CoD) fraction for malaria that is applied to the trends in all-cause mortality in children aged under 5 years, and to which a factor for malaria deaths among those aged over 5 years is applied. For countries with stronger surveillance systems, either reported data are used or cases are estimated by adjusting national data for rates of treatment seeking, testing and reporting. Where adjustments are applied to national case data, malaria deaths are estimated by applying a species-specific case fatality rate to these data.

In this year's report, there are two new and noteworthy considerations in the estimation of malaria cases and deaths (**Annex 1**). First, a new CoD fraction for malaria has been used, affecting 32 countries in sub-Saharan Africa that account for almost 93% of all malaria deaths globally. Previously, malaria CoD fractions were estimated using a frequentist multinomial logistic regression model based on verbal autopsy data available before 2015 and a few covariates, including parasite prevalence in children aged 2–9 years (*36*). In 2021, a new method has been developed to better address data scarcity and uncertainty, improve covariate selection and provide generally more robust estimates (*37*). This new approach uses the multinomial Bayesian least absolute shrinkage and selection operator (LASSO) model. The new CoD estimates have resulted in higher point estimates for malaria deaths in children aged under 5 years across the period 2000–2020, compared with previous analyses (**Annex 1**). This has resulted in a change in the fraction of deaths due to malaria in children aged under 5 years globally from 4.8% to 7.8% for the most recent year (*4*).

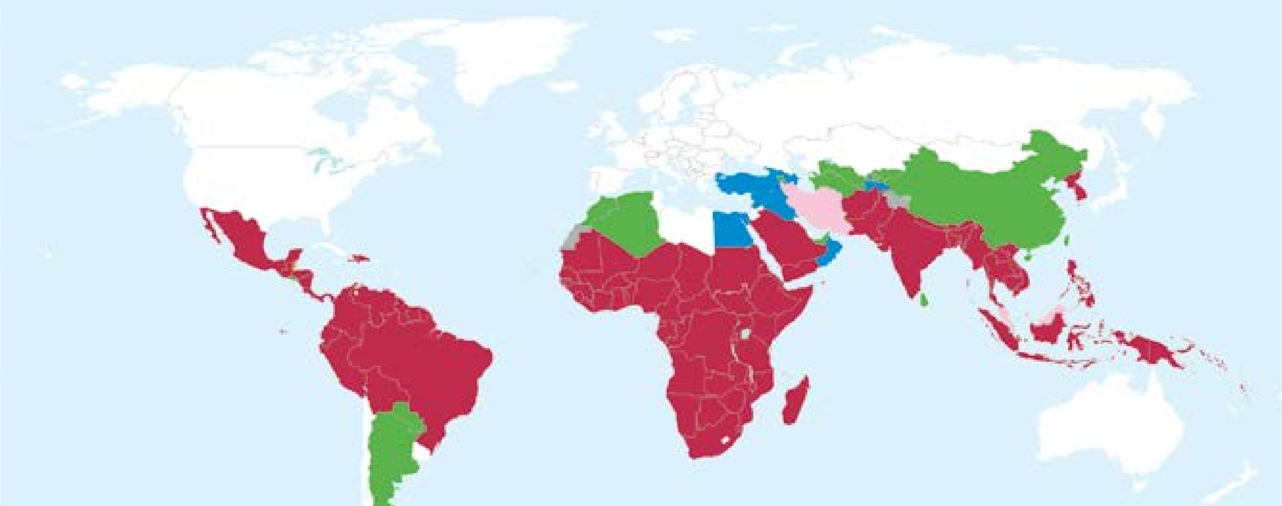
Second, the estimates for both cases and deaths now include the impact of prevention and treatment disruptions during the COVID-19 pandemic, leading to an increase in malaria burden in 2020 compared with 2019 in most moderate and high transmission countries, especially in sub-Saharan Africa. Data on disruptions in malaria prevention and treatment (**Section 2.6**) were used to estimate levels of disruptions by country. These estimations were then used to quantify the changes in estimates of cases and deaths in 2020 for several countries (**Annex 1**). The burden estimates for 2020 are associated with wider confidence intervals than in previous years because of uncertainty in the precision of the service disruptions data.

3.1 GLOBAL ESTIMATES OF MALARIA CASES AND DEATHS, 2000–2020

Globally in 2019, there were an estimated 227 million malaria cases (**Table 3.1**) in 85 malaria endemic countries (including the territory of French Guiana) (**Fig. 3.1**). In 2020, 1 year after the COVID-19 pandemic and service disruptions, the estimated number of malaria cases rose to 241 million cases, an additional 14 million cases compared with 2019 (**Table 3.1**).

FIG. 3.1.

Countries with indigenous cases in 2000 and their status by 2020 Countries with zero indigenous cases for at least 3 consecutive years are considered to have eliminated malaria. In 2020, the Islamic Republic of Iran and Malaysia reported zero indigenous cases for the third consecutive year, and Belize and Cabo Verde reported zero indigenous cases for the second time. China and El Salvador were certified malaria free in 2021, following 4 years of zero malaria cases. *Source: WHO database.*



WHO: World Health Organization.

TABLE 3.1.

Global estimated malaria cases and deaths, 2000–2020 Estimated cases and deaths are shown with 95% upper and lower confidence intervals. *Source: WHO estimates.*

Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% *P. vivax*	Point	Lower bound	Upper bound
2000	**241 000**	226 000	260 000	7.7%	**896 000**	854 000	942 000
2001	**246 000**	231 000	267 000	7.9%	**892 000**	851 000	941 000
2002	**241 000**	225 000	261 000	7.5%	**848 000**	808 000	896 000
2003	**244 000**	228 000	266 000	7.9%	**825 000**	783 000	877 000
2004	**247 000**	227 000	277 000	7.9%	**803 000**	756 000	877 000
2005	**246 000**	228 000	271 000	8.1%	**778 000**	733 000	838 000
2006	**241 000**	222 000	265 000	7.0%	**764 000**	722 000	823 000
2007	**238 000**	220 000	262 000	6.6%	**745 000**	703 000	797 000
2008	**238 000**	220 000	259 000	6.4%	**725 000**	683 000	773 000
2009	**242 000**	223 000	266 000	6.3%	**721 000**	673 000	784 000
2010	**244 000**	225 000	269 000	6.7%	**698 000**	650 000	764 000
2011	**237 000**	219 000	259 000	6.9%	**651 000**	611 000	703 000
2012	**233 000**	216 000	254 000	6.7%	**614 000**	578 000	664 000
2013	**227 000**	211 000	247 000	5.6%	**589 000**	553 000	640 000
2014	**224 000**	206 000	243 000	5.1%	**569 000**	532 000	620 000
2015	**224 000**	207 000	243 000	4.5%	**562 000**	524 000	619 000
2016	**226 000**	210 000	246 000	4.3%	**566 000**	527 000	627 000
2017	**231 000**	214 000	251 000	3.6%	**574 000**	537 000	643 000
2018	**227 000**	209 000	247 000	3.1%	**558 000**	521 000	633 000
2019	**227 000**	208 000	248 000	2.8%	**558 000**	521 000	642 000
2020	**241 000**	218 000	269 000	1.9%	**627 000**	583 000	765 000

P. vivax: *Plasmodium vivax*; WHO: World Health Organization.

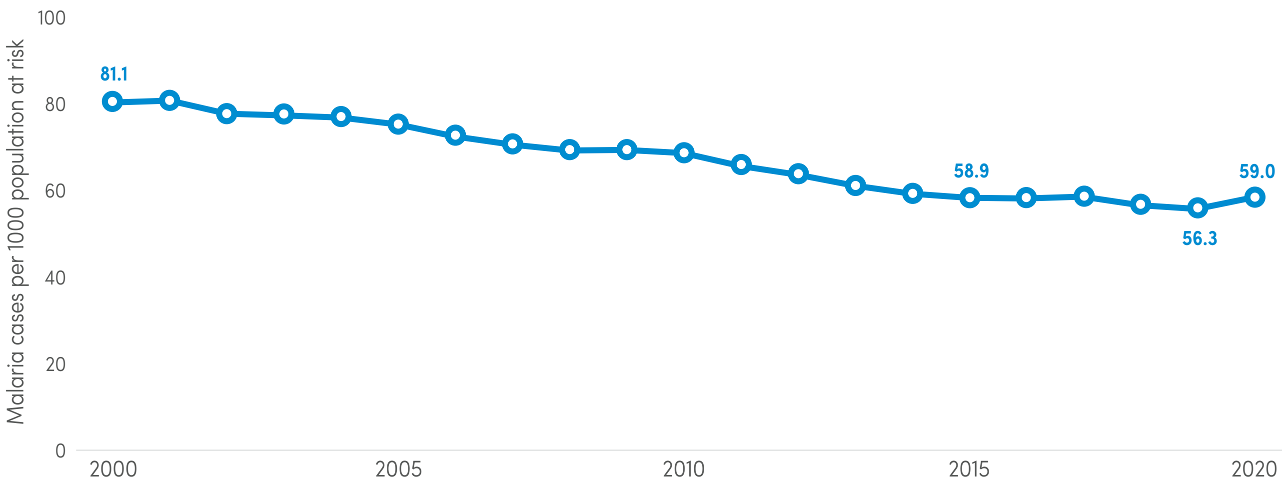
Although there are wide uncertainties in the 2020 estimates (owing to the difficulties of reliably measuring service disruptions), the analysis suggests that there were about the same number of malaria cases in 2020 as there were across 108 malaria endemic countries in 2000. Most of the increase in case numbers in 2020 occurred in countries in the WHO African Region (**Section 3.2**). This situation highlights the consequences of even moderate service disruptions (**Section 2.6**) in a population at risk that is rapidly increasing and has nearly doubled in sub-Saharan Africa since the turn of the century. This is perhaps best highlighted in the trends in malaria case incidence, which declined from 81 per 1000 population at risk in 2000 to 56 in 2019, before rising slightly to 59 in 2020 – a 5% increase (**Fig. 3.2a**). Despite the increase in cases, the results suggest that efforts by countries and partners have averted the worst-case scenario projected at the start of the pandemic (*26*).

Since 2000, malaria deaths declined steadily from 896 000 to 562 000 in 2015, and to 558 000 in 2019. However, in 2020, malaria deaths increased to an estimated 627 000, a 12% increase from 2019; an estimated 47 000 (68%) of the additional 69 000 malaria deaths were due to disruptions during the COVID-19 pandemic (**Table 3.1**). The remaining 22 000 additional deaths represent the increase in deaths between 2019

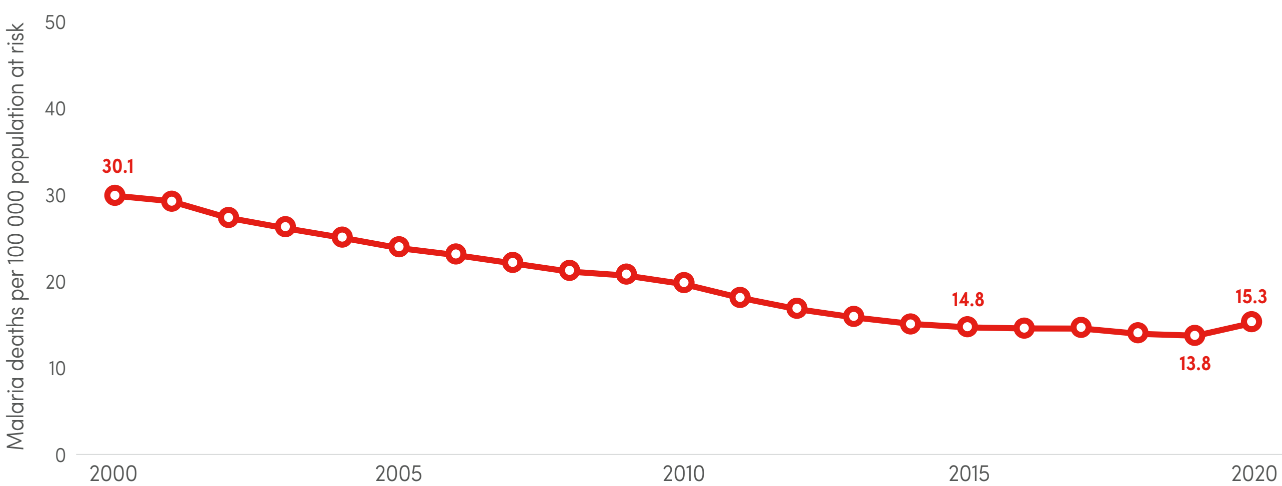
FIG. 3.2.

Global trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) distribution of malaria cases and d) deaths by country, 2020 *Source: WHO estimates.*

a)



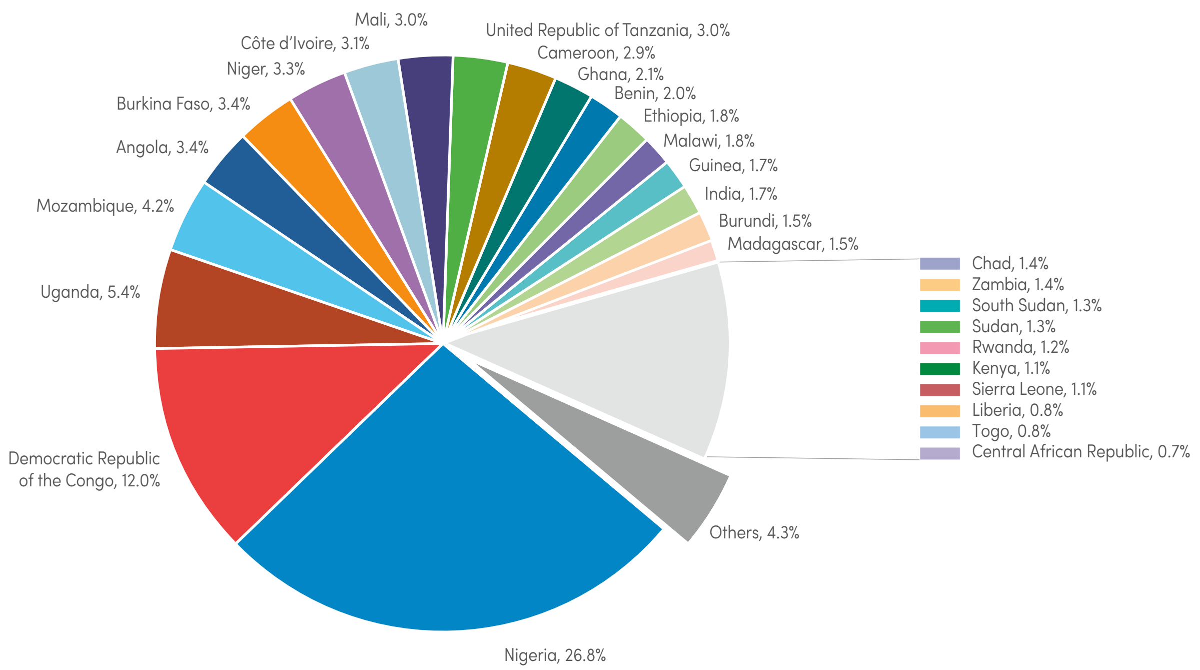
b)



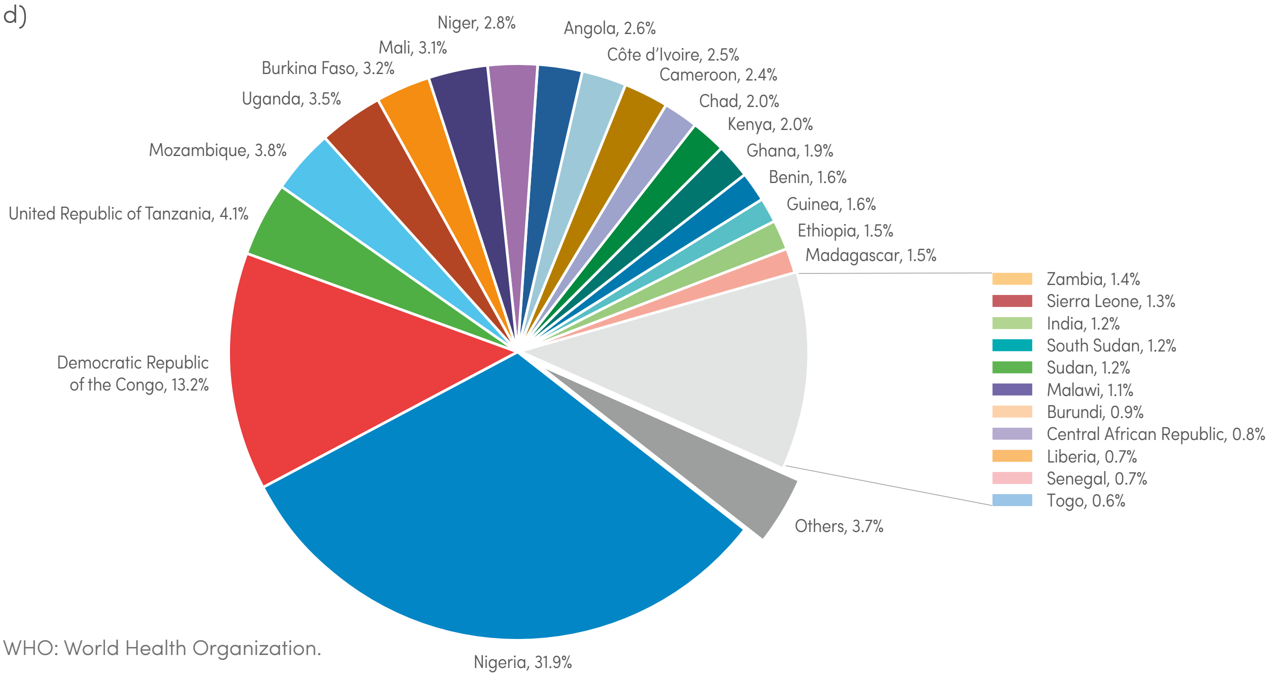
and 2020 expected using the new malaria CoD fraction estimation method in the absence of disruptions during the COVID-19 pandemic (**Annex 1**). The malaria mortality rate halved between 2000 and 2015, from about 30 to 15 per 100 000 population at risk, then reduced slightly to 14 in 2019 before increasing back to 15 in 2020 (**Fig. 3.2b**). The percentage of total malaria deaths among children aged under 5 years continued to decline over the past 20 years, from 87% in 2000 to 76% in 2019, but increased slightly to 77% in 2020.

In 2020, 29 of the 85 countries that were malaria endemic (including the territory of French Guiana) accounted for about 96% of malaria cases and deaths globally (**Fig. 3.2c**). Nigeria (26.8%), the Democratic Republic of the Congo (12.0%), Uganda (5.4%), Mozambique (4.2%), Angola (3.4%) and Burkina Faso (3.4%) accounted for 55% of all cases. Four countries accounted for just over half of all malaria deaths globally: Nigeria (31.9%), the Democratic Republic of the Congo (13.2%), the United Republic of Tanzania (4.1%) and Mozambique (3.8%) (**Fig. 3.2d**).

c)



d)



WHO: World Health Organization.

3.2 ESTIMATED MALARIA CASES AND DEATHS IN THE WHO AFRICAN REGION, 2000–2020

Between 2019 and 2020, estimated malaria cases increased from 213 million to 228 million, and deaths from 534 000 to 602 000 in the WHO African Region (**Table 3.2**). This region accounted for about 95% of cases and 96% of deaths globally; 80% of all deaths in this region are among children aged under 5 years. Since 2000, malaria case incidence had reduced from 368 to 222 cases per 1000 population at risk in 2019, before increasing to 233 in 2020 owing to disruptions during the COVID-19 pandemic (**Fig. 3.3a**). Between 2000 and 2019, malaria deaths reduced by 36%, from 840 000 in 2000 to 534 000 in 2019, before increasing

TABLE 3.2.

Estimated malaria cases and deaths in the WHO African Region, 2000–2020 Estimated cases and deaths are shown with 95% upper and lower confidence intervals. *Source: WHO estimates.*

Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% *P. vivax*	Point	Lower bound	Upper bound
2000	**207 000**	192 000	223 000	2.0%	**840 000**	813 000	871 000
2001	**212 000**	196 000	230 000	2.1%	**838 000**	809 000	873 000
2002	**209 000**	193 000	227 000	1.8%	**797 000**	770 000	832 000
2003	**211 000**	195 000	231 000	1.9%	**774 000**	744 000	818 000
2004	**212 000**	194 000	239 000	1.7%	**750 000**	718 000	818 000
2005	**209 000**	192 000	232 000	1.1%	**723 000**	695 000	772 000
2006	**209 000**	191 000	232 000	1.2%	**715 000**	686 000	761 000
2007	**209 000**	191 000	230 000	1.2%	**698 000**	670 000	741 000
2008	**208 000**	192 000	228 000	1.0%	**678 000**	652 000	715 000
2009	**212 000**	194 000	234 000	1.2%	**671 000**	640 000	723 000
2010	**212 000**	194 000	235 000	1.5%	**646 000**	613 000	702 000
2011	**209 000**	193 000	230 000	2.1%	**608 000**	579 000	652 000
2012	**209 000**	192 000	228 000	2.4%	**575 000**	544 000	620 000
2013	**207 000**	191 000	227 000	2.2%	**556 000**	523 000	602 000
2014	**204 000**	187 000	223 000	2.2%	**534 000**	503 000	581 000
2015	**204 000**	187 000	223 000	1.7%	**527 000**	495 000	577 000
2016	**205 000**	189 000	224 000	1.1%	**528 000**	497 000	582 000
2017	**213 000**	196 000	233 000	0.8%	**542 000**	510 000	607 000
2018	**211 000**	194 000	232 000	0.2%	**533 000**	500 000	605 000
2019	**213 000**	194 000	233 000	0.3%	**534 000**	498 000	616 000
2020	**228 000**	205 000	256 000	0.3%	**602 000**	560 000	738 000

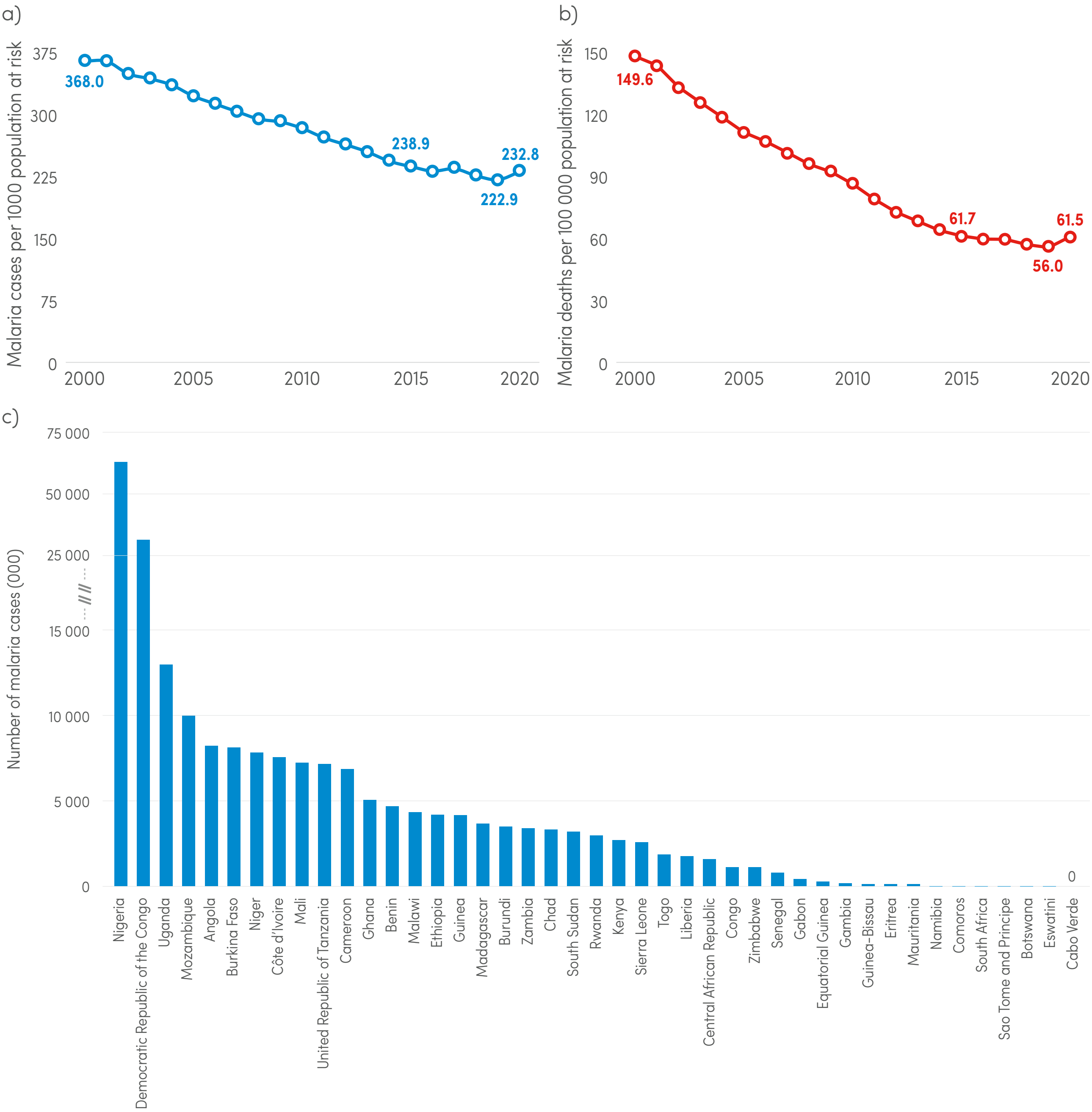
P. vivax: *Plasmodium vivax*; WHO: World Health Organization.

to 602 000 in 2020. Between 2000 and 2019, the malaria mortality rate reduced by 63%, from 150 to 56 per 100 000 population at risk, before rising to 62 in 2020 (**Fig. 3.3b**). Cabo Verde and Sao Tome and Principe have reported zero malaria deaths since 2018.

Since 2015, the rate of progress in both cases and deaths has stalled in several countries with moderate or high transmission; the situation was made worse, especially in sub-Saharan Africa, by disruptions during the COVID-19 pandemic and other humanitarian emergencies (**Fig. 3.3a–b**). The WHO African Region contributed to over 95% of the increase in cases and deaths between 2019 and 2020. The distribution of cases by country in 2020 is shown in **Fig. 3.3c**.

FIG. 3.3.

Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO African Region, 2020 *Source: WHO estimates.*



WHO: World Health Organization.

3.3 ESTIMATED MALARIA CASES AND DEATHS IN THE WHO SOUTH-EAST ASIA REGION, 2000–2020

The WHO South-East Asia Region had nine malaria endemic countries in 2020, accounting for 5 million cases and contributing to 2% of the burden of malaria cases globally (**Table 3.3**). In 2020, India accounted for about 83% of all malaria cases; more than a third of all cases in the region were due to *P. vivax* (**Fig. 3.4c**).

Over the past 20 years, malaria cases have reduced by 78%, from 22.9 million in 2000 to 5 million in 2020, and incidence has reduced by 83%, from 18 to 3 per 1000 population at risk (**Fig. 3.4a**). Sri Lanka was certified malaria free in 2016. There were no major increases in malaria burden between 2019 and 2020 in this region.

TABLE 3.3.
Estimated malaria cases and deaths in the WHO South-East Asia Region, 2000–2020 Estimated cases and deaths are shown with 95% upper and lower confidence intervals. *Source: WHO estimates.*

Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% *P. vivax*	Point	Lower bound	Upper bound
2000	**22 900**	18 600	29 000	47.7%	**35 000**	7 000	59 000
2001	**23 200**	19 000	29 200	50.5%	**34 000**	7 000	57 000
2002	**22 100**	17 800	27 900	50.0%	**33 000**	7 000	55 000
2003	**23 200**	18 700	28 900	52.3%	**33 000**	7 000	55 000
2004	**25 500**	20 300	32 400	51.9%	**36 000**	8 000	62 000
2005	**27 300**	21 300	36 100	53.7%	**38 000**	8 000	66 000
2006	**22 700**	17 500	30 500	51.4%	**33 000**	7 000	58 000
2007	**22 200**	17 100	29 800	49.5%	**33 000**	7 000	58 000
2008	**23 400**	17 800	32 400	47.5%	**36 000**	8 000	64 000
2009	**23 800**	18 000	33 200	45.3%	**37 000**	7 000	69 000
2010	**24 600**	19 400	32 800	44.2%	**39 000**	9 000	68 000
2011	**20 700**	16 200	27 800	46.0%	**32 000**	7 000	56 000
2012	**17 800**	14 200	23 700	47.7%	**27 000**	7 000	46 000
2013	**13 400**	10 500	17 600	46.1%	**21 000**	4 000	36 000
2014	**12 900**	10 200	17 100	35.1%	**23 000**	3 000	42 000
2015	**13 300**	10 400	17 700	34.4%	**24 000**	3 000	43 000
2016	**13 800**	10 200	19 400	34.9%	**25 000**	3 000	46 000
2017	**10 300**	7 800	14 200	37.3%	**18 000**	2 000	33 000
2018	**7 500**	5 400	10 200	50.6%	**11 000**	2 000	19 000
2019	**6 300**	4 500	8 600	51.6%	**9 000**	2 000	16 000
2020	**5 000**	3 600	6 800	36.3%	**9 000**	1 000	16 000

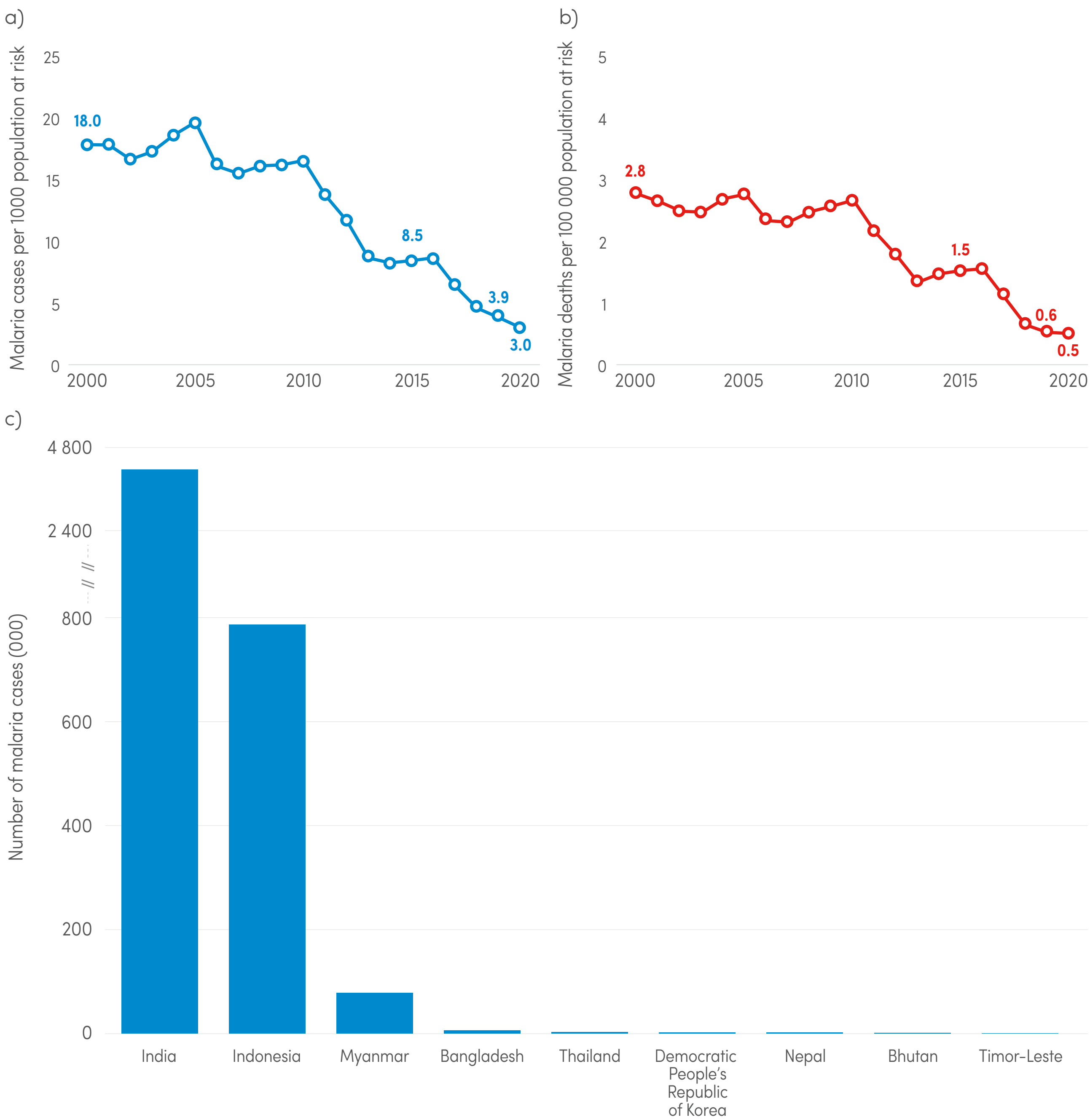
P. vivax: *Plasmodium vivax*; WHO: World Health Organization.

Despite Timor-Leste reporting zero malaria cases in 2018 and 2019, three indigenous cases were reported in 2020.

Malaria deaths reduced by 75%, from about 35 000 in 2000 to 9000 in 2020. Over the same period, the malaria mortality rate reduced by 81%, from 2.8 to 0.5 per 100 000 population at risk (**Fig. 3.4b**). India accounted for about 82% of all malaria deaths in this region in 2020. Except for Indonesia (where there was a slight increase in deaths), all countries in this region where a malaria death occurred had reported a reduction in the malaria mortality rate. Bhutan, Nepal and Timor-Leste have reported zero malaria deaths since 2013, 2015 and 2017, respectively.

FIG. 3.4.

Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO South-East Asia Region, 2020 *Source: WHO estimates.*



WHO: World Health Organization.

3.4 ESTIMATED MALARIA CASES AND DEATHS IN THE WHO EASTERN MEDITERRANEAN REGION, 2000–2020

Malaria cases in the WHO Eastern Mediterranean Region reduced by 38% between 2000 and 2015, from 7 million to 4.3 million, before steadily increasing between 2016 and 2020 by 33%, to reach 5.7 million cases in 2020 (**Table 3.4**). Increases in estimated malaria cases were seen in the Sudan, Somalia and Djibouti, with an additional 410 000, 71 000 and 23 000 cases, respectively, between 2019 and 2020. Estimated cases reduced in Afghanistan, Pakistan and Yemen. About 18% of the cases in 2020 were due to *P. vivax*, mainly in Afghanistan and Pakistan.

Malaria deaths also reduced by about 39%, from 13 700 in 2000 to 8300 in 2015, and then increased by 49% between 2016 and 2020 to reach 12 300 deaths (**Table 3.4**). Most of the increase in estimated malaria deaths in this region was observed in the Sudan, where more than 80% of cases are due to *P. falciparum*, responsible for almost all fatalities due to malaria.

Over the period 2000–2020, malaria case incidence declined from 21.2 to 11.2 cases per 1000 population at risk and the mortality rate declined from 4.2 to

TABLE 3.4.
Estimated malaria cases and deaths in the WHO Eastern Mediterranean Region, 2000–2020
Estimated cases and deaths are shown with 95% upper and lower confidence intervals. *Source: WHO estimates.*

Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% *P. vivax*	Point	Lower bound	Upper bound
2000	**7 000**	5 500	11 500	27.3%	**13 700**	4 800	28 500
2001	**7 100**	5 600	12 000	27.5%	**13 900**	5 000	29 800
2002	**6 800**	5 200	12 000	28.2%	**13 200**	5 000	27 400
2003	**6 400**	4 900	11 100	29.3%	**12 200**	4 600	26 000
2004	**5 300**	4 100	9 200	24.8%	**10 600**	3 600	22 100
2005	**5 500**	4 200	9 500	21.9%	**11 500**	4 100	24 600
2006	**5 500**	4 100	10 200	20.2%	**11 500**	4 000	26 500
2007	**4 800**	3 700	6 600	23.4%	**9 800**	3 700	16 800
2008	**3 700**	2 900	5 200	28.2%	**7 200**	2 400	12 300
2009	**3 600**	2 800	5 300	29.3%	**6 900**	2 500	12 000
2010	**4 500**	3 400	6 500	28.5%	**8 800**	3 400	15 100
2011	**4 700**	3 500	6 700	38.7%	**8 000**	3 200	12 900
2012	**4 400**	3 300	6 200	32.7%	**8 100**	3 100	13 100
2013	**4 200**	3 400	5 800	34.2%	**7 700**	2 900	12 200
2014	**4 400**	3 500	5 900	35.0%	**7 900**	2 800	12 700
2015	**4 300**	3 400	5 700	28.9%	**8 300**	2 700	13 800
2016	**5 300**	4 200	7 000	35.5%	**9 500**	3 300	16 200
2017	**5 400**	4 100	7 300	30.1%	**10 200**	3 300	18 700
2018	**5 500**	4 100	7 700	26.2%	**10 900**	3 100	20 500
2019	**5 500**	4 000	8 000	21.7%	**11 500**	3 100	21 700
2020	**5 700**	4 000	8 400	18.1%	**12 300**	3 100	23 600

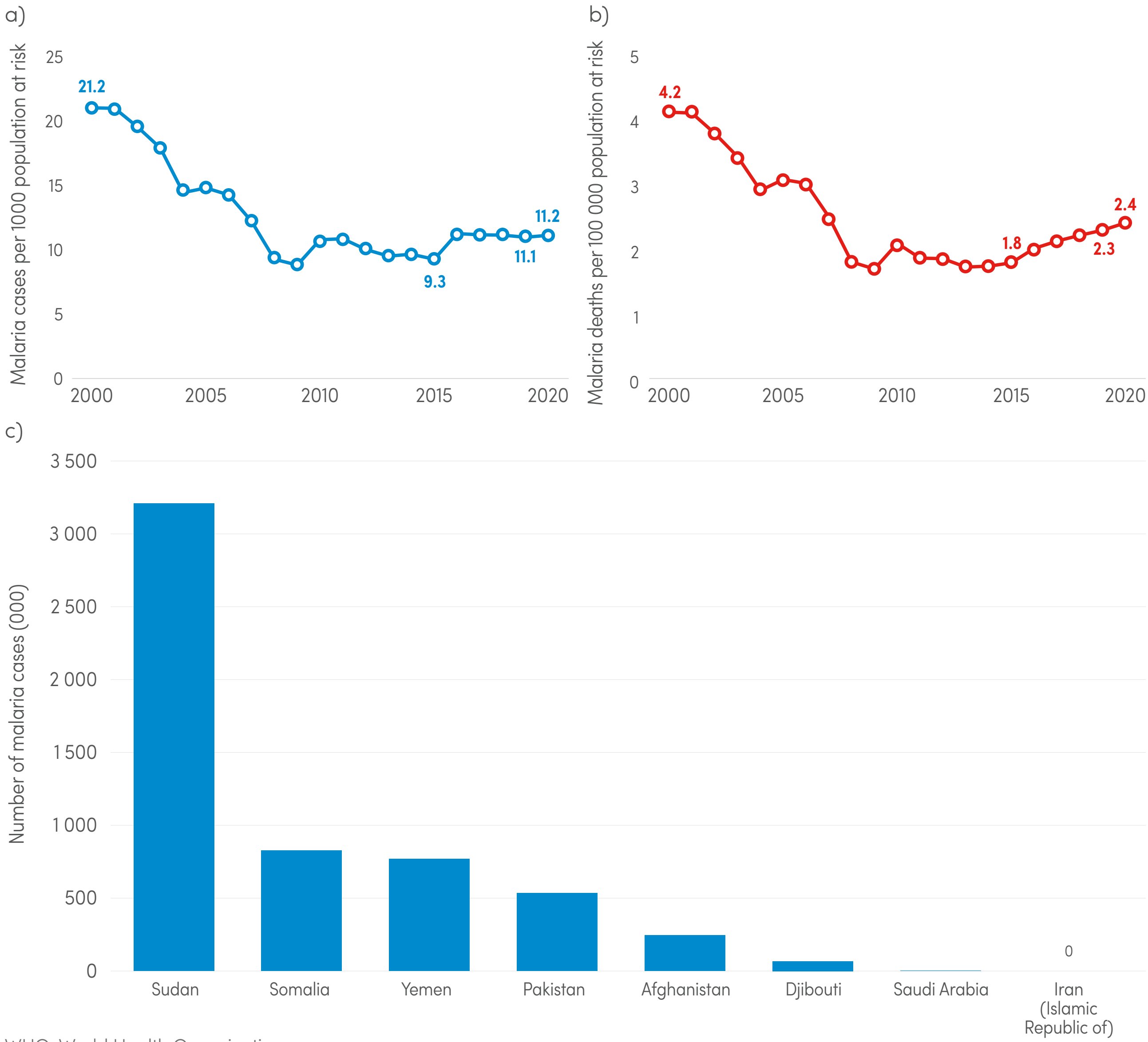
P. vivax: *Plasmodium vivax*; WHO: World Health Organization.

2.4 deaths per 100 000 population at risk (**Fig. 3.5a–b**). Although case incidence and mortality rate reduced overall between 2000 and 2020, the largest reductions of 58% were seen between 2000 and 2009. Between 2010 and 2015, the decline slowed to 14%, and since 2015 there have been increases in both cases (20%) and deaths (35%). The larger increase in mortality rate compared with incidence rate since 2015 is mostly due to increased deaths in the Sudan, which accounted for a higher proportion of all deaths in the region in 2020 (61%) compared with the proportion of cases (56%). Between 2019 and 2020, the mortality rate in this region rose only slightly, from 2.3 to 2.4 deaths per 100 000 population at risk.

In 2020, the Sudan accounted for most of the estimated malaria cases in this region (56%), followed by Somalia, Yemen, Pakistan, Afghanistan and Djibouti (**Fig. 3.5c**). In 2020, Saudi Arabia reported only 83 indigenous malaria cases and the Islamic Republic of Iran reported no indigenous malaria cases for a third consecutive year. Iraq, Morocco, Oman and the Syrian Arab Republic last reported indigenous malaria cases in 2008, 2004, 2007 and 2004, respectively (**Annex 5-I**).

FIG. 3.5.

Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO Eastern Mediterranean Region, 2020 *Source: WHO estimates.*



WHO: World Health Organization.

3.5 ESTIMATED MALARIA CASES AND DEATHS IN THE WHO WESTERN PACIFIC REGION, 2000–2020

Malaria cases decreased by 39% in the WHO Western Pacific Region, from 2.8 million cases in 2000 to an estimated 1.7 million cases in 2020, even though cases increased by 19% in 2020, from 1.4 million in 2019 (**Table 3.5**). Malaria deaths also decreased significantly, by 47%, from about 6100 deaths in 2000 to 3200 in 2020, with an increase between 2019 and 2020 (from 2600 to 3200 deaths). Increases in cases and deaths between 2019 and 2020 were mainly due to increases in Papua New Guinea. The proportion of cases in the region due to *P. vivax* has increased over time, from about 17% in 2000 to almost a third of all cases in 2020, with effective malaria prevention and treatment contributing to reductions in the burden of *P. falciparum*.

TABLE 3.5.
Estimated malaria cases and deaths in the WHO Western Pacific Region, 2000–2020 Estimated cases and deaths are shown with 95% upper and lower confidence intervals. *Source: WHO estimates.*

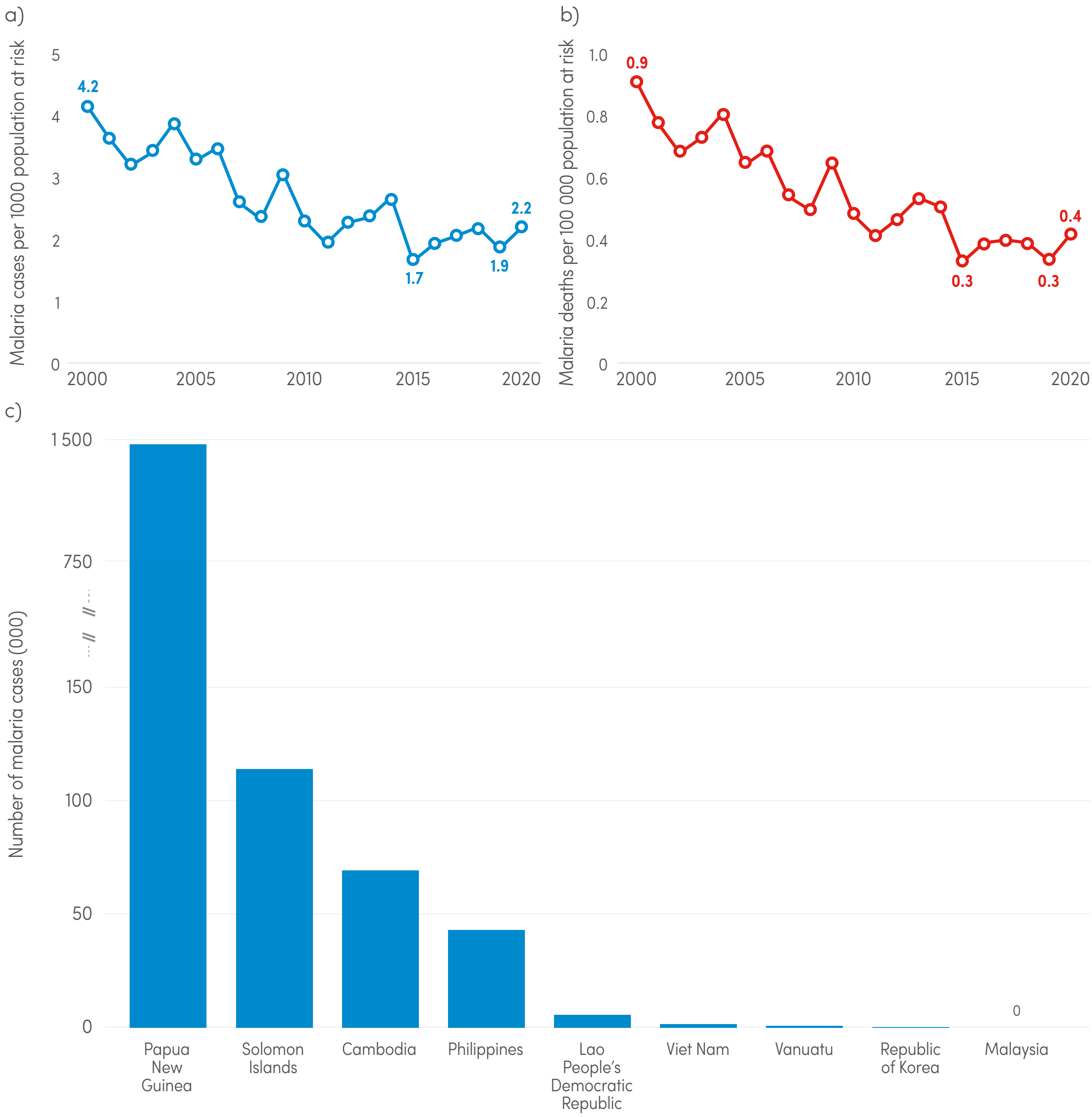
Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% *P. vivax*	Point	Lower bound	Upper bound
2000	**2 805**	1 772	4 044	17.4%	**6 100**	1 900	11 100
2001	**2 477**	1 529	3 621	20.3%	**5 300**	1 600	9 900
2002	**2 192**	1 322	3 251	20.6%	**4 700**	1 500	8 700
2003	**2 359**	1 441	3 506	20.1%	**5 000**	1 600	9 300
2004	**2 712**	1 577	4 086	22.5%	**5 600**	1 600	10 700
2005	**2 301**	1 347	3 466	28.7%	**4 500**	1 300	8 700
2006	**2 463**	1 510	3 646	27.0%	**4 900**	1 400	9 200
2007	**1 847**	1 022	2 890	22.3%	**3 800**	1 000	7 900
2008	**1 673**	886	2 691	20.9%	**3 500**	800	7 300
2009	**2 225**	1 264	3 463	20.8%	**4 700**	900	9 500
2010	**1 677**	984	2 537	22.7%	**3 500**	800	6 800
2011	**1 422**	860	2 133	21.9%	**3 000**	600	6 000
2012	**1 680**	854	2 935	23.5%	**3 400**	600	7 900
2013	**1 756**	1 119	2 557	13.6%	**4 000**	500	8 100
2014	**2 010**	1 340	2 922	31.0%	**3 800**	600	7 400
2015	**1 247**	938	1 622	27.1%	**2 400**	400	4 400
2016	**1 472**	1 077	1 930	25.4%	**2 900**	400	5 500
2017	**1 576**	1 145	2 098	28.7%	**3 000**	500	5 600
2018	**1 693**	1 241	2 240	36.2%	**3 000**	500	5 600
2019	**1 436**	1 091	1 806	35.4%	**2 600**	400	4 700
2020	**1 705**	1 247	2 236	30.1%	**3 200**	400	6 100

P. vivax: *Plasmodium vivax*; WHO: World Health Organization.

In the period 2000–2020, malaria case incidence reduced from 4.2 to 2.2 cases per 1000 population at risk (**Fig. 3.6a**), and the malaria mortality rate reduced from 0.9 to 0.4 deaths per 100 000 population at risk (**Fig. 3.6b**). Papua New Guinea accounted for 86% of all cases in this region in 2020, followed by Solomon Islands, Cambodia and the Philippines (**Fig. 3.6c**). China has had no indigenous malaria cases since 2017 and was certified malaria free in 2021. Malaysia had no cases of human malaria for 3 consecutive years, but in 2020 reported 2607 cases of *P. knowlesi*, a zoonotic malaria. Four countries had fewer than 10 000 cases in 2020: the Lao People's Democratic Republic (5674), the Republic of Korea (356), Vanuatu (910) and Viet Nam (1657). Papua New Guinea accounted for 93% of all deaths in the region. There have been zero reported malaria deaths in the Republic of Korea and Vanuatu since 2012, Malaysia since 2017, Cambodia and the Lao People's Democratic Republic since 2018, and Viet Nam since 2019.

FIG. 3.6.

Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO Western Pacific Region, 2020 *Source: WHO estimates.*



WHO: World Health Organization.

3.6 ESTIMATED MALARIA CASES AND DEATHS IN THE WHO REGION OF THE AMERICAS, 2000–2020

Between 2000 and 2020, in the WHO Region of the Americas, malaria cases and case incidence reduced by 58% (from 1.5 million to 0.65 million) and 67% (from 14.1 to 4.6 cases per 1000 population at risk), respectively (**Table 3.6**, **Fig. 3.7a**). Over the same period, malaria deaths and the mortality rate reduced by 56% (from 909 to 409) and 66% (from 0.8 to 0.3 deaths per 100 000 population at risk), respectively (**Table 3.6**, **Fig. 3.7b**). The Bolivarian Republic of Venezuela, Brazil and Colombia accounted for 77% of all cases in this region (**Fig. 3.7c**). Most of the cases in this region are due to *P. vivax* (68% in 2020).

Progress in this region suffered in recent years because of a major increase in malaria in the Bolivarian Republic of Venezuela, which had about 35 500 cases in 2000, rising to over 467 000 by 2019. In 2020, however, cases reduced by more than half compared with 2019, to 232 000, in part because of restrictions on movement during the COVID-19 pandemic and a

TABLE 3.6.

Estimated malaria cases and deaths in the WHO Region of the Americas, 2000–2020 Estimated cases and deaths are shown with 95% upper and lower confidence intervals. *Source: WHO estimates.*

Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% *P. vivax*	Point	Lower bound	Upper bound
2000	**1 540**	1 391	1 699	71.6%	**909**	665	1 169
2001	**1 297**	1 169	1 432	67.2%	**832**	597	1 092
2002	**1 183**	1 077	1 298	67.8%	**764**	513	1 022
2003	**1 159**	1 066	1 262	68.6%	**726**	480	984
2004	**1 147**	1 069	1 235	69.6%	**711**	462	985
2005	**1 273**	1 202	1 358	70.3%	**687**	439	960
2006	**1 097**	1 032	1 174	68.4%	**581**	346	843
2007	**989**	908	1 074	70.3%	**503**	293	738
2008	**696**	644	760	71.1%	**470**	224	747
2009	**688**	634	753	70.6%	**463**	230	737
2010	**818**	741	901	70.9%	**502**	247	793
2011	**615**	570	671	68.9%	**464**	205	727
2012	**585**	545	634	68.9%	**430**	211	652
2013	**576**	531	629	64.5%	**470**	232	709
2014	**475**	444	509	69.5%	**348**	193	485
2015	**602**	552	665	70.7%	**414**	227	579
2016	**688**	637	747	67.3%	**529**	264	749
2017	**946**	878	1 031	73.9%	**664**	290	958
2018	**929**	862	1 013	78.2%	**571**	271	815
2019	**894**	826	981	77.4%	**509**	231	738
2020	**653**	604	708	68.3%	**409**	185	579

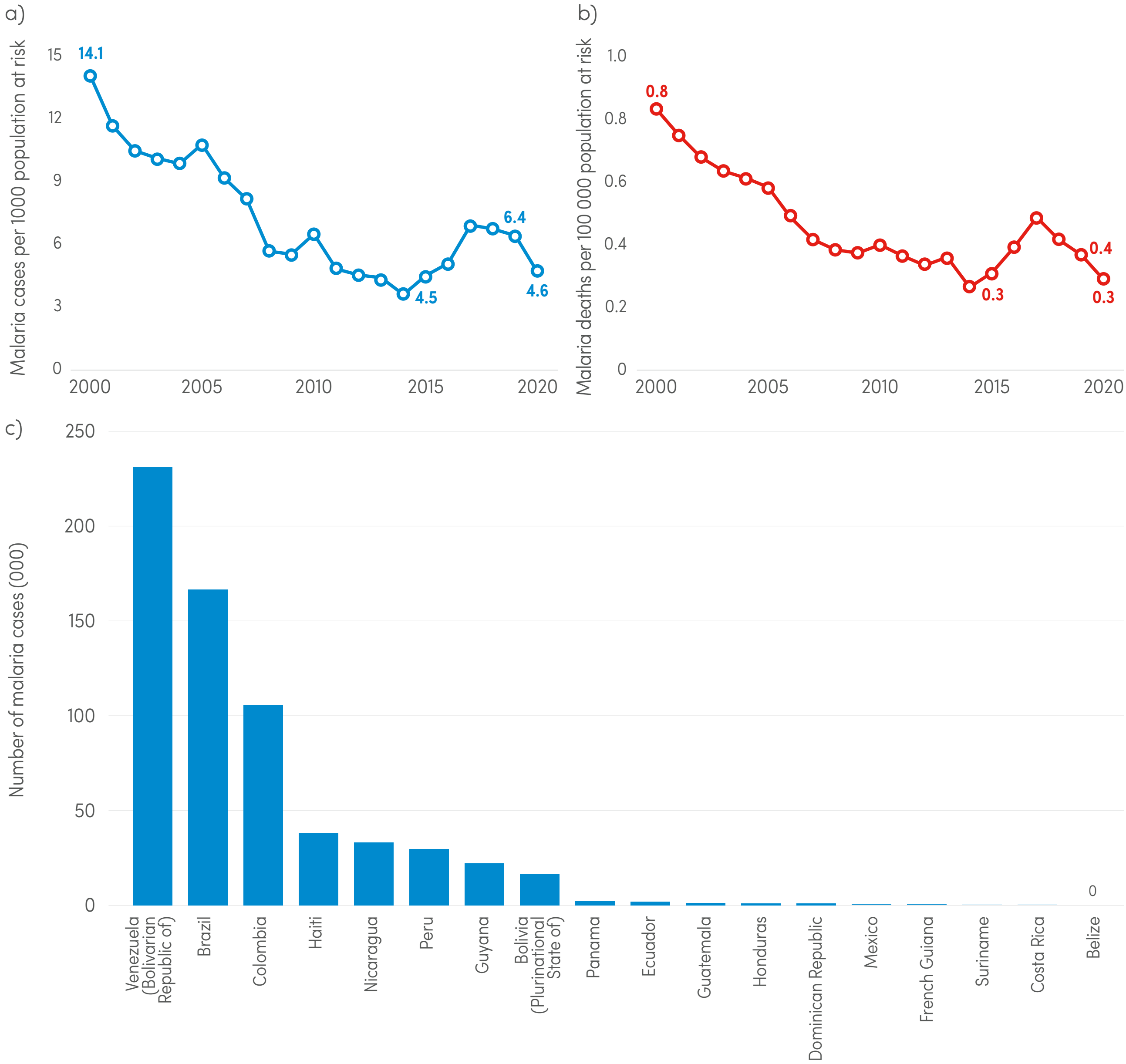
P. vivax: *Plasmodium vivax*; WHO: World Health Organization.

shortage of fuel that affected the mining industry, reducing the occupational exposure risk normally experienced by this population, who are the main contributors to the recent increase in malaria in the country. These restrictions may also have affected access to care, reducing cases reported from health facilities. Other countries that experienced substantial increases in the region in 2020 compared with 2019 were Haiti, Honduras, Nicaragua, Panama and the Plurinational State of Bolivia. Nicaragua experienced a malaria outbreak in 2020, in addition to a shortage of RDTs, resulting in a number of reported presumed cases. Overall, however, malaria cases and deaths in this region both declined in the period 2019–2020, mainly due to a reduction in burden in the Bolivarian Republic of Venezuela.

Argentina, El Salvador and Paraguay were certified as malaria free in 2019, 2021 and 2018, respectively. Belize reported zero indigenous malaria cases for the second consecutive year. There are few malaria-related deaths in the region, with an estimated 409 deaths in 2020, most being in adults (77%).

FIG. 3.7.

Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO Region of the Americas, 2020 *Source: WHO estimates.*



WHO: World Health Organization.

3.7 ESTIMATED MALARIA CASES AND DEATHS IN THE WHO EUROPEAN REGION, 2000–2020

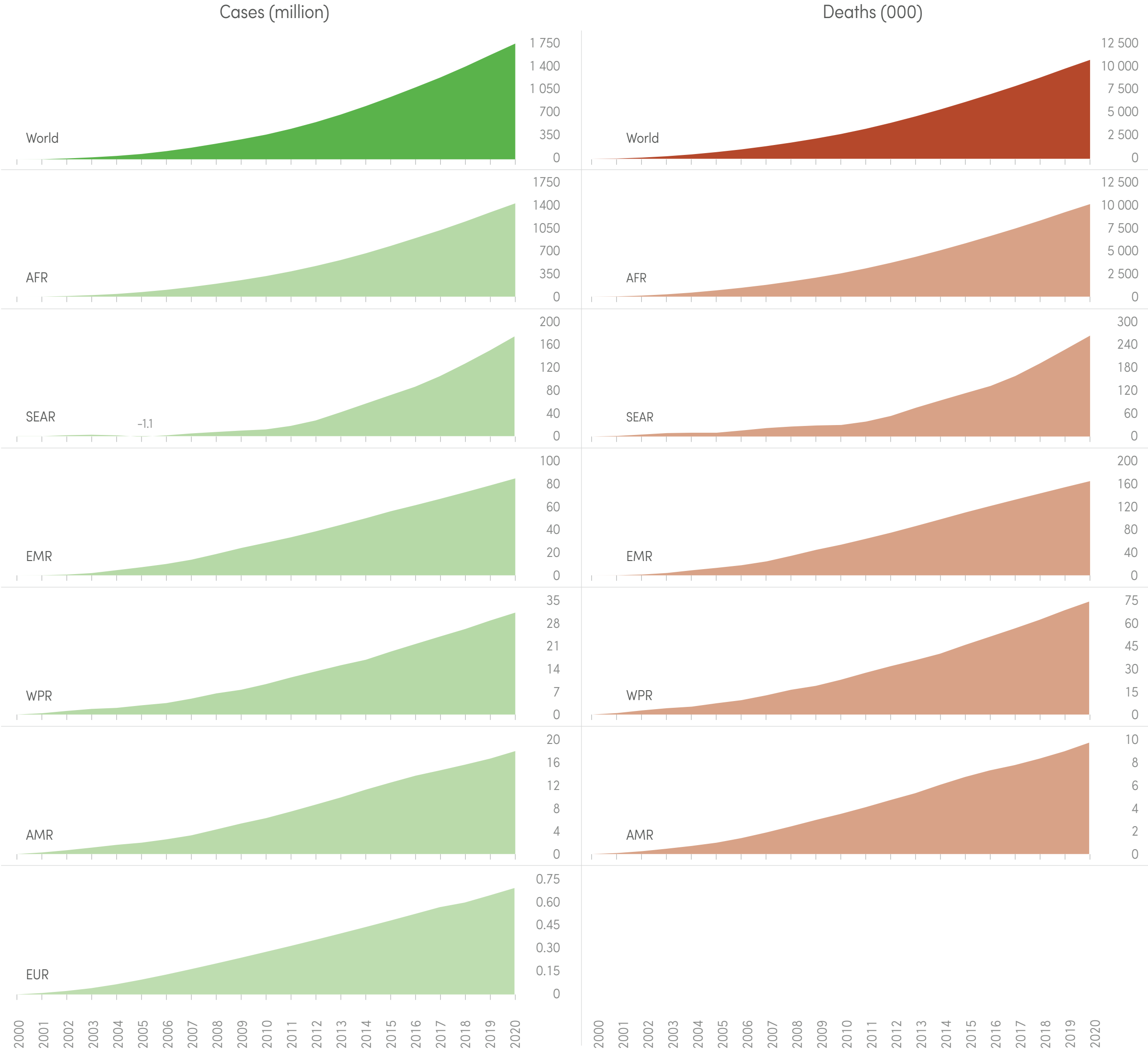
Since 2015, the WHO European Region has been free of malaria. The last country to report an indigenous malaria case was Tajikistan in 2014. Throughout the period 2000–2020, no malaria deaths were reported in the WHO European Region.

3.8 CASES AND DEATHS AVERTED SINCE 2000, GLOBALLY AND BY WHO REGION

Cases and deaths averted over the period 2000–2020 were calculated by comparing the current annual estimated burden of malaria with the malaria case incidence and mortality rates from 2000, assuming

FIG. 3.8.

Cumulative number of cases and deaths averted globally and by WHO region, 2000–2020 *Source: WHO estimates.*



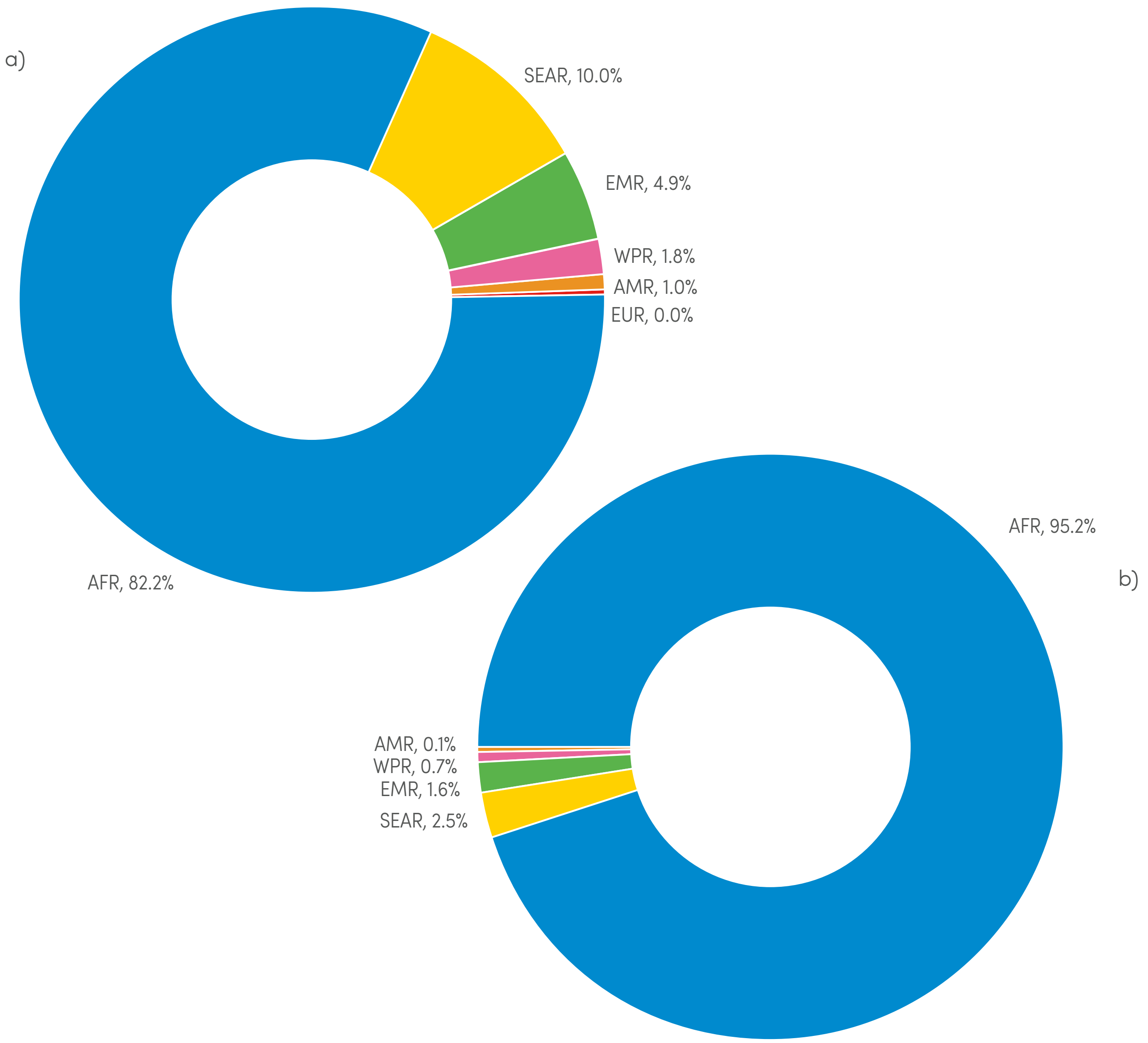
AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; EUR: WHO European Region; SEAR: WHO South-East Asia Region; WHO: World Health Organization; WPR: WHO Western Pacific Region.

that, as a counterfactual, they remained constant throughout the same period (**Annex 1**). The analysis shows that 1.7 billion malaria cases and 10.6 million malaria deaths have been averted globally in the period 2000–2020. Most of the cases (82%) and deaths (95%) averted were in the WHO African Region, followed by the South-East Asia Region (cases 10% and deaths averted 2%) (**Fig. 3.8** and **Fig. 3.9**). In addition to malaria interventions, cases and deaths could also have been averted by other factors that modify malaria transmission or disease, such as improvements in socioeconomic status, malnutrition, infrastructure, housing and urbanization.

Despite considerable disruptions in malaria services during the COVID-19 pandemic, it is estimated that 170 million cases and 938 000 deaths were averted in 2020, compared with the estimated burden if case incidence and mortality rate remained at the levels of 2000.

FIG. 3.9.

Percentage of a) cases and b) deaths averted by WHO region, 2000–2020 *Source: WHO estimates.*



AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; EUR: WHO European Region; SEAR: WHO South-East Asia Region; WHO: World Health Organization; WPR: WHO Western Pacific Region.

3.9 SEVERE MALARIA: AGE PATTERNS AND CLINICAL MANIFESTATIONS BY TRANSMISSION INTENSITY

Severe malaria is multi-syndromic and often manifests as cerebral malaria (coma), severe malaria anaemia and respiratory distress. Other manifestations of severe malaria include low blood sugar, pulmonary oedema, acute kidney injury, significant bleeding, metabolic acidosis, shock, jaundice and hyperparasitaemia (*10*). Mortality is high if severe malaria is not promptly and effectively managed. The risk for death increases in the presence of multiple complications. In some survivors, cerebral malaria may result in lifelong neurological disabilities.

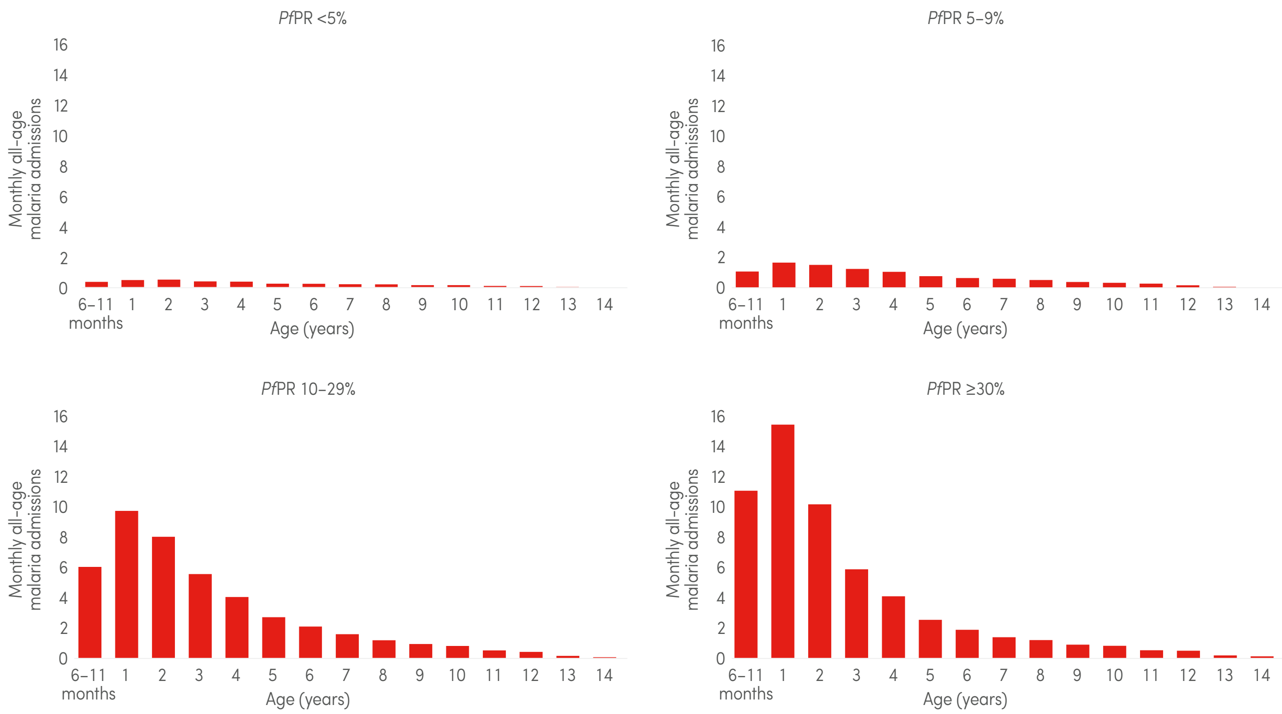
Understanding the variation in the clinical manifestations of severe malaria by age and transmission intensity is essential in implementing effective interventions. Mortality among severe malaria cases can be considerably reduced with prompt, effective antimalarial treatment and supportive care. In areas of moderate and high transmission, chemoprevention measures such as SMC and intermittent preventive treatment in infants reduce the risk of infection and disease. Vector control measures, such as ITNs, indirectly affect the burden of severe malaria by reducing the risk of infection in the population and therefore the chance of developing disease.

In sub-Saharan Africa, where the highest burden of malaria is concentrated, *P. falciparum* is the main cause of disease and death, particularly in young children because a substantial proportion of older children and adults have acquired functional immunity (*38*). As intensity of transmission reduces, the age-immunity patterns change and older children may become increasingly susceptible to severe malaria, even though the overall malaria burden declines.

It is difficult to define a case of severe malaria reliably, especially in settings with weak clinical and laboratory resources. To track the trends in severe malaria, inpatient data from routine surveillance systems are used as a proxy. In some settings, additional high-quality data may be available (e.g. from research groups). In this section of the report, multiple datasets are analysed to describe the severe malaria clinical manifestation and age patterns in areas of sub-Saharan Africa.

FIG. 3.10.

Average monthly all-age malaria admissions by age across four endemicity classes from about 52 000 admissions in 21 hospitals in east Africa, 2006–2021 *Source: KEMRI-Wellcome Trust Research Programme.*



KEMRI: Kenya Medical Research Institute; *Pf*PR: *P. falciparum* parasite rate.

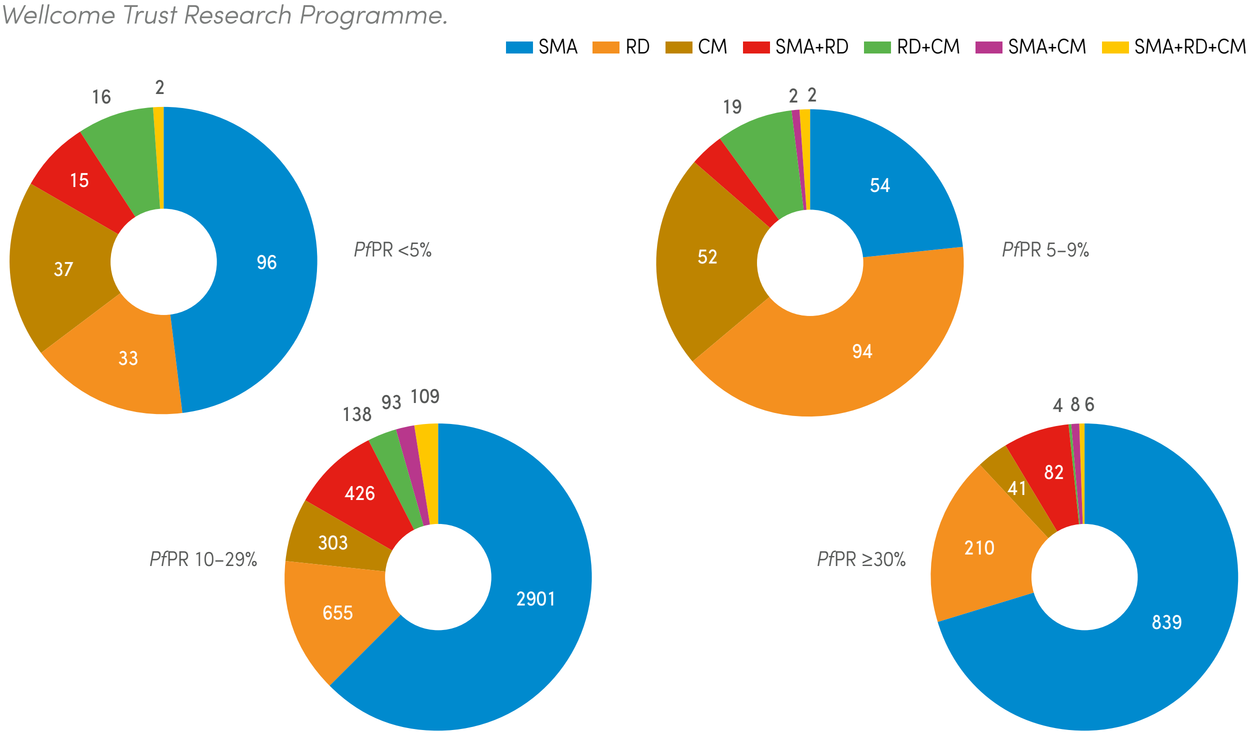
3.9.1 The distribution of severe malaria by age and clinical manifestations by different levels of transmission

Secondary analysis of demographic and clinical data from 21 surveillance hospitals in east Africa was conducted (*39*). Children were included in the analysis if they were aged 1 month to 14 years, were resident in selected administrative areas, and had evidence of laboratory confirmed malaria infection on admission and a final discharge diagnosis of malaria following review of all available clinical and laboratory findings by hospital clinicians. Cases for which it was possible to identify co-primary or secondary admission and discharge diagnoses of HIV, TB, sickle cell disease, malignancies, epilepsy, measles or poisoning were excluded from analysis because these conditions may have been the principal, underlying causal pathway for admission. At admission, information was documented for each person on clinical manifestations of severe anaemia, including measured levels of consciousness, respiratory distress and anaemia (*40–42*). Cerebral malaria was defined at different sites using either a Blantyre coma score (BCS) of less than 3 or documented neurological responsiveness based on the "alert, response to voice, response to pain, or unconscious" (AVPU) scale, where "unconscious" was regarded as equivalent to a BCS of less than 3. Severe malaria anaemia was defined among children who had a haemoglobin of less than 5 g/dL and were positive for malaria. However, haemoglobin concentrations were not available among all admissions at all sites. Where the haemoglobin level was not available, information on whether clinicians ordered a blood transfusion was used as a proxy measure of severe malaria anaemia. Respiratory distress was defined as clinically observed and recorded deep breathing (a sign of metabolic acidosis). Malaria admissions aged 1 month to 14 years from discrete administrative areas were identified from 2006 onwards. The information from each site and time period was matched to modelled community-based predictions of parasite prevalence in childhood (*Pf*PR$_{2–10}$), grouped according to four classifications. Twelve of the sites were described as low transmission (*Pf*PR$_{2–10}$ <5%), five as low to moderate transmission (*Pf*PR$_{2–10}$ 5–9%), 20 as moderate transmission (*Pf*PR$_{2–10}$ 10–29%) and 12 as high transmission (*Pf*PR$_{2–10}$ ≥30%).

Across all transmission settings in east Africa, severe malaria was concentrated in children aged under 5 years, with the number of severe disease cases increasing with transmission intensity (**Fig. 3.10**). Severe malaria anaemia was the most common manifestation of severe anaemia (**Fig. 3.11**). Cerebral malaria was

FIG. 3.11.

Distribution of common clinical manifestations of severe malaria across four endemicity classes from 6245 malaria admissions from 21 hospitals in east Africa covering 49 time-site periods *Source: KEMRI-Wellcome Trust Research Programme.*



CM: cerebral malaria; KEMRI: Kenya Medical Research Institute; *Pf*PR: *Plasmodium falciparum* parasite rate; RD: respiratory distress; SMA: severe malaria anaemia.

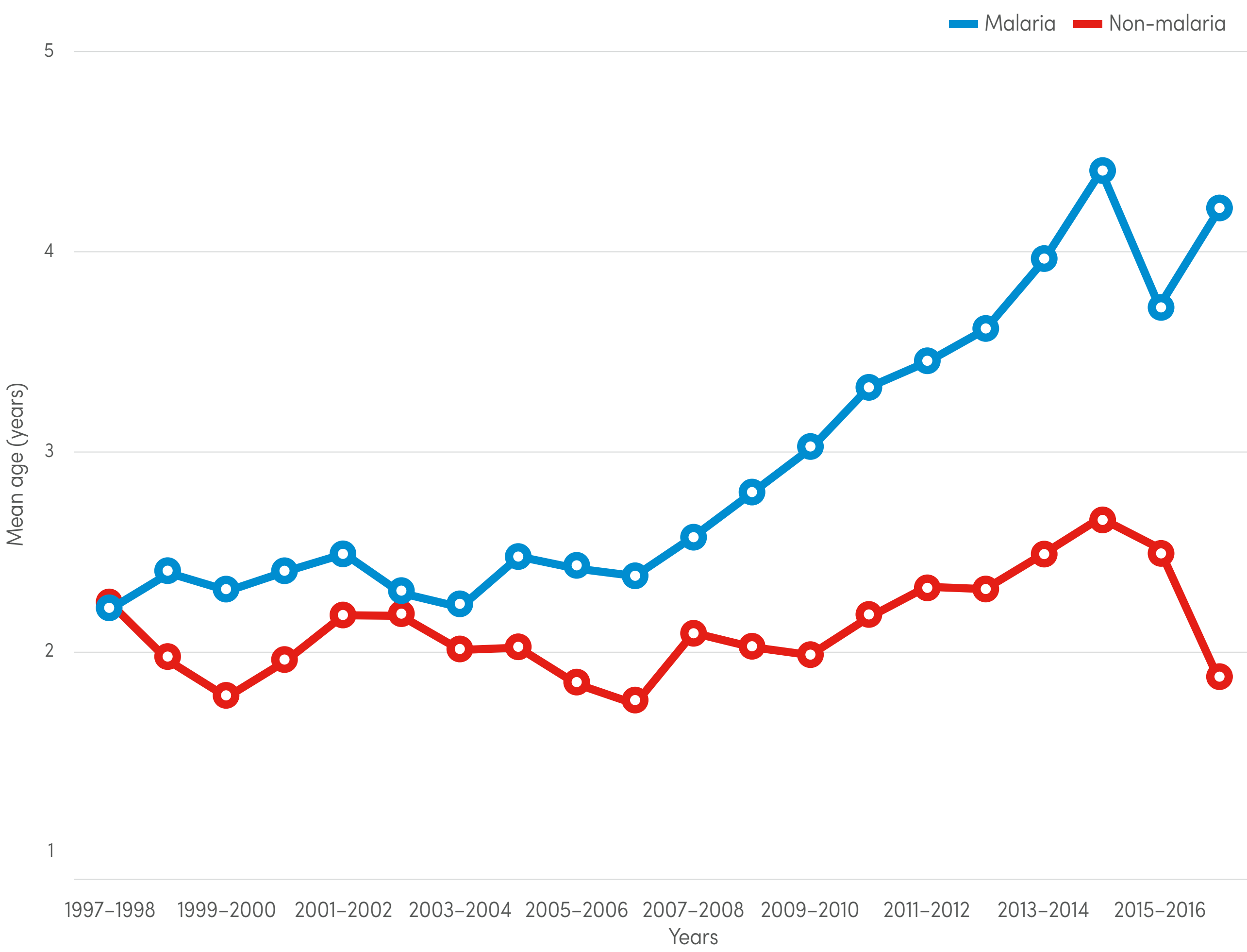
much more common in the lower transmission settings; however, in absolute numbers, it was higher in areas where prevalence of infection in the community was greater than 10%. This may reflect imbalance in the number of sites by endemicity and potential heterogeneity in transmission intensity and seasonality, masked by the aggregate prevalence classification. The second most common clinical manifestation of severe anaemia in endemicities with a *Pf*PR$_{2\text{–}10}$ of 5% or more was respiratory distress. Despite careful attempts to combine information on parasite densities with syndromic patient history, the study settings have many other causes of anaemia and respiratory distress, which should be considered when interpreting these results. Overall, the highest rates were always seen in children aged under 3 years, regardless of transmission setting. There was relatively little severe disease in children aged over 5 years in all settings and incidence of illness substantially decreased in lower transmission settings.

3.9.2 Changing age pattern and clinical manifestations of severe malaria under epidemiological transition

The results in the previous section show the distribution of severe malaria by age and clinical manifestations across four different transmission levels using data from multiple sites in east Africa. The analysis shows variation in the clinical manifestations and burden by age, influenced by transmission intensity. In this section, data from one site are used to illustrate the changing

FIG. 3.12.

Mean age (years) of admitted malaria and non-malaria (other diagnoses) cases, by year *Source: Centro de Investigação em Saúde de Manhiça and ISGlobal.*

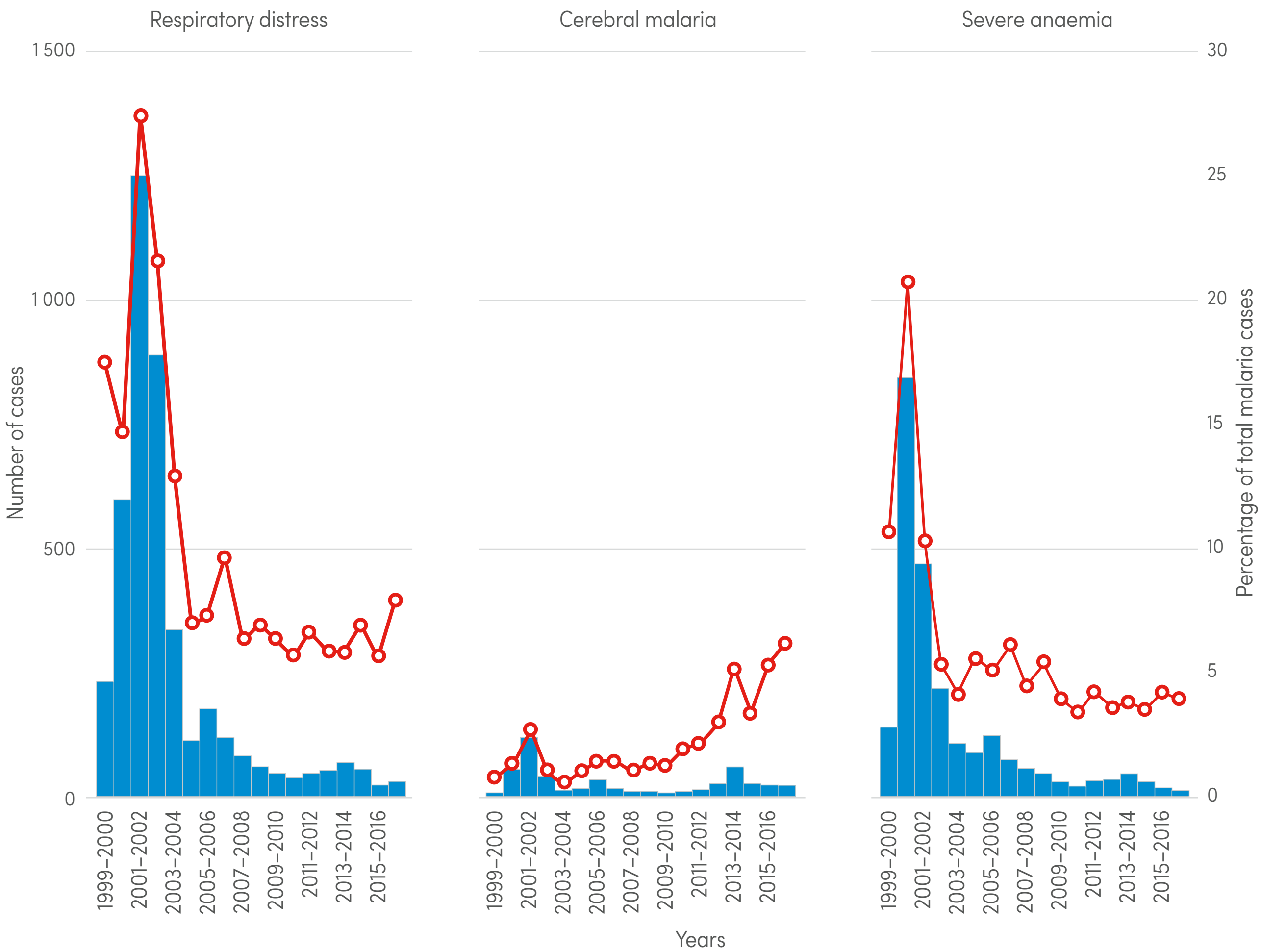


clinical presentation of severe disease over 20 years in a district hospital in Mozambique (*43*). This section presents a prospective study of hospital data collection from 32 138 children aged under 15 years admitted with malaria to Manhiça District Hospital (Mozambique) during 1997–2017. Prior research shows that over the analysis period, malaria transmission in Manhiça district declined considerably, from about 138 cases per 1000 to 65 cases per 1000 (*44–46*). **Fig. 3.12** shows that during this period the mean age of malaria admission changed, with a relatively higher proportion of older children increasingly being admitted for severe malaria, even as the overall burden of admission declined. The age pattern shifted to older ages (cases mean age 2.4 years in 1997–2007 and 3.4 years in 2007–2017), although most of the malaria deaths (60–75% in 2009–2017) still occurred in children aged under 5 years. The clinical presentation of severe malaria also changed, with a higher percentage of cerebral malaria and a somewhat lower percentage of severe anaemia and respiratory distress (**Fig. 3.13**).

The analyses presented in **Sections 3.9.1** and **3.9.2** show that severe malaria is still concentrated in children aged under 5 years, regardless of clinical manifestation. The analyses also show that most of the burden in children aged under 5 years is further concentrated in those aged under 3 years. Targeting malaria interventions to this age group that has the highest risk of developing severe malaria should be the focus of reducing levels of malaria mortality, which continue to be very high.

FIG. 3.13.

Total number of admissions with severe malaria syndromes (bars) and percentage of malaria admissions with respective severe malaria syndromes (line), by year *Source: Centro de Investigação em Saúde de Manhiça & ISGlobal.*



3.10 BURDEN OF MALARIA IN PREGNANCY

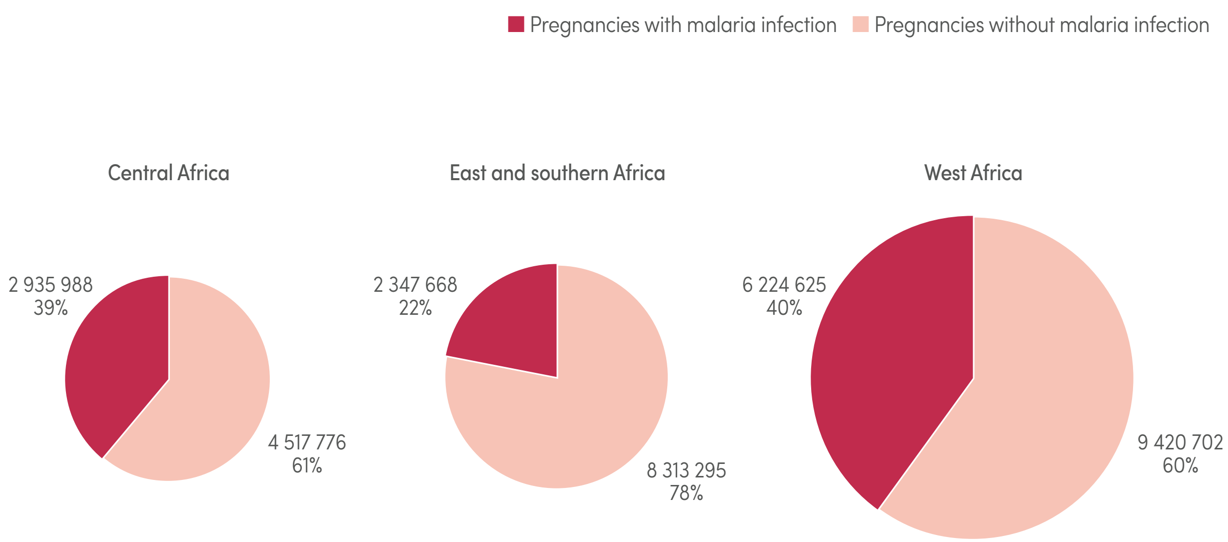
The estimation of malaria exposure prevalence during pregnancy and its contribution to low birthweight neonates in moderate and high transmission settings was initially published in the *World malaria report 2019* (*47*). This analysis was expanded in the *World malaria report 2020* to include analysis of low birthweights that would be averted if the first dose of IPTp (IPTp1) coverage matched the first ANC visit (ANC1) coverage (*4*). In this current world malaria report, additional analysis was undertaken to update the estimates of prevalence of malaria exposure and low birthweights for the year 2020, to capture the potential effect of service disruptions. Further analysis was undertaken to estimate the number of low birthweights that would be averted if the third dose of IPTp (IPTp3) was optimized to ANC1 or up to 90% coverage.

3.10.1 Prevalence of exposure to malaria infections during pregnancy and contribution to low birthweight neonates

Malaria infection exposure during pregnancy (measured as cumulative prevalence over 40 weeks) was estimated from mathematical models (*48*) that relate estimates of the geographical distribution of *P. falciparum* exposure by age across the WHO African Region in 2019 with patterns of infections in placental histology by age and parity (*49*) (**Annex 1**). Country-specific age- and

FIG. 3.14.

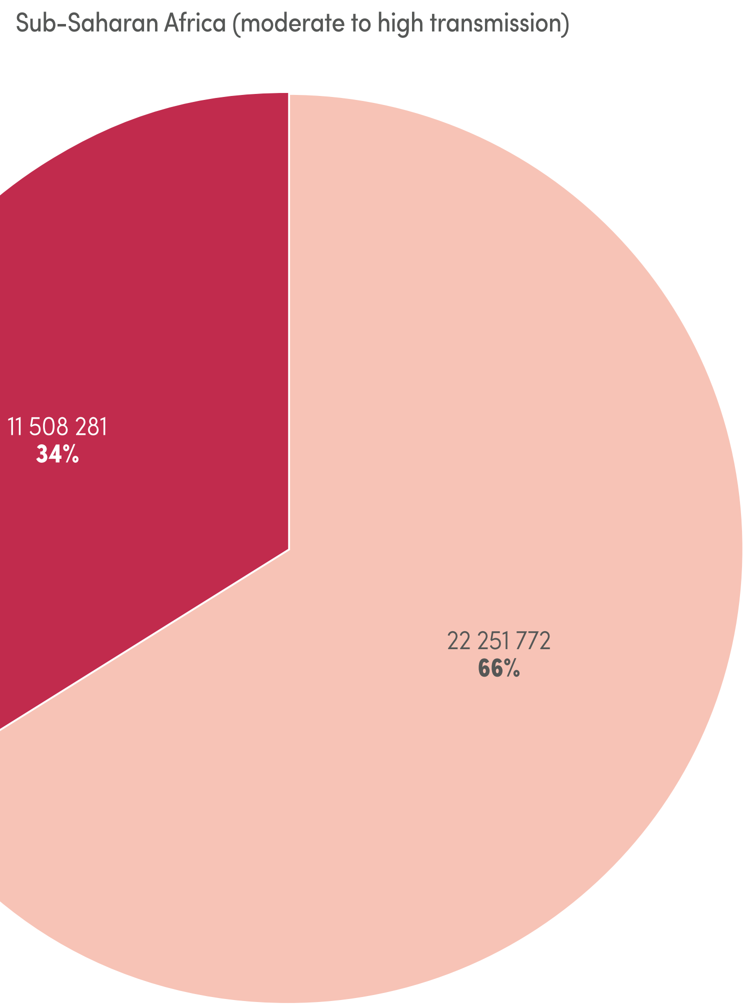
Estimated prevalence of exposure to malaria infection during pregnancy, overall and by subregion in 2020, in moderate to high transmission countries in the WHO African Region *Source: Imperial College and WHO estimates.*



gravidity-specific fertility rates, stratified by urban or rural status, were obtained from demographic and health surveys (DHS) and malaria indicator surveys (MIS) (*50*), where such surveys had been carried out since 2014 and were available from the DHS programme website (*51*). For countries where surveys were not available, fertility patterns were allocated based on survey data from a different country, matched on the basis of total fertility rate (*52*) and proximity. The exposure prevalence and the expected number of pregnant women who would have been exposed to infection were computed by country and subregion. Estimates of IPTp and ANC coverage are presented in **Section 7.4**.

In 2020, in 33 moderate and high transmission countries[1] in the WHO African Region, there were an estimated 33.8 million pregnancies, of which 34% (11.6 million) were exposed to malaria infection (**Fig. 3.14**). By WHO subregion, west Africa had the highest prevalence of exposure to malaria during pregnancy (39.8%) closely followed by central Africa (39.4%), while the prevalence was 22% in east and southern Africa. It is estimated that

[1] 33 moderate and high transmission countries: Angola, Benin, Burkina Faso, Burundi, Cameroon, the Central African Republic, Chad, the Congo, Côte d'Ivoire, the Democratic Republic of the Congo, Gabon, the Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, the Niger, Nigeria, Senegal, Sierra Leone, South Sudan (not included in the analysis of estimated averted low birthweights due to lack of consistent IPTp coverage data), Togo, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe.



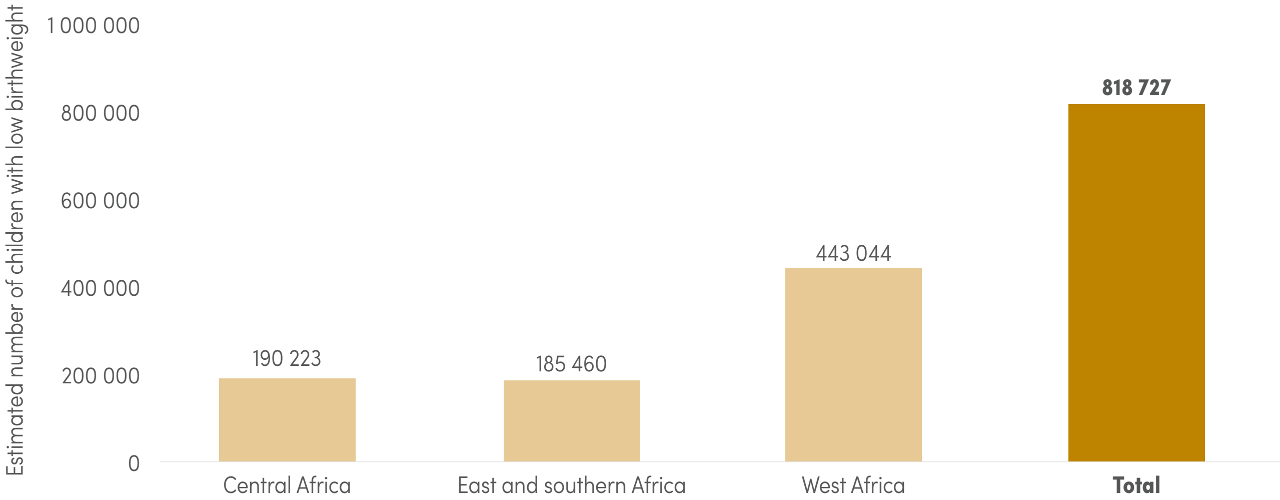
WHO: World Health Organization.

malaria infection during pregnancy in these 33 countries resulted in 819 000 neonates with low birthweight, with 54.1% of these children being in the subregion of west Africa (**Fig. 3.15**).

In the 33 countries that had data available on IPTp, an average of 74% of all pregnant women visited ANC clinics at least once during their pregnancy, 57% received at least one dose of IPTp, 46% received at least two doses of IPTp and 32% received at least three doses of IPTp (**Section 7.4**). At current levels of IPTp coverage across all doses, an estimated 408 000 low birthweights were averted in 2020. If all of the pregnant women visiting ANC clinics at least once during pregnancy

FIG. 3.15.

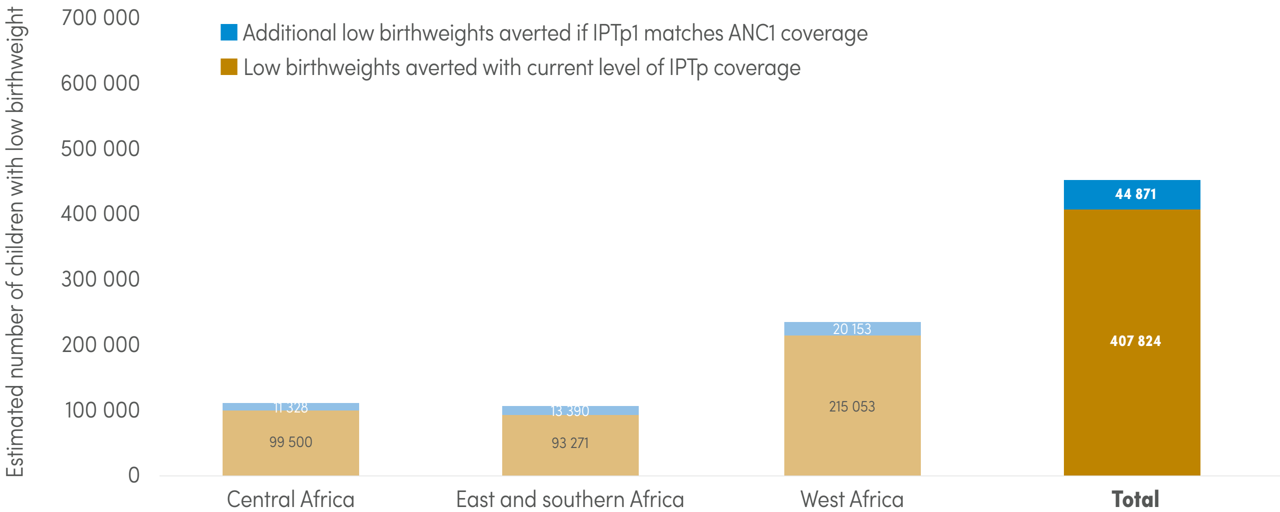
Estimated number of low birthweights due to exposure to malaria infection during pregnancy, overall and by subregion in 2020, in moderate to high transmission countries in sub-Saharan Africa *Sources: Imperial College and WHO estimates.*



WHO: World Health Organization.

FIG. 3.16.

Estimated number of low birthweights averted if current levels of IPTp coverage are maintained, and additional number averted if coverage of IPTp1 was optimized to match levels of coverage of ANC1 in 2020 while maintaining IPTp2 and IPTp3 at current levels, in moderate to high transmission countries in the WHO African Region *Sources: Imperial College and WHO estimates.*

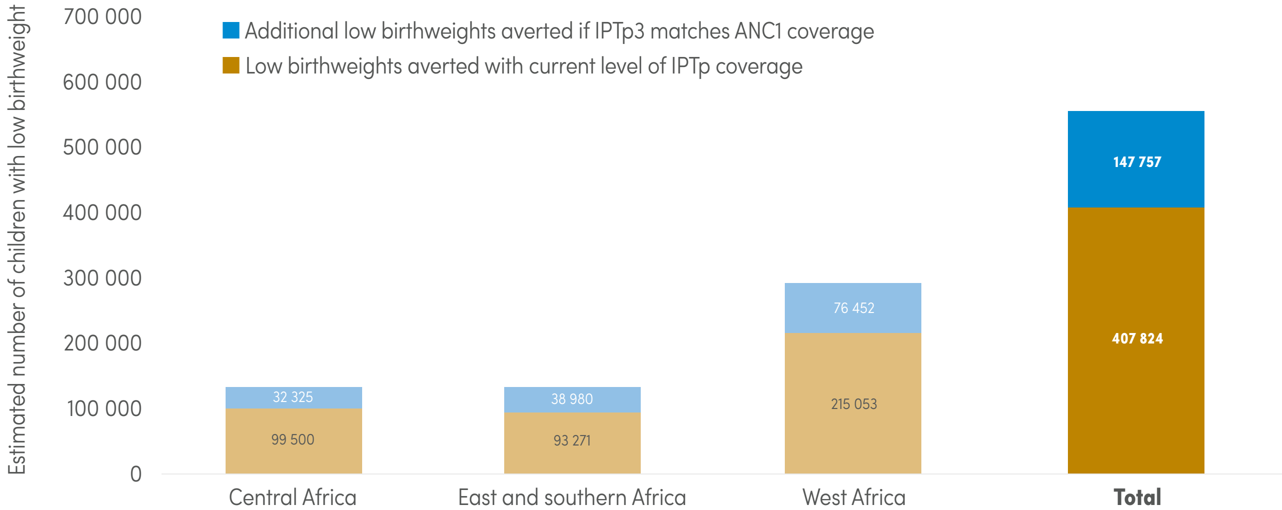


ANC: antenatal care; ANC1: first ANC visit; IPTp: intermittent preventive treatment in pregnancy; IPTp1: first dose of IPTp; WHO: World Health Organization.

received a single dose of IPTp, assuming they were all eligible, and that the levels of IPTp2 and IPTp3 coverage remained the same, an additional 45 000 low birthweights would be averted (**Fig. 3.16**). If IPTp3 coverage was raised to the same levels of ANC1 coverage, assuming that subsequent ANC visits were just as high, then an additional 148 000 low birthweights would be averted (**Fig. 3.17**). If IPTp3 coverage was optimized to 90% of all pregnant women, 206 000 low birthweights would be averted (**Fig. 3.18**). Given that low birthweight is a strong risk factor for neonatal and childhood mortality, averting a substantial number of low birthweights will save many lives.

FIG. 3.17.

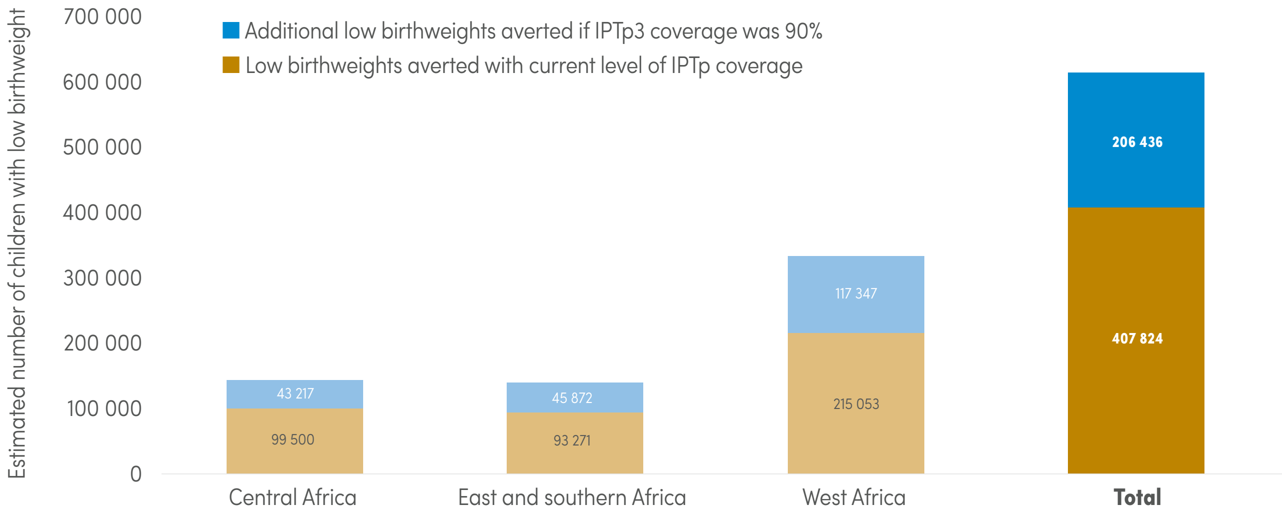
Estimated number of low birthweights averted if levels of IPTp3 coverage were optimized to match levels of coverage of ANC1 in 2020, in moderate to high transmission countries in the WHO African Region
Sources: Imperial College and WHO estimates.



ANC: antenatal care; ANC1: first ANC visit; IPTp: intermittent preventive treatment in pregnancy; IPTp3: third dose of IPTp; WHO: World Health Organization.

FIG. 3.18.

Estimated number of low birthweights averted if levels of IPTp3 were optimized to achieve 90% coverage in 2020, in moderate to high transmission countries in the WHO African Region *Sources: Imperial College and WHO estimates.*



IPTp: intermittent preventive treatment in pregnancy; IPTp3: third dose of IPTp; WHO: World Health Organization.

4 ELIMINATION

Globally, progression towards malaria elimination is increasing in several countries. The total number of malaria endemic countries that reported fewer than 10 000 malaria cases increased from 26 in 2000 to 47 in 2020. During the same period, the number of countries that reported fewer than 100 indigenous cases increased from six to 26. Between 2015 and 2020, the number of countries with fewer than 10 indigenous cases increased from 20 to 23 (**Fig. 4.1**).

4.1 MALARIA ELIMINATION CERTIFICATION

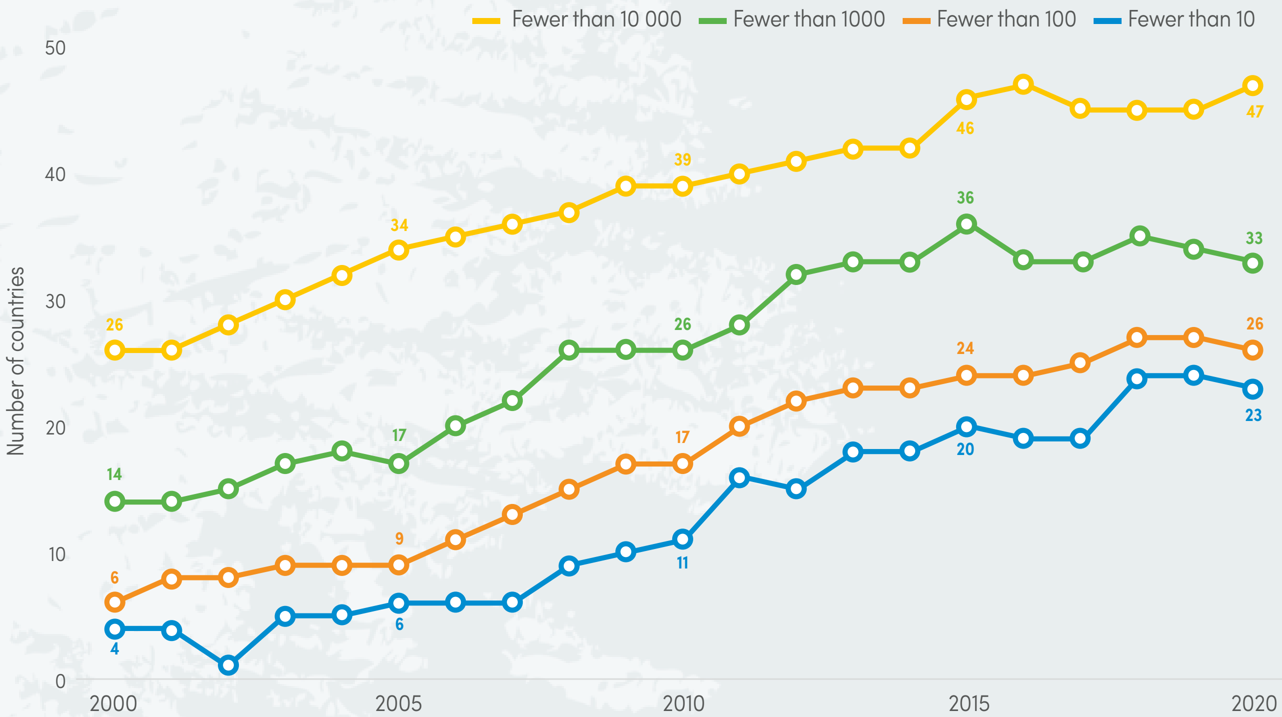
Between 2000 and 2020, 23 countries had achieved 3 consecutive years of zero indigenous malaria cases; 12 of these countries were certified malaria free by WHO (**Table 4.1**). Malaria free certification is awarded by WHO once a country has provided evidence that indigenous transmission of malaria has been interrupted throughout the entire country in the previous 3 consecutive years. Following 3 consecutive years of reporting zero indigenous cases, China and El Salvador have been certified malaria free in 2021.

In El Salvador, malaria cases decreased from more than 9000 in 1990 to 26 indigenous cases in 2010 (*53*). Since 2017, the country has continued to report zero indigenous malaria cases each year. El Salvador is the first Central American country to achieve malaria free status. The certification follows more than 50 years of political commitment by the government and the people of El Salvador to halting malaria transmission. El Salvador's antimalaria efforts began in the 1940s with environmental management to control mosquito breeding through construction of the first permanent drains in swamps, followed by IRS. In the mid-1950s, El Salvador established an NMP and recruited a network of community health workers to detect and treat malaria across the country. This also led to improved health information systems that allowed for strategic and targeted responses across El Salvador. In the 1960s and 1970s, an expansion in the country's cotton industry, a surge of migrant labourers and insecticide resistance led to malaria resurgence. Improvements in the programmatic response including decentralized laboratory systems led to a rapid decline of cases in the 1980s. Also contributing to El Salvador's success was the 2009 health reform, which included important improvements in the budget for and coverage of primary health care, and maintenance of the vector control programme; hence, the country became a technical leader in malaria interventions.

Following 70 years of investment in the fight against malaria, China is the first country in the WHO Western Pacific Region to be certified malaria free in more than 30 years. This is a notable achievement from a country that reported 30 million malaria cases annually in the 1940s. Over the decades, China accelerated the pace of progress towards elimination; by 1990, malaria cases in China had declined to 117 000, and deaths had been reduced by 95%. With increased donor funds, within 10 years, the annual number of cases dropped to 5000. In 2020, after reporting zero indigenous cases for 4 consecutive years, China applied for WHO certification of malaria elimination. China's key drivers of success were provision of a free basic public health service

FIG. 4.1.

Number of countries that were malaria endemic in 2000 and had fewer than 10, 100, 1000 and 10 000 indigenous malaria cases between 2000 and 2020 *Sources: NMP reports and WHO estimates.*



NMP: national malaria programme; WHO: World Health Organization.

TABLE 4.1.

Countries eliminating malaria since 2000 Countries are shown by the year that they attained 3 consecutive years of zero indigenous cases; countries that have been certified as malaria free are shown in green (with the year of certification in parentheses). *Sources: Country reports and WHO.*

2000	Egypt	United Arab Emirates (2007)		
2001				
2002				
2003				
2004	Kazakhstan			
2005				
2006				
2007	Morocco (2010)	Syrian Arab Republic	Turkmenistan (2010)	
2008	Armenia (2011)			
2009				
2010				
2011	Iraq			
2012	Georgia	Turkey		
2013	Argentina (2019)	Kyrgyzstan (2016)	Oman	Uzbekistan (2018)
2014	Paraguay (2018)			
2015	Azerbaijan	Sri Lanka (2016)		
2016	Algeria (2019)			
2017	Tajikistan			
2018				
2019	China (2021)	El Salvador (2021)		
2020	Islamic Republic of Iran	Malaysia		

WHO: World Health Organization.

Note: Maldives was certified in 2015; however, it was already malaria free before 2000, and thus is not listed here.

package (treatment and diagnosis) for its population; effective in-country multisector collaboration to drive and implement the agenda to end malaria; and, in recent years, to further reduce indigenous malaria cases, implementation of a "1–3–7" strategy that detects cases early, investigates them and rapidly responds to prevent the spread of the disease.

Algeria, which was certified malaria free in 2019, remains the first country in the WHO African Region to be certified since 1973. Azerbaijan and Tajikistan have officially submitted requests for certification and the process is underway.

4.2 E-2020 INITIATIVE

In the period 2010–2020, the number of malaria cases in the 21 countries that were part of the eliminating countries for 2020 (E-2020) initiative decreased by 84%. Progress in the reduction of malaria cases since 2010 in the 21 countries that are part of the E-2020 initiative is shown in **Table 4.2**.

In 2020, several countries reported significant progress towards elimination. The Islamic Republic of Iran and Malaysia reported zero malaria cases for the third consecutive year. Timor-Leste reported zero indigenous malaria cases in 2018 and 2019; however, in 2020, three indigenous cases were reported following a malaria outbreak in the country. Belize and Cabo Verde reported zero indigenous malaria cases for a second consecutive year. The Comoros, Mexico, the Republic of Korea, Nepal, Eswatini and Costa Rica saw a reduction of cases in 2020 compared with 2019, with reductions of 13 053, 262, 129, 54, 6 and 5, respectively. However, the following countries had more cases in 2020 than in 2019: South Africa (1367 additional cases), Botswana (715), Ecuador (131), Suriname (52), Saudi Arabia (45) and Bhutan (20).

4.3 E-2025 INITIATIVE

Building on the foundation and success of the E-2020 initiative, an increasing number of countries are approaching and achieving zero malaria cases. A new initiative was launched in April 2021 that identified a set of 25 countries with the potential to halt malaria transmission by 2025.

All E-2020 countries that have not yet requested malaria free certification by WHO have automatically been selected to participate in the E-2025 initiative. The additional eight countries that have been identified are the Democratic People's Republic of Korea, the Dominican Republic, Guatemala, Honduras, Panama, Sao Tome and Principe, Thailand and Vanuatu. These countries will receive specialized support and technical guidance throughout their journey towards the target of zero malaria.

The following criteria were used in the selection of the countries; where each country:

- has set a goal for malaria elimination by 2025, backed by a government-endorsed elimination plan;
- has met a defined threshold of malaria case reductions in recent years, suggesting that they are capable of achieving malaria free status by 2025;
- has a governmental agency or focal point responsible for malaria elimination, and the capacity to confirm 100% of suspected malaria cases in a laboratory; and
- was selected through expert opinions of WHO staff and members of the Malaria Elimination Oversight Committee, which supports WHO and countries to eliminate malaria through strategic oversight and advice.

This cohort of 25 countries all have common drivers for success, including a strong political commitment to end the disease; a strong primary health care system that ensures early diagnosis and treatment services; and malaria prevention strategies that apply to all, regardless of nationality and legal status.

4.4 THE GREATER MEKONG SUBREGION

In the GMS, the accelerated decrease in *P. falciparum* is especially critical because of increasing drug resistance; *P. falciparum* parasites have developed partial resistance to artemisinin – the core compound of the best available antimalarial drugs.

TABLE 4.2.

Number of indigenous malaria cases in E-2020 and E-2025 countries, 2010–2020 *Source: NMP reports.*

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Algeria	1	1	55	8	0	0	0	0	0	0	0
Belize	150	72	33	20	19	9	4	7	3	0	0
Bhutan	436	194	82	15	19	34	15	11	6	2	22
Botswana	1 046	432	193	456	1 346	284	659	1 847	534	169	884
Cabo Verde	47	7	1	22	26	7	48	423	2	0	0
China	4 990	1 308	244	83	53	39	1	0	0	0	0
Comoros	36 538	24 856	49 840	53 156	2 203	1 884	1 467	3 896	15 613	17 599	4 546
Costa Rica	110	10	6	0	0	0	4	12	70	95	90
Democratic People's Republic of Korea[a]	13 520	16 760	21 850	14 407	10 535	7 022	5 033	4 603	3 698	1 869	1 819
Dominican Republic[a]	2 482	1 616	952	473	459	631	690	340	433	1 291	826
Ecuador	1 888	1 218	544	368	242	618	1 191	1 275	1 653	1 803	1 934
El Salvador	17	7	13	6	6	5	12	0	0	0	0
Eswatini	268	379	409	728	389	318	250	440	686	239	233
Guatemala[a]	7 384	6 817	5 346	6 214	4 929	5 538	5 000	4 121	3 018	2 069	1 058
Honduras[a]	9 745	7 618	6 439	5 364	3 378	3 555	4 094	1 266	632	330	815
Iran (Islamic Republic of)	1 847	1 632	756	479	358	167	81	57	0	0	0
Malaysia	5 194	4 164	2 050	1 092	604	242	266	85	0	0	0
Mexico	1 226	1 124	833	495	656	517	551	736	803	618	356
Nepal	3 894	3 414	3 230	1 974	832	591	507	623	493	127	73
Panama[a]	418	354	844	696	864	546	769	649	684	1 580	2 190
Paraguay	20	1	0	0	0	0	0	0	0	0	0
Republic of Korea	1 267	505	394	383	557	627	602	436	501	485	356
Sao Tome and Principe[a]	2 740	8 442	12 550	9 243	1 754	2 056	2 238	2 239	2 937	2 732	1 933
Saudi Arabia	29	69	82	34	30	83	272	177	61	38	83
South Africa	8 060	9 866	6 621	8 645	11 705	4 959	4 323	23 381	9 540	3 096	4 463
Suriname	1 771	795	569	729	401	81	76	19	29	95	147
Thailand[a]	32 480	24 897	46 895	41 602	41 218	8 022	7 428	5 694	4 077	3 198	3 009
Timor-Leste	48 137	19 739	5 518	1 223	411	80	81	16	0	0	3
Vanuatu[a]	9 817	6 179	4 532	2 883	1 314	571	2 252	1 227	632	567	493
Total	**195 522**	**142 476**	**170 881**	**150 798**	**84 308**	**38 486**	**37 914**	**53 580**	**46 105**	**38 002**	**25 333**

E-2020: eliminating countries for 2020; E-2025: eliminating countries for 2025; NMP: national malaria programme.
[a] These eight countries joined the E-2025 initiative in 2021.
Note: When cases in E-2020 countries were higher in 2020 than in 2019, they are shown in red.

Between 2000 and 2020, the number of *P. falciparum* indigenous malaria cases in the GMS fell by 93%, while all malaria indigenous cases fell by 78% (**Fig. 4.2**). Of the 82 595 indigenous malaria cases in 2020, 19 386 were *P. falciparum* cases. Compared with 2012, when malaria cases were at a peak, the subregional initiative to respond to the emergence and spread of artemisinin resistance led to a reduction in indigenous malaria cases of 88% by 2020, while *P. falciparum* cases reduced by 95%. Myanmar (71%) and Cambodia (19%) accounted for most of the indigenous cases of malaria in the GMS in 2020 (**Fig. 4.3**). Myanmar accounted for most of the indigenous *P. falciparum* malaria cases within the region, followed by Cambodia and the Lao People's Democratic Republic. As *P. falciparum* cases reduced over time, *P. vivax* has become the dominant species, in relative terms, in the GMS. To accelerate towards elimination, countries also need to focus on aggressive treatment and vector control measures to prevent the transmission of and relapses due to *P. vivax*.

4.5 PREVENTION OF RE-ESTABLISHMENT

Once countries have eliminated malaria, re-establishment of transmission must be prevented through continued preventive measures in areas with malariogenic potential (i.e. risk of importation in areas receptive to transmission), vigilance to identify suspected malaria cases in the health system, quality-assured diagnosis and treatment, and follow-up to ensure complete cure and no onward transmission. After elimination, imported cases of malaria are expected; however, any introduced or indigenous cases signify local transmission and indicate possible deficiencies in prevention and surveillance strategies that must be addressed. Transmission of malaria is considered re-established when at least three indigenous cases of malaria of the same species have been found in the same focus of transmission for 3 consecutive years. Between 2000 and 2020, no country that was certified malaria free has been found to have malaria transmission re-established.

FIG. 4.2.

Total indigenous malaria and *P. falciparum* indigenous cases in the GMS, 2000–2019 *Source: WHO database.*

GMS: Greater Mekong subregion; *P. falciparum*: *Plasmodium falciparum*; WHO: World Health Organization.

Notes: Data for *P. falciparum* comes from the GSM Malaria Elimination database for Cambodia 2014, 2015 and 2017, Thailand 2012 and 2013, and Viet Nam 2018 and 2019.

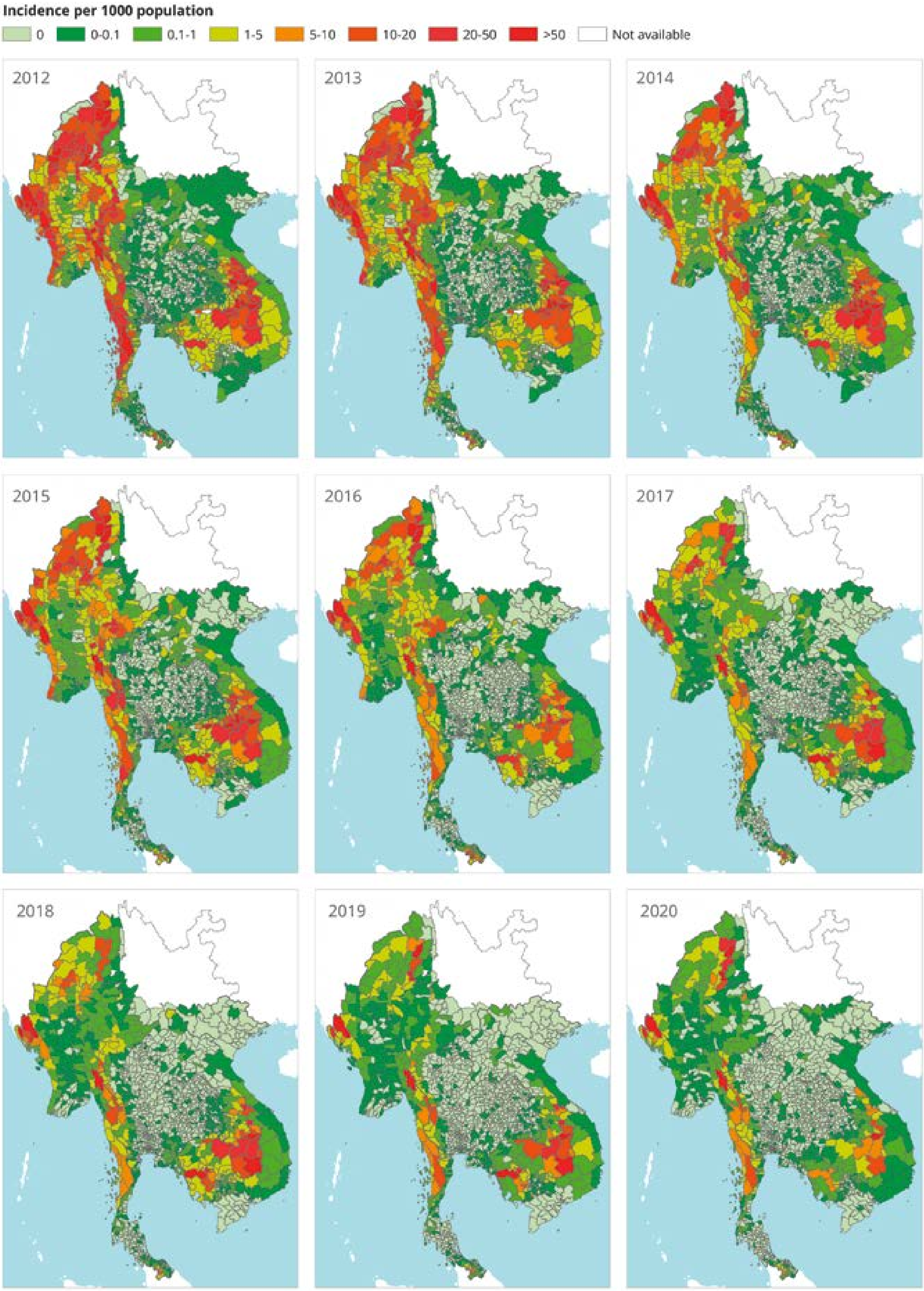
For the following countries and years, species breakdown does not add up to the total confirmed cases and therefore the number of *P. falciparum* cases are likely under-reported: Cambodia 2000–2006 and 2010–2013; Myanmar 2000–2006 and 2010–2011; Thailand 2005, 2006 and 2010–2011; and Viet Nam 2000 and 2007–2009.

Before the implementation of case investigation and classification in countries, all confirmed cases are considered to be indigenous. This uncertainty should be noted in the interpretation of the trends. The year of implementation of these activities varies by country.

For further details of species breakdown from 2010 onwards, see **Annex 5-I**.

FIG. 4.3.

Regional map of malaria incidence in the GMS, by area, 2012–2020 *Source: NMP reports to GMS MEDB.*



GMS: Greater Mekong subregion; MEDB: Malaria Elimination Database; NMP: national malaria programme.

5

HIGH BURDEN TO HIGH IMPACT APPROACH

In November 2018, WHO and the RBM Partnership to End Malaria launched the HBHI country-led approach *(54)* as a mechanism to support the 11 highest burden countries to get back on track to achieve the GTS 2025 milestones *(2)*. The approach includes the four key response pillars and several objectives, as shown in **Fig. 5.1**, and relies heavily on a strong health system and a broad multisectoral response. The 11 countries (Burkina Faso, Cameroon, the Democratic Republic of the Congo, Ghana, India, Mali, Mozambique, the Niger, Nigeria, Uganda and the United Republic of Tanzania) account for 70% of the global estimated case burden and 71% of global estimated deaths. Several countries with smaller populations but with high malaria incidence, such as Burundi, Guinea and Somalia, have also adopted the HBHI approach.

5.1 PROGRAMMATIC PROGRESS IN HBHI COUNTRIES IN 2020–2021

In 2020 and 2021, WHO and the RBM Partnership to End Malaria supported countries to implement rapid self-evaluations on progress against the HBHI objectives across the four response elements. Country self-evaluations are summarized in **Annex 3**. The self-evaluations covered the key objectives under each response pillar.

All HBHI countries mounted considerable efforts to maintain malaria services during the COVID-19 pandemic. SMC campaigns were delivered on time (**Table 7.1**). Planned ITN distribution in 2020 was realized in most countries, despite delays. However, India, the Democratic Republic of the Congo, Uganda and the United Republic of Tanzania did not reach their planned distribution targets, delivering only 50%, 53%, 79% and 98% of the nets planned for distribution in 2020, respectively, in that year (**Annex 2**); the remaining nets were delivered in 2021.

Among the six HBHI countries that had additional campaigns planned for 2021, only the Niger and the United Republic of Tanzania had completed their net distributions by the end of October 2021. In the other four countries, the percentage of nets distributed (excluding spillover from 2020) was as follows: the Democratic Republic of the Congo 4%, Ghana 76%, India 0% and Nigeria 47% (**Annex 2**).

The results of the WHO pulse surveys on essential health services (*30, 35*) showed that HBHI countries reported moderate levels of disruption to access to malaria diagnosis and treatment (mostly between 5% and 50%). Data on malaria tests performed showed

FIG. 5.1.

HBHI: response pillars and objectives *Sources: WHO GMP and RBM Partnership to End Malaria.*

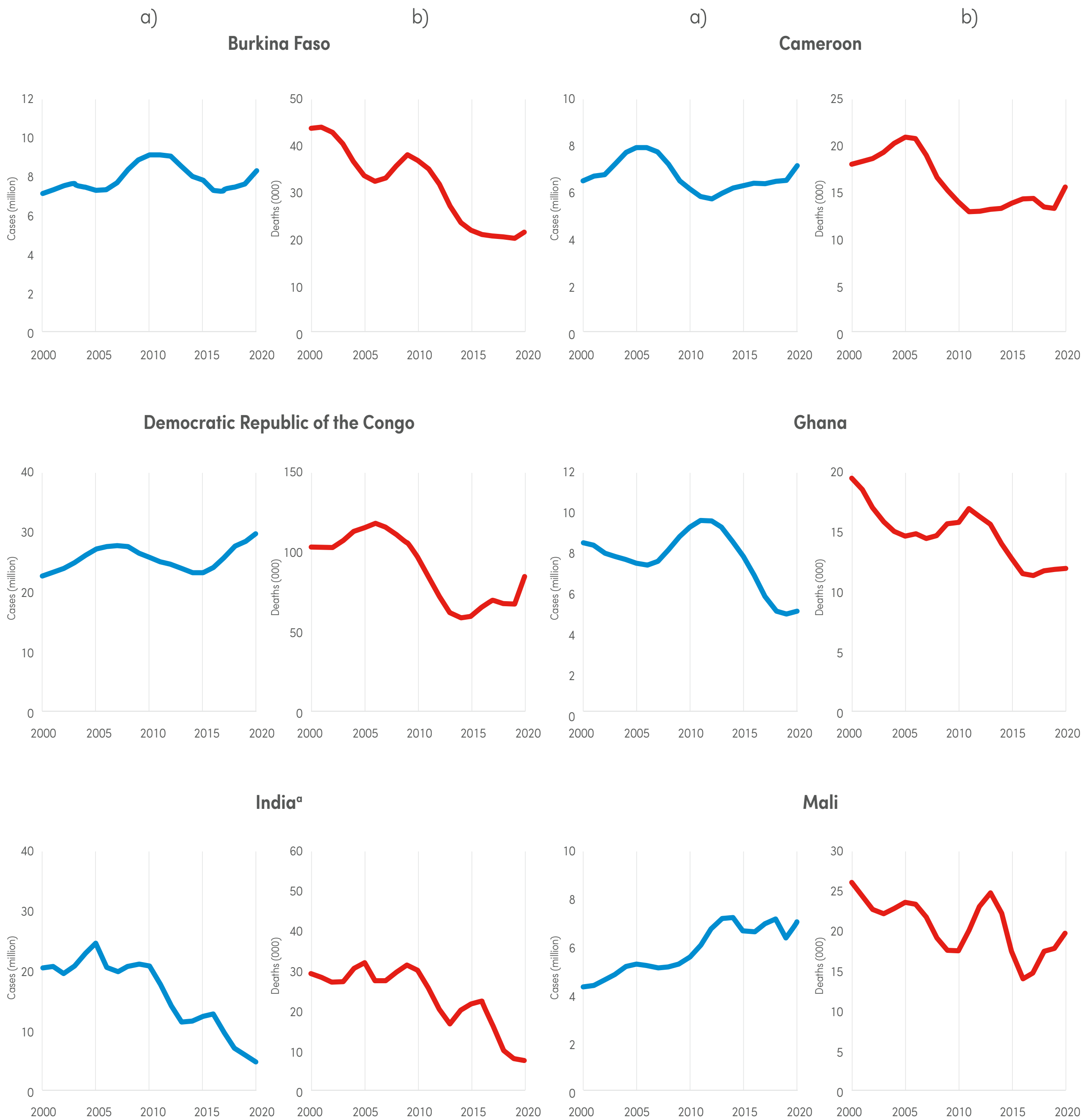
Response pillar	Objectives
I – **Political will** to reduce malaria deaths	a. **Empowered political structures** that ensure political **support for malaria** b. **Accountability** of political actors and institutions to ensure commitment and action c. **Translation** of political will **into corresponding resources including funding** through multisectoral resource mobilization d. **Increased awareness** of malaria through **targeted communication** fostering **active participation of communities** in prevention malaria
II – **Strategic information** to drive impact	a. **Functioning** national malaria **data repositories** with programme **tracking dashboards** b. **Country-level malaria situation analysis** and review of malaria programs to understand **progress and bottlenecks** c. **Data analysis** for **stratification, optimal intervention mixes** and **prioritization** for **national strategic plan** development and implementation d. **Subnational operational plans** linked to subnational **health plans** e. **Ongoing** subnational **monitoring and evaluation** of programmatic activities (incl. data systems) and impact
III – **Better guidance,** policies and strategies	a. **Continually updated global guidelines** based on **best available evidence; incorporation of country needs** into global guidance allowing **space for innovation** b. **Improved dissemination and uptake** of global policies through individual **country adoption and adaptation to local context,** including intervention mixes and prioritization c. **Country-level implementation guidance** tools to inform **effective and optimal deployment** of national policies d. **Improved tracking of policy uptake** by countries
IV – **A coordinated** national malaria **response**	a. **Clear overview of relevant stakeholders** and partners in-country and their financial and technical contribution throughout a multisectoral engagement b. **Clear overview of relevant processes** that need coordination and respective roles, responsibilities and timelines outlined c. **Dedicated structures** that ensure **systematic coordination** d. **Alignment of partner support** and funding in line **with costed national strategic plans and health sector priorities**

GMP: Global Malaria Programme; HBHI: high burden to high impact; WHO: World Health Organization.

that – excluding Burkina Faso, whose test data in 2019 were incomplete because of health worker strikes in that year – the numbers of malaria tests performed reduced by values ranging from about 24% in Nigeria to 60% in the Democratic Republic of the Congo by April to June 2020, compared with the same period in 2019 (**Table 2.1**). In the period July to September 2020, the number of tests performed had risen in most countries, but was still lower than the same period in 2019, with reductions greater than 20% in the Democratic Republic of the Congo, Ghana, Mozambique and Nigeria.

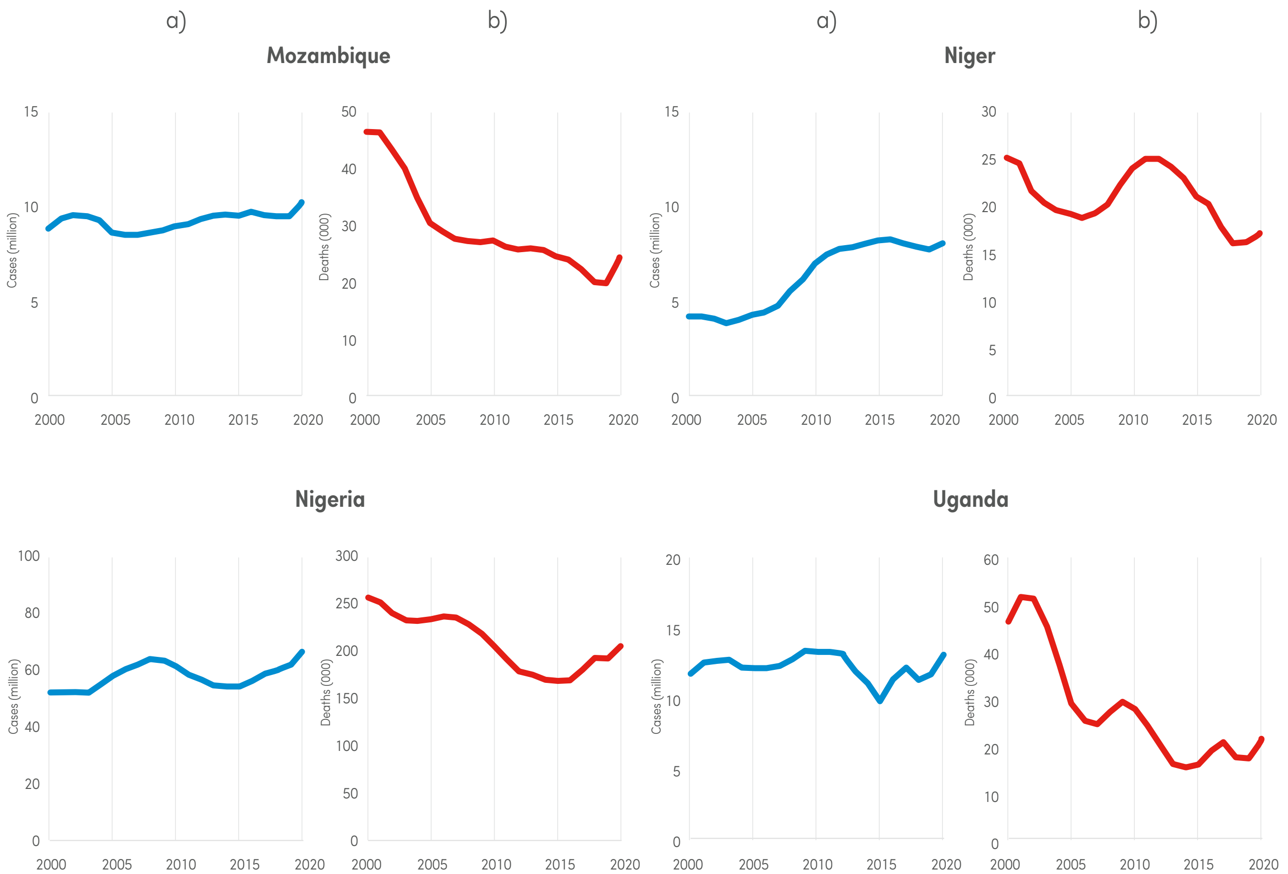
FIG. 5.2.

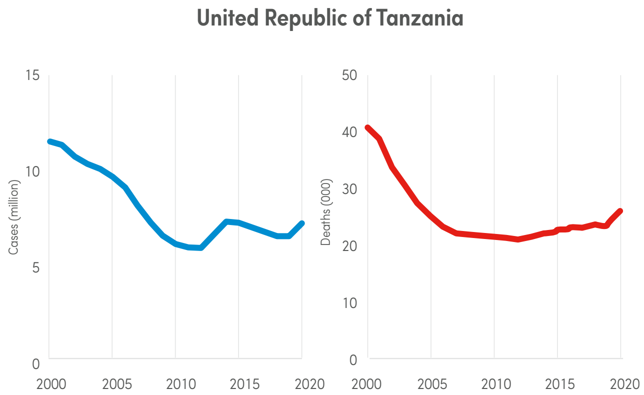
Estimated malaria a) cases and b) deaths in HBHI countries, 2000–2020 *Sources: WHO estimates.*



5.2 MALARIA BURDEN IN HBHI COUNTRIES

Comparisons of estimated malaria cases and deaths from 2000 to 2020 in HBHI countries are presented in **Fig. 5.2**. Overall, malaria cases in HBHI countries reduced from 155 million to 150 million and deaths from 641 000 to 390 000 from 2000 to 2015, then increased to 154 million and 398 000 by 2019, before increasing further to 163 million and 444 600 in 2020. Between 2019 and 2020, all HBHI countries except India reported increases in cases and deaths (and in India, the rate of reduction had decreased compared with prepandemic years). By 2020, HBHI countries accounted for 67% and 71% of malaria cases and deaths, respectively; they also accounted for 66% and 67% of increases in malaria cases and deaths between 2019 and 2020, respectively.





HBHI: high burden to high impact; WHO: World Health Organization.

[a] India's estimated deaths are calculated by applying case fatality rates to estimated cases. Death estimates for other countries are calculated using the malaria cause of death fraction for children aged under 5 years to which an over-5 adjustment is applied (**Annex 1**).

INVESTMENTS IN MALARIA PROGRAMMES AND RESEARCH

In 2015, WHO launched the GTS (*2*). The recently published GTS update (*5*) estimates the funding required to achieve key milestones for 2020, 2025 and 2030. To reach over 80% coverage of currently available interventions, investment in malaria (both international and domestic contributions) needs to increase substantially above the current annual spending of about US$ 3.0 billion. Total annual resources needed were estimated at US$ 6.8 billion in 2020, rising to US$ 9.3 billion per year by 2025 and US$ 10.3 billion per year by 2030 (*5*). Additionally, funding of US$ 8.5 billion is projected to be needed for research and development (R&D) during the period 2021–2030, representing an average annual investment of US$ 851 million (*5*).

This section on malaria financing has two main subsections: **Section 6.1** presents the most up-to-date funding trends for malaria control and elimination, by source and channel of funding, for the period 2000–2020 (where possible through available data), both globally and for major country groupings, and **Section 6.2** presents investments in malaria-related R&D for the period 2011–2020.

6.1 FUNDING TRENDS FOR MALARIA CONTROL AND ELIMINATION

For the 91 countries analysed, total funding for malaria control and elimination in 2020 was estimated at US$ 3.3 billion, a steady increase from the US$ 3.0 billion in 2019 and US$ 2.7 billion in 2018. The amount invested in 2020 continues to fall short of the US$ 6.8 billion estimated to be required globally to stay on track towards the GTS milestones (*2*). Moreover, the funding gap between the amount invested and the resources needed has continued to widen significantly, particularly in the past year, increasing from US$ 2.3 billion in 2018 to US$ 2.6 billion in 2019 and US$ 3.5 billion in 2020. The sources of funding for malaria control and elimination are summarized in **Table 6.1**.

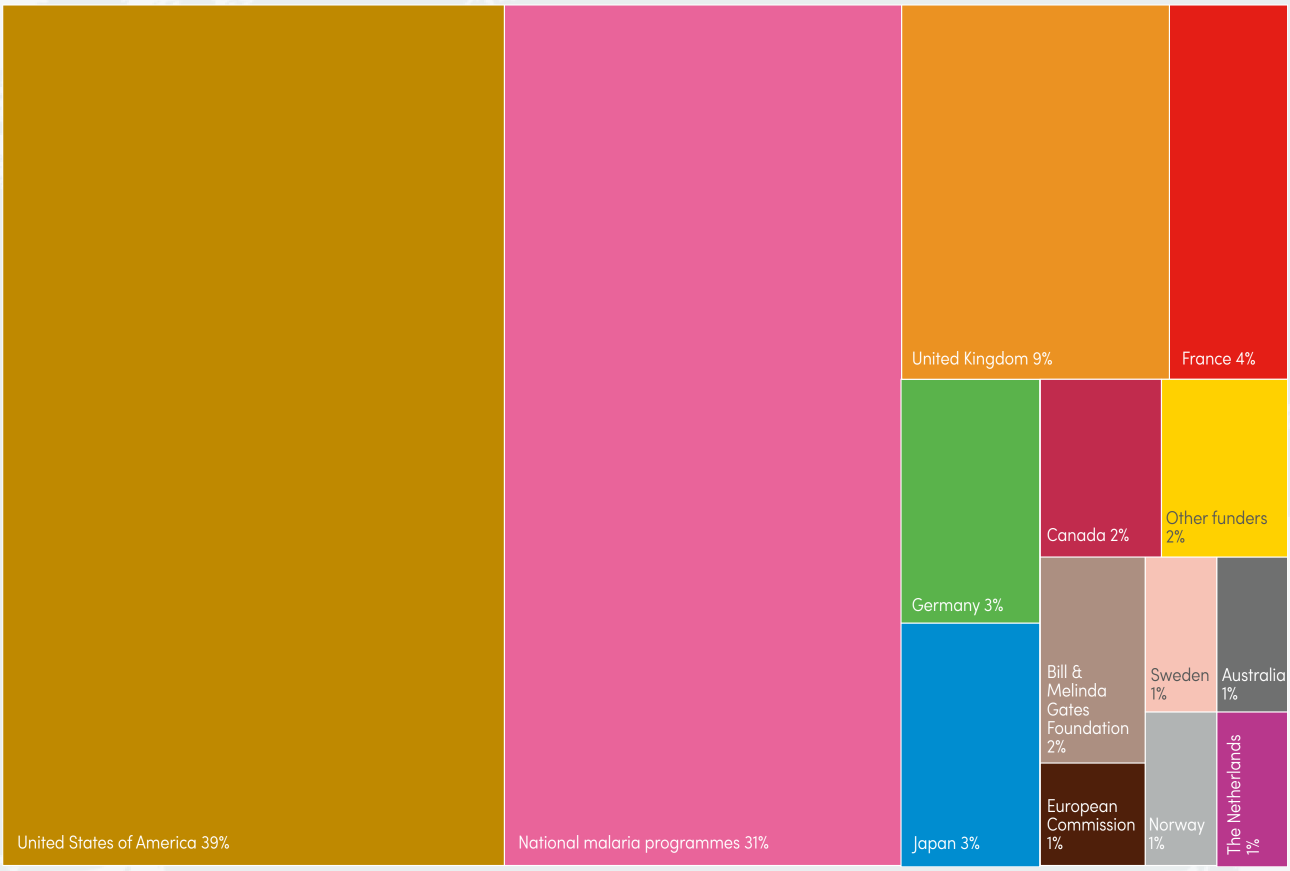
To assess the share of international funding by source of funds in the past decade, malaria-related annual funding through multilateral agencies was estimated from donors' contributions to the Global Fund for 2010–2020, and from contributions from the Organisation for Economic Co-operation and Development (OECD) for 2011–2019. Annual OECD funding for 2010 and 2020 was estimated using 2011 and 2019 reported data, respectively. In addition, contributions from malaria endemic countries to multilateral agencies were allocated to governments of endemic countries for the years 2010–2020. Over the past decade, the share of international funding (69%) and domestic funding (31%) was similar to that seen in 2020, with international funding corresponding to 68% of total funding and governments of malaria endemic countries contributing 32% of total funding (**Fig. 6.1**). The highest share of contributions over the past 10 years from international sources stemmed from the USA, the United Kingdom of Great Britain and Northern Ireland (United Kingdom), France, Germany and Japan, followed by other donors.

TABLE 6.1.
Sources of funding for malaria control and elimination

International funding		Domestic funding
Multilateral agencies	**Bilateral data**	
Donor contributions to the Global Fund 2010–2020 Global Fund annual disbursements 2003–2020	United Kingdom final aid spend 2017–2020	NMP reported domestic budget (or expenditures when available, or estimates), 2000–2020
OECD members' total use of the multilateral system, gross disbursements 2011–2019 (estimates for 2010 and 2020)	USAID country specific and agency funded data	Patient care delivery estimates, 2010–2020
	OECD disbursement data ■ United Kingdom 2007–2016 ■ Other donors 2002–2019 (estimates for 2020)	

Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; OECD: Organisation for Economic Co-operation and Development; United Kingdom: United Kingdom of Great Britain and Northern Ireland; USAID: United States Agency for International Development.

FIG. 6.1.
Funding for malaria control and elimination, 2010–2020 (% of total funding), by source of funds (constant 2020 US$) *Sources: ForeignAssistance.gov, Global Fund, NMP reports, OECD creditor reporting system database, United Kingdom Department for International Development, WHO estimates and World Bank DataBank.*



Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; OECD: Organisation for Economic Co-operation and Development; United Kingdom: United Kingdom of Great Britain and Northern Ireland; WHO: World Health Organization.

Fig. 6.2 shows the breakdown of total funding for each donor per year from 2010 through 2020. Most of the US$ 3.3 billion invested in 2020 (>US$ 2.2 billion) came from international funders. The highest contribution was from the government of the USA, which provided a total of more than US$ 1.3 billion through planned bilateral funding and a malaria-adjusted share of multilateral contributions agencies. This was followed by bilateral and multilateral disbursements of about US$ 0.2 billion each from Germany and the United Kingdom, contributions of about US$ 0.1 billion each from France and Japan, and a combined US$ 0.3 billion from other countries that are members of the Development Assistance Committee and from private sector contributors. Governments of malaria endemic countries contributed almost a third of total funding in 2020, with investments nearing US$ 1.1 billion, of which an estimated US$ 0.3 billion was spent on malaria case management in the public sector and over US$ 0.7 billion on other malaria control activities.

To analyse malaria investment since 2000, international bilateral funding data were obtained from several sources, although the availability of historical data varied, depending on the donor. From the USA, data on total annual planned funding from the Centers for Disease Control and Prevention (CDC), Department of Defense and United States Agency for International Development (USAID) are available from 2001 to 2020; planned country-level USAID data are available starting in 2006.

Data on annual disbursements by the Global Fund to malaria endemic countries are available from 2003 to 2020. For the government of the United Kingdom, disbursement data were obtained through the OECD creditor reporting system on aid activity from 2007 to 2016; however, from 2017 to 2020, disbursement data were sourced from *Statistics on international development: final UK aid spend 2020* (*55*). Thus, overall funding reported in this section for the United Kingdom has declined since 2017, because the estimates based on the "final UK aid spend" do not capture all the spending that may affect malaria outcomes. The United Kingdom supports malaria control and elimination through a broad range of interventions (e.g. via support to overall health systems in malaria endemic countries and R&D contributions to the Global Fund), which are not included in this estimate.

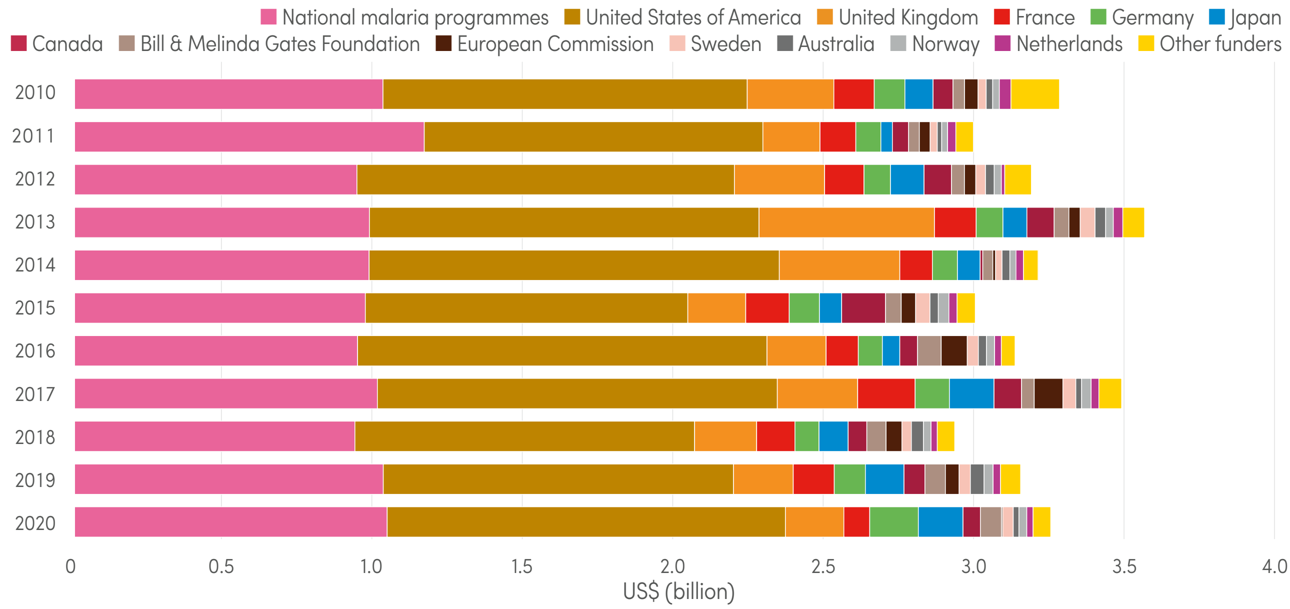
For all other donors, disbursement data were also obtained from the OECD creditor reporting system database for the period 2002–2019, with 2020 estimates being derived from 2019 figures. For all international bilateral funding data, the country recipient has been labelled as "unspecified" for all years where country-specific data are not available. For years where no data are available for a particular funder, no imputation was conducted; hence, the trends presented in **Fig. 6.3** to **Fig. 6.6** should be interpreted carefully, particularly for the years preceding 2010.

Contributions from governments of endemic countries were estimated as the sum of contributions reported by NMPs for the relevant year plus the estimated costs of patient care delivery services at public health facilities. From 2000 to 2020, where available, government expenditures were used for their contributions (if unavailable, then government budgets or estimates were used). Patient care delivery costs were derived using unit cost estimates from WHO-CHOosing Interventions that are Cost-Effective (WHO-CHOICE) (*56*). Where possible, patient care delivery costs per country were included for the years 2010 to 2020, because no unit cost estimates are available for the years before 2010.

Of the US$ 3.3 billion invested in 2020, almost US$ 1.1 billion (32%) was contributed from governments of endemic countries, similar to the US$ 1.0 billion invested in 2019 (**Fig. 6.3**). Of the total investments, nearly US$ 1.4 billion (42%) was channelled through the Global Fund. Compared with 2019, the Global Fund's disbursements to malaria endemic countries increased by about US$ 0.2 billion in 2020. Of the US$ 200 million increase, US$ 50 million is due to the Global Fund's sixth replenishment (*57*) and increased disbursements owing to a scale-up of support for SMC and an increase in the number of countries with ITN campaigns as compared with 2019 (which is cyclical). Planned bilateral funding from the government of the USA amounted to US$ 0.7 billion in 2020, similar to the US$ 0.8 billion per year from 2017 to 2019. In 2020, the United Kingdom remained the second largest bilateral funder (nearing US$ 0.1 billion), alongside the World Bank and other Development Assistance Committee members (**Fig. 6.3**).

FIG. 6.2.

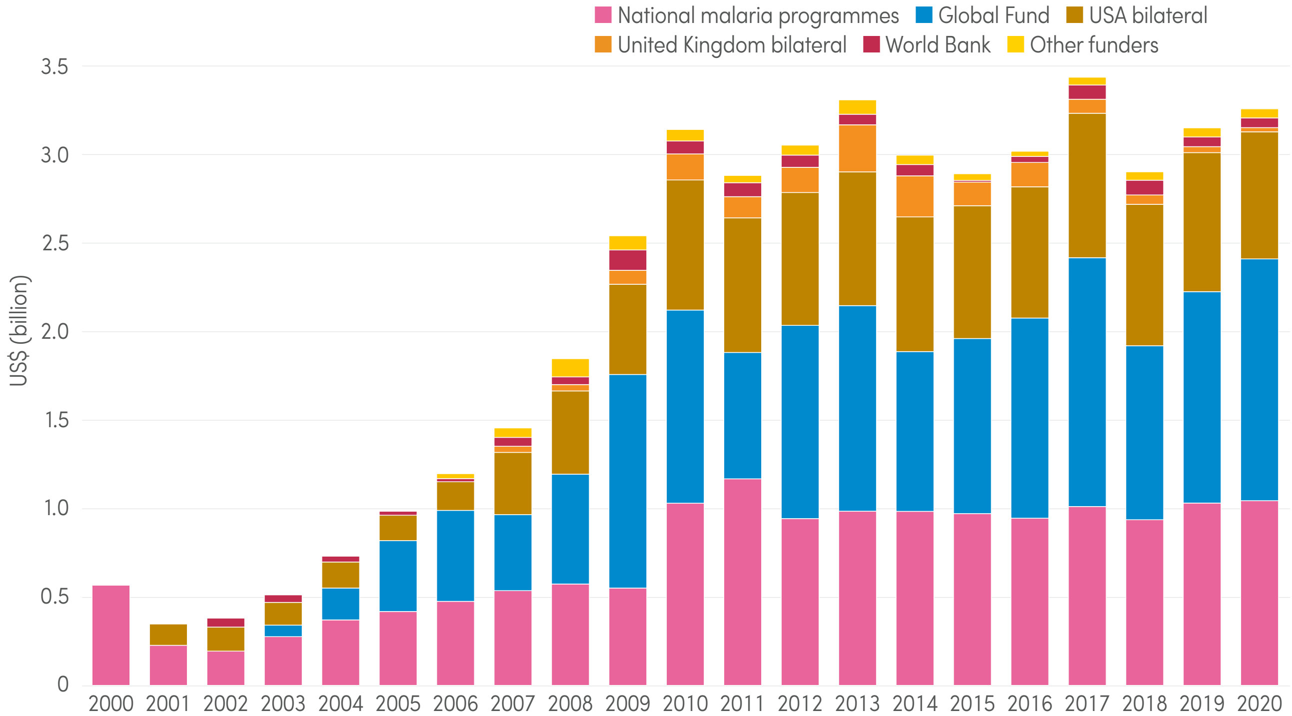
Funding for malaria control and elimination, 2010–2020, by source of funds (constant 2020 US$) *Sources: ForeignAssistance.gov, United Kingdom Department for International Development, Global Fund, NMP reports, OECD creditor reporting system database, the World Bank Data Bank and WHO estimates.*



Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; OECD: Organisation for Economic Co-operation and Development; United Kingdom: United Kingdom of Great Britain and Northern Ireland; WHO: World Health Organization.

FIG. 6.3.

Funding for malaria control and elimination, 2000–2020, by channel (constant 2020 US$) *Sources: ForeignAssistance.gov, Global Fund, NMP reports, OECD creditor reporting system database, United Kingdom Department for International Development, WHO estimates and World Bank DataBank.*

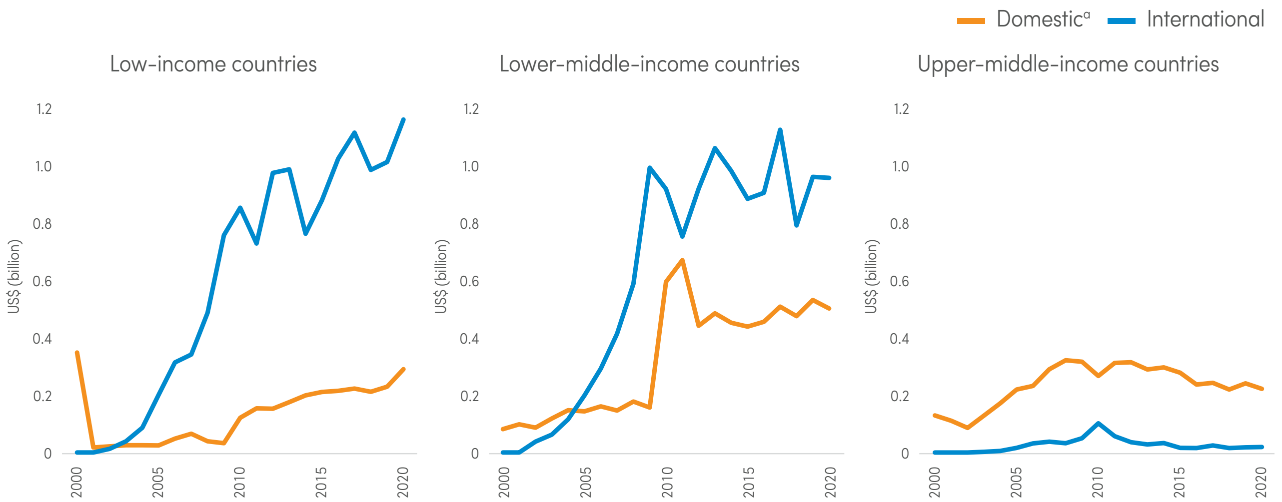


Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; OECD: Organisation for Economic Co-operation and Development; United Kingdom: United Kingdom of Great Britain and Northern Ireland; USA: United States of America; WHO: World Health Organization.

Fig. 6.4 shows the substantial variation across country income groups (as defined by the World Bank classifications published in July 2021) (*58*) in the share of funding received from domestic and international sources. The low-income group, comprising 26 countries and representing over 90% of global malaria cases and deaths, accounted for 44% of total malaria funding in 2020, experiencing an increasing trend in overall funding since 2000, and an increase from the 41% share of total funding in 2019. In this low-income group, 80% of the funding stemmed from international sources and 20% from domestic sources. The lower-middle-income group, comprising 41 countries, accounted for 45% of total funding in 2020, with international and domestic sources accounting for 66% and 34% of funding, respectively. In contrast, the upper-middle-income group, comprising 19 countries and accounting for 7% of total funding in 2020, received 8% of their malaria funding from international sources and 92% from domestic public funding. Finally, the two high-income countries accounted for 1% of total malaria funding, with 100% of the funding from domestic sources. Malaria funding to regions with no geographical information on recipients and one country that was not classified into an income group this year represent the remaining 3% of malaria funding in 2020.

FIG. 6.4.

Funding for malaria control and elimination, 2000–2020, by World Bank 2020 income group and source of funding (constant 2020 US$) *Sources: ForeignAssistance.gov, Global Fund, NMP reports, OECD creditor reporting system database, United Kingdom Department for International Development, WHO estimates and World Bank DataBank.*

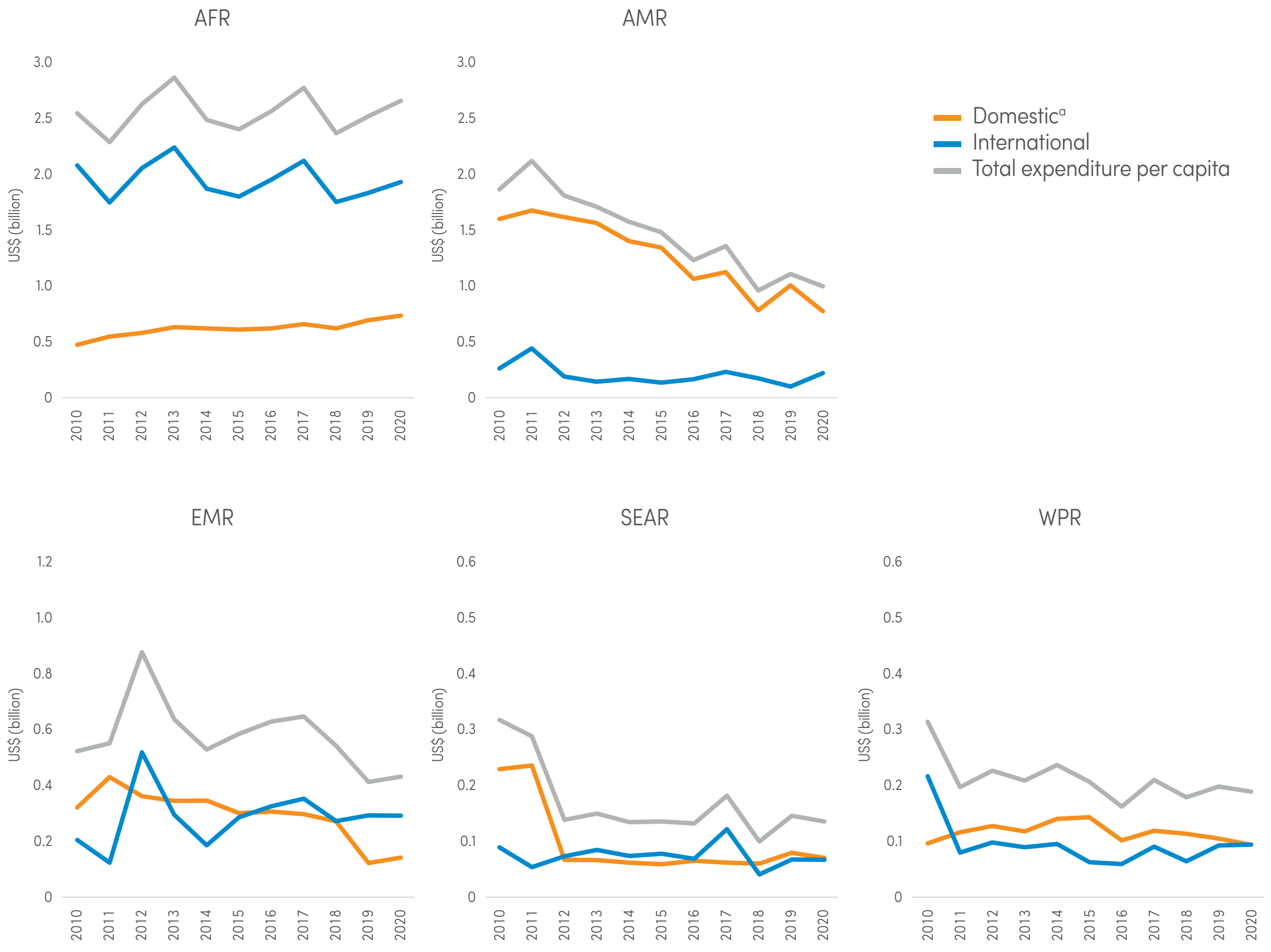


Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; OECD: Organisation for Economic Co-operation and Development; United Kingdom: United Kingdom of Great Britain and Northern Ireland; WHO: World Health Organization.
[a] Excludes out-of-pocket spending by households.

The assessment of funding for malaria control and elimination per capita by domestic and international sources highlights the variation in funding per person at risk, on average, within each WHO region (**Fig. 6.5**). The WHO African Region has the highest funding per person at risk; international expenditure per capita has reached US$ 2 and domestic expenditure per capita nearly US$ 1, with domestic funding having increased by 56% in the past decade. From 2010 through 2020, funding per person at risk within the WHO Region of the Americas and South-East Asia Region has nearly halved for both domestic and international sources. In the WHO South-East Asia Region and Western Pacific Region, funding per person at risk from domestic and international sources has converged in recent years, with total funding per person at risk remaining relatively stable in the Western Pacific Region since 2011. The WHO Eastern Mediterranean Region has experienced variations in funding per person at risk by domestic and international sources, with international funding outweighing domestic funding in 2020. Most of the regions have shown volatility in overall funding over the past decade and experienced lower total funding per person at risk in 2020 than in 2010.

FIG. 6.5.

Funding for malaria control and elimination per person at risk, 2010–2020, by WHO region (constant 2020 US$) *Sources: ForeignAssistance.gov, United Kingdom Department for International Development, Global Fund, NMP reports, OECD creditor reporting system database, World Bank Data Bank and WHO estimates.*



AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; OECD: Organisation for Economic Co-operation and Development; SEAR: WHO South-East Asia Region; United Kingdom: United Kingdom of Great Britain and Northern Ireland; WHO: World Health Organization; WPR: Western Pacific Region.

[a] Excludes out-of-pocket spending by households.

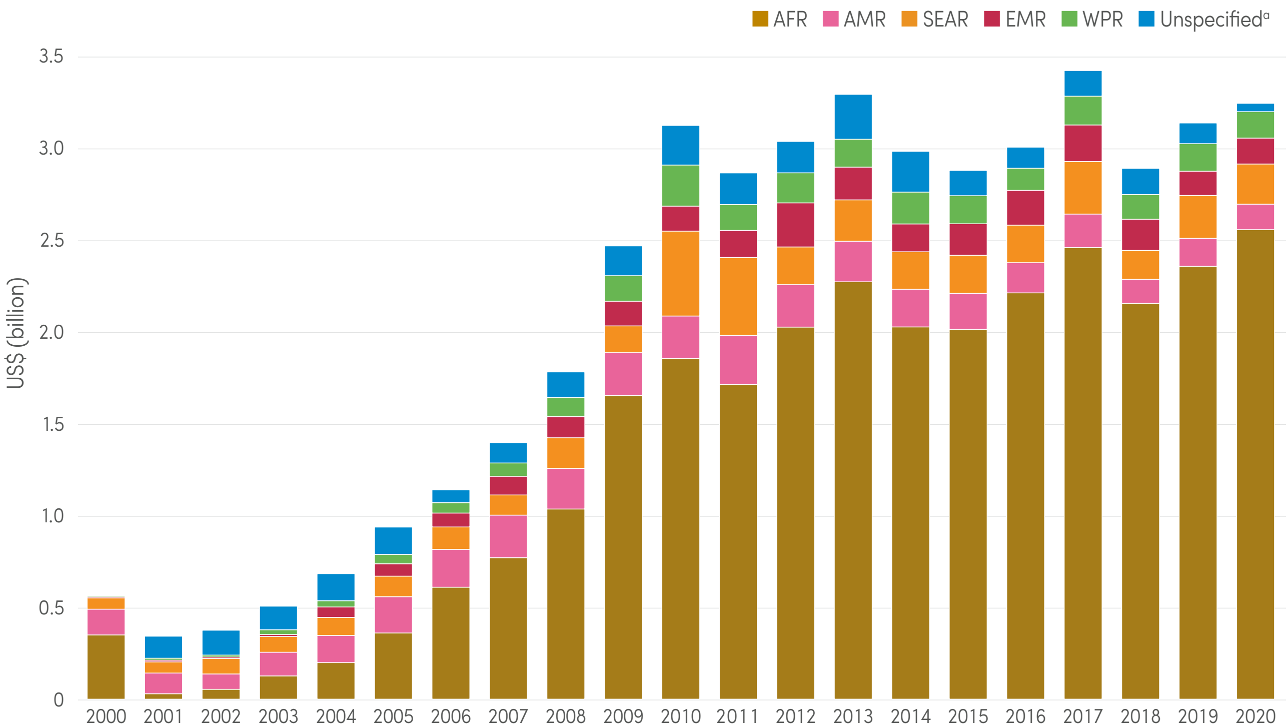
In the assessment of funding for malaria control and elimination by WHO region, more than three quarters (79%) of the US$ 3.3 billion invested in 2020 benefited the WHO African Region. Of the remaining funding, 7% went to the WHO South-East Asia Region, and 4% each to the Eastern Mediterranean Region, the Western Pacific Region and the Region of the Americas. For almost 2% of the total funding in 2020, no geographical information on recipients was available (**Fig. 6.6**).

In 2020, numerous countries experienced shocks in their real gross domestic product (GDP), reflecting the effects of COVID-19 on a country's overall economic activity. The United Nations (UN) predicted that the global economy could shrink by about 0.9% because of the pandemic (*59*). Among the 61 malaria endemic countries categorized as LMIC, 43 experienced a shock in their annual real GDP in 2020, of which 34 shrunk by more than 1%, with half of these 34 coming from the WHO African Region (as defined in the International Monetary Fund data mapper on real GDP annual growth percentage change in October 2021) (*60*) (**Fig. 6.7**).

The initial conditions across malaria endemic countries played an important role in this shock (e.g. the underlying age of the population, individuals' health and access to care). Across these countries, the comparison of 2020 with prepandemic levels of 2019 ranged from an increase of 7.1% in Guinea to a decrease of 14.8% in Cabo Verde. Despite the increase in malaria funding reported in 2020, the actual impact of COVID-19 and the associated economic crisis on international and domestic funding for malaria is not clear. GDP changes could affect future funding, adding new challenges to malaria control. It is expected that the deepest recessions were experienced in 2020; however, the severity of the economic impact will largely depend on the duration of the restrictions put in place by countries and the fiscal response and monetary interventions from governments.

FIG. 6.6.

Funding for malaria control and elimination, 2000–2020, by WHO region (constant 2020 US$) *Sources: ForeignAssistance.gov, United Kingdom Department for International Development, Global Fund, NMP reports, OECD creditor reporting system database, World Bank Data Bank and WHO estimates.*

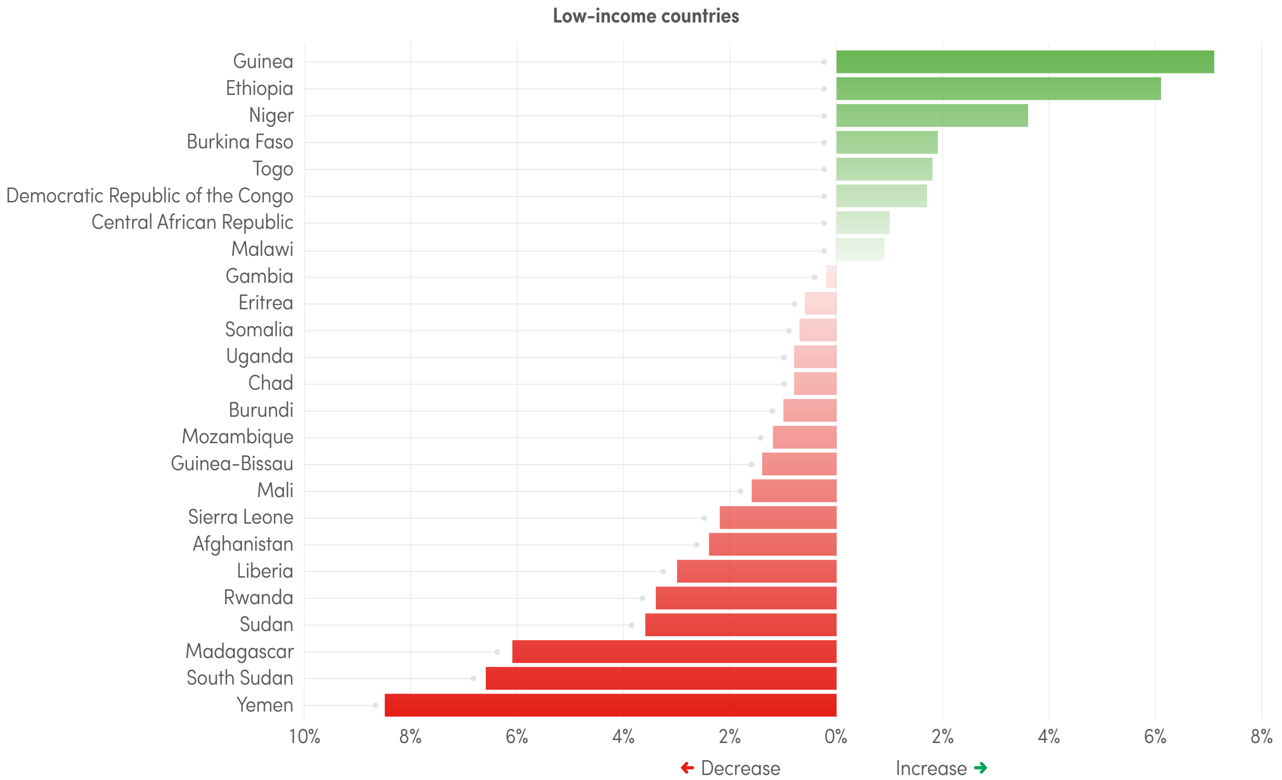


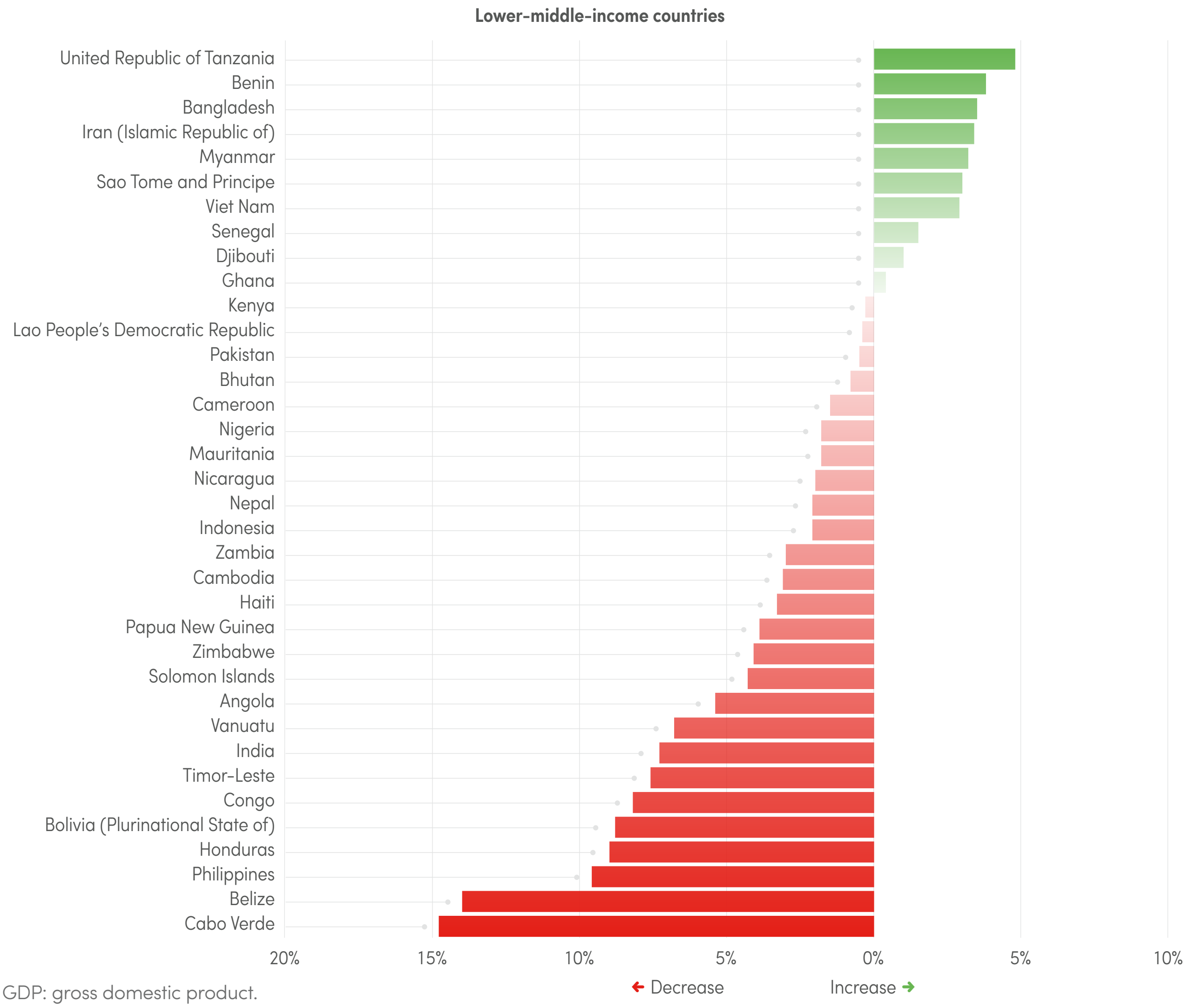
AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; OECD: Organisation for Economic Co-operation and Development; SEAR: WHO South-East Asia Region; United Kingdom: United Kingdom of Great Britain and Northern Ireland; WHO: World Health Organization; WPR: Western Pacific Region.

[a] "Unspecified" refers to funding flows, with no information on the geographical localization of their recipients.

FIG. 6.7.

Real GDP annual growth percentage change, 2020, by World Bank income classification (constant 2020 US$) *Source: International Monetary Fund data mapper (60) and World Bank Data Bank.*





GDP: gross domestic product.

6.2 INVESTMENTS IN MALARIA-RELATED R&D

6.2.1 Overarching trends

Total funding in malaria R&D in 2020 was US$ 619 million, falling short of the estimated US$ 851 million projected to be required to stay on track towards the GTS milestones (*2*). This was a small decrease compared with 2019 (US$ -15 million, -2.3%); however, it was also the second year in a row that funding declined overall, compared with 3 consecutive years of growth between 2016 and 2018 when malaria R&D reached its highest ever recorded funding levels. As with all other years since the start of G-FINDER, investment in R&D in 2020 specifically targeting *P. vivax* (US$ 51 million) was orders of magnitude smaller than investment in *P. falciparum* (US$ 241 million) or other malaria strains (US$ 326 million) (*61*).

In 2020, over a third of R&D funding went to drugs (US$ 226 million, 37%), followed by US$ 176 million to basic research (28%), and about a fifth (US$ 118 million, 19%) to vaccine R&D. A further 10% went to vector control products (VCPs) (US$ 65 million), but all other products – including diagnostics (US$ 17 million, 2.7%), biologicals (US$ 5.3 million, 0.9%) and unspecified products (US$ 12 million, 2.0%) – saw investments under US$ 20 million each. This pattern of product funding was broadly the same in 2019, with marginal changes in investment levels across the top two products: drugs (down US$ 3.7 million, a decrease of 1.6%) and basic research (up US$ 6.7 million, an increase of 3.9%) (**Fig. 6.8**).

6.2.2 Funding flows

The 2020 drop in overall funding had the most significant impact on vaccine R&D, where investment dropped by US$ 21 million (-15%). Vaccine funding has been trending downwards since a peak in 2017, making this its third consecutive year of decline, and taking it to its lowest level since 2010. In fact, nearly every single funder of malaria vaccine R&D in 2019 (87%, 20 out of 23) dropped their investment in 2020. Notably, funding from the five top funders of malaria vaccine R&D in 2019 – US National Institutes of Health (NIH), aggregate industry, the Bill & Melinda Gates Foundation, US Department of Defense and USAID – not only fell in 2020 but also had gradually decreased nearly every year for the past 3 years.

Vaccine funding decline is not equal across R&D stages. Although 2020 saw an ongoing investment decrease in vaccine clinical development – which also fell for the third year running – funding of early-stage malaria vaccine research continued to grow. This is consistent with a malaria vaccine landscape in transition, reflecting the progression of RTS,S and the search for next generation vaccines, as well as the challenges for clinical research posed by COVID-19.

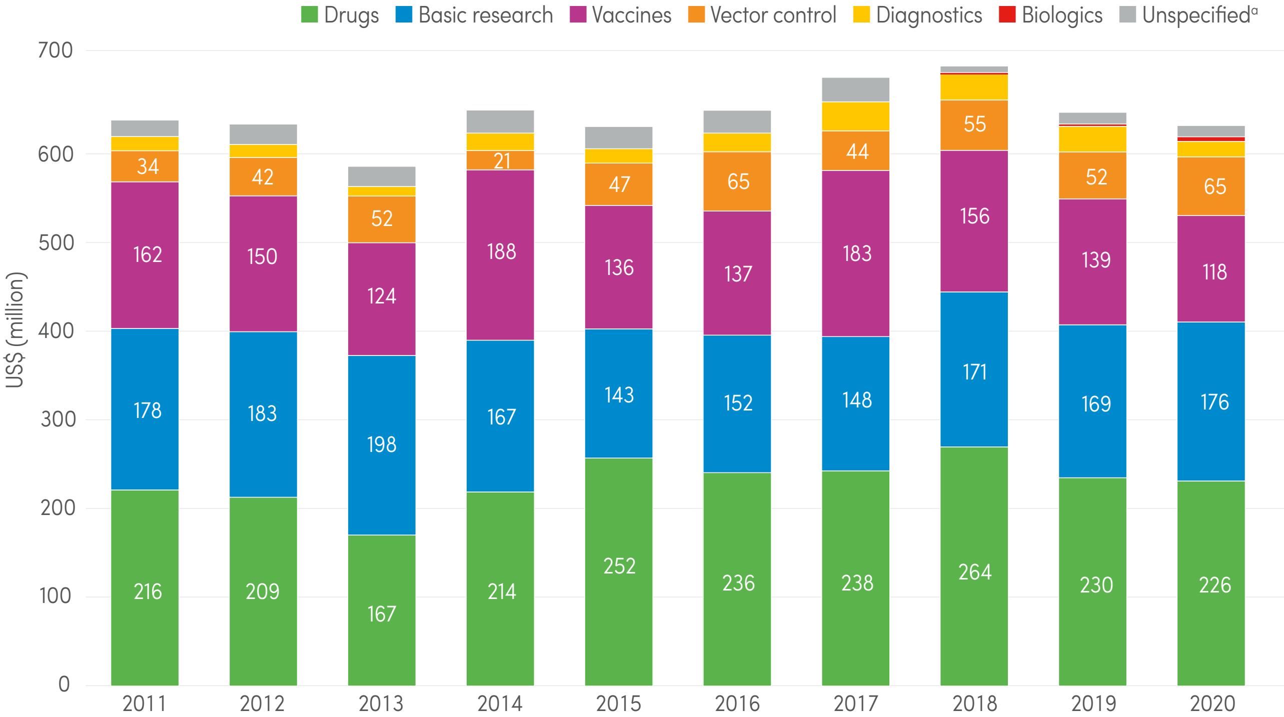
In 2020, diagnostic R&D funding decreased by 40% (down US$ 11 million and reaching just US$ 17 million) after a 3-year period over which it averaged nearly US$ 30 million per year, more than double its US$ 13 million annual average over the first 10 years of the G-FINDER survey. The same three funding organizations were responsible for both the 3 years of high funding and the funding decline in 2020: diagnostics funding from the US NIH fell by US$ 2.3 million (–28%) from its 2019 peak, the Bill & Melinda Gates Foundation reduced its funding by US$ 4.4 million (–59%), and funding from the United Kingdom Department of Health and Social Care, which began a new funding stream for malaria diagnostics in 2017, fell by US$ 3.3 million (–49%).

In contrast, funding for VCPs jumped in 2020 to a total of US$ 65 million, an increase of US$ 13 million compared with 2019 (up 25%). This increase is despite a major industry funder not participating in the 2020 survey. Adjusting for participation (and comparing only those that are considered ongoing participants), the increase in VCP funding is therefore even greater (up US$ 16 million, an increase of 33% on 2019). This spike in VCP investment brought it to a level just shy of its 2016 peak, and nearly twice its average over the first 10 years of the G-FINDER report. This year's increase also led to VCPs' record share of malaria funding, resulting from a sizeable increase in funding from the Bill & Melinda Gates Foundation between 2019 and 2020 (up US$ 17 million, an increase of 70%) – which represented 65% of all VCP funding in 2020.

With respect to the largest funders of malaria R&D, the top three – US NIH, the Bill & Melinda Gates Foundation and industry – have remained steady, again making up over two thirds of investment in all malaria R&D in 2020 (US$ 422 million, 68%), as they did in 2019 (US$ 419 million, 66%), and retaining their top funder positions as they have since 2007 (**Fig. 6.9**). This funder dynamic is also reflected in the distribution of funding by sector, which is dominated by the high-income countries, public sector (US$ 320 million, 52%), philanthropic (US$ 159 million, 26%), and multinational corporation (MNC) investment (US$ 110 million, 18%). This order has also remained consistent for the past decade, with the notable exception of 2018 when MNC funding surpassed philanthropic investment for the first (and only) time.

FIG. 6.8.

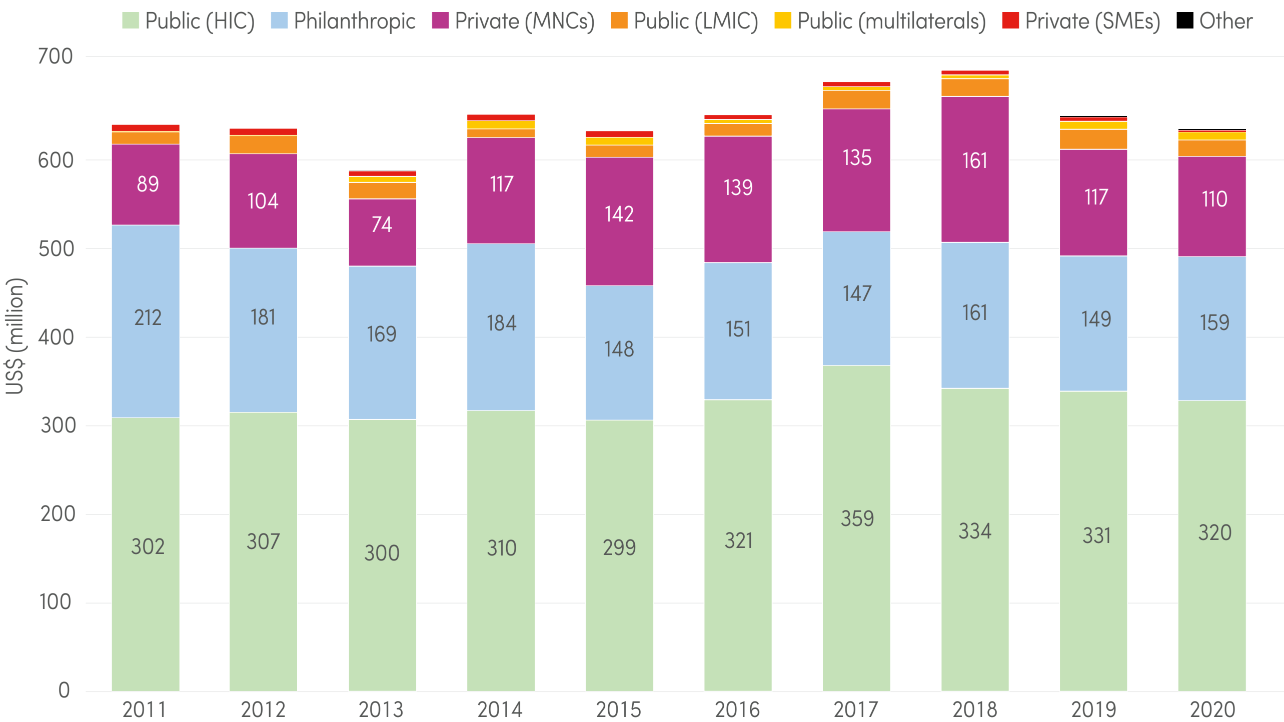
Funding for malaria-related R&D, 2011–2020, by product type (constant 2020 US$) *Sources: Policy Cures Research G-FINDER data portal (61).*



R&D: research and development.
[a] "Unspecified" refers to funding flows, with no information on the product type.

FIG. 6.9.

Funding for malaria-related R&D, 2011–2020, by sector (constant 2020 US$) *Sources: Policy Cures Research, G-FINDER data portal (61).*



HIC: high-income countries; LMIC: low- and middle-income countries; MNC: multinational corporation; R&D: research and development; SME: small and medium enterprise.
[a] "Unspecified" refers to funding flows, with no information on the product type.

7 DISTRIBUTION AND COVERAGE OF MALARIA PREVENTION, DIAGNOSIS AND TREATMENT

7.1 DISTRIBUTION AND COVERAGE OF ITNs

Manufacturers delivered about 229 million ITNs to malaria endemic countries in 2020, 24 million fewer than in 2019 (**Fig. 7.1**). Of these, 19.4% were pyrethroid–piperonyl butoxide (PBO) nets (12.4% more than in 2019) and 5.2% were dual active ingredient ITNs (3.6% more than in 2019). About 91% of all ITNs delivered by manufacturers went to countries in sub-Saharan Africa. About 64% of the ITNs were received in the Democratic Republic of the Congo (33.4 million), Uganda (22.8 million), Nigeria (21.7 million), Côte d'Ivoire (19.8 million), the United Republic of Tanzania (13.1 million), Ghana (12.2 million) and Mozambique (11.4 million). Although data from 2010–2020 are presented here, manufacturers' delivery data show that between 2004 and 2020, more than 2.3 billion ITNs were supplied globally, of which 2 billion (86%) were supplied to sub-Saharan Africa.

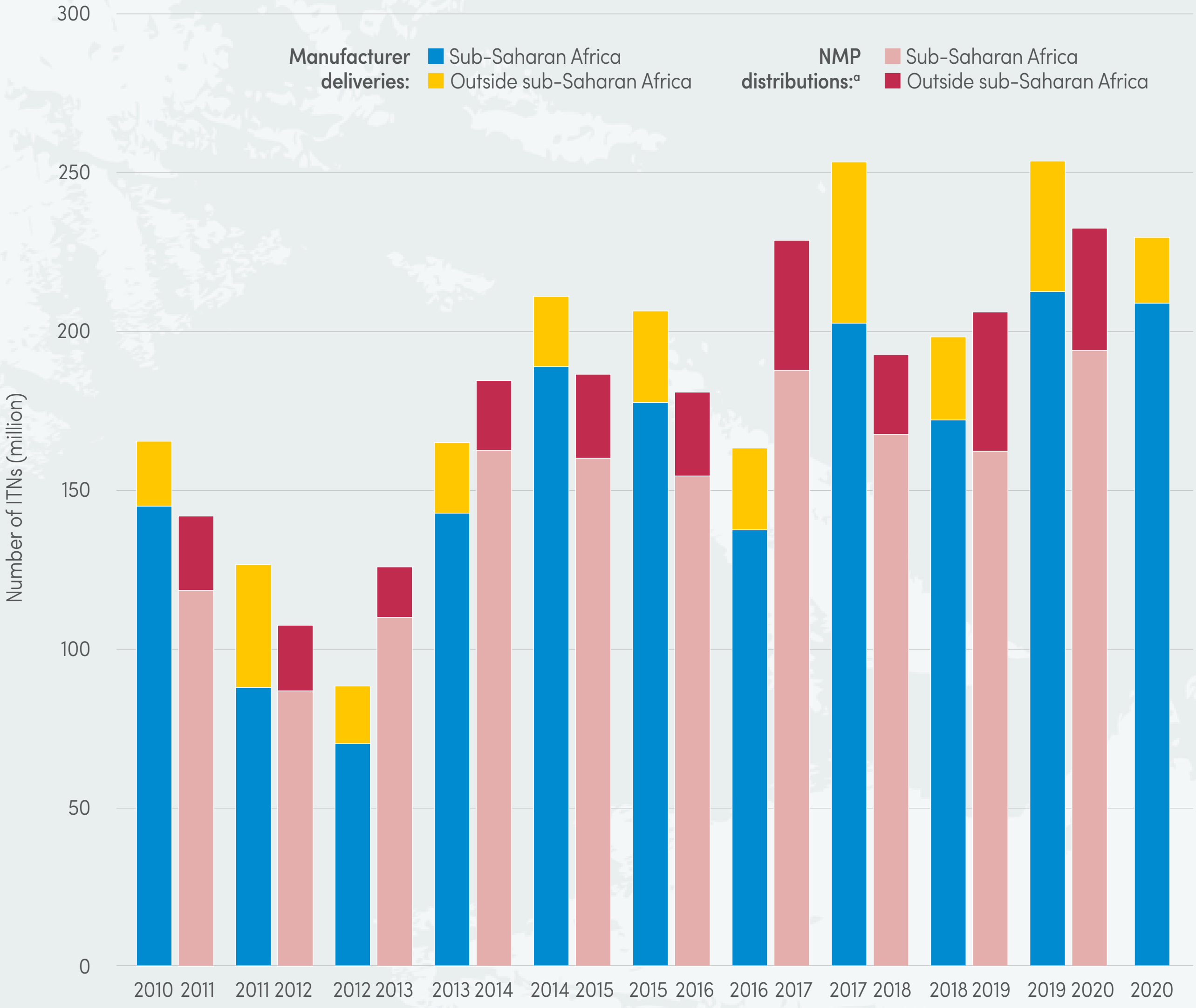
In 2020, 233 million ITNs were distributed globally by NMPs in malaria endemic countries. Of these ITNs, 194 million were distributed in sub-Saharan Africa, with a total of about 110 million ITNs distributed in five countries: Uganda (26 million), Nigeria (25 million), the Democratic Republic of the Congo (21 million), the United Republic of Tanzania (20 million) and Mozambique (18 million). Outside sub-Saharan Africa, the largest distribution was in India (25 million).

Indicators of population-level coverage of ITNs were estimated for sub-Saharan African countries in which ITNs are the main method of vector control. Household surveys were used, together with manufacturer deliveries and NMP distributions, to estimate the following main indicators:

- ITN use (i.e. percentage of a given population group that slept under an ITN the night before the survey);
- ITN ownership (i.e. percentage of households that owned at least one ITN);
- percentage of households with at least one ITN for every two people; and
- percentage of the population with access to an ITN within their household (i.e. percentage of the population that could be protected by an ITN, if each ITN in a household could be used by two people).

FIG. 7.1.

Number of ITNs delivered by manufacturers and distributed by NMPs, 2010–2020 *Sources: Milliner Global Associates and NMP reports.*



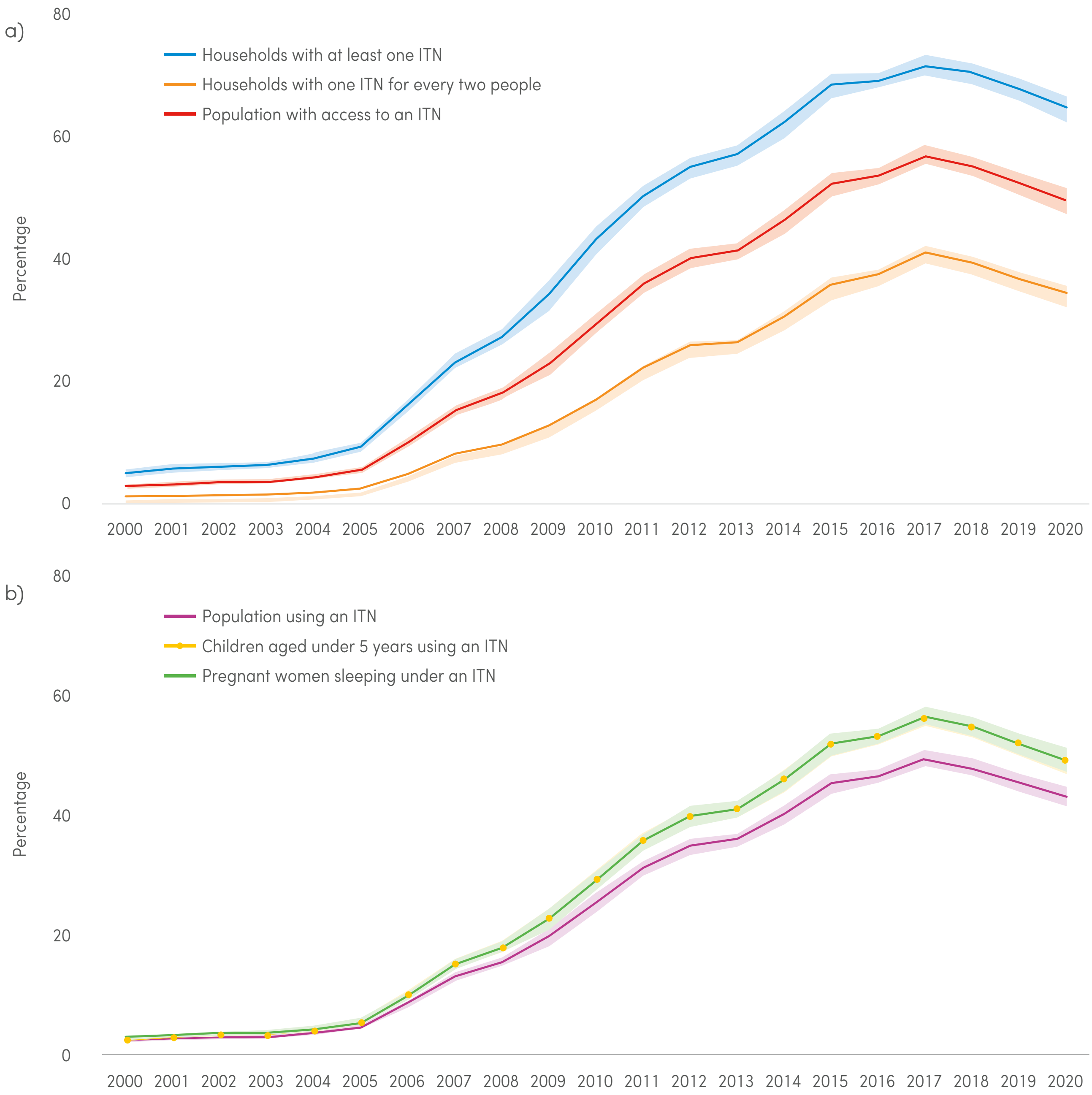
ITN: insecticide-treated mosquito net; NMP: national malaria programme.

[a] A lag between manufacturer deliveries to countries and NMP distributions of about 6–12 months is expected; thus, deliveries by manufacturers in a given year are often not reflected in distributions by NMPs in that year. Also, distributions of ITNs reported by NMPs do not always reflect all the nets that have been distributed to communities, depending on completeness of reporting. These issues should be considered when interpreting the relationship between manufacturer deliveries, NMP distributions and likely population coverage. Additional considerations include nets that are in storage in-country but have not yet been distributed by NMPs, and those sold through the private sector that are not reported by programmes.

By 2020, 65% of households in sub-Saharan Africa had at least one ITN, increasing from about 5% in 2000. The percentage of households owning at least one ITN for every two people increased from 1% in 2000 to 34% in 2020. In the same period, the percentage of the population with access to an ITN within their household increased from 3% to 50%. The percentage of the population sleeping under an ITN also increased considerably between 2000 and 2020 for the whole population (from 2% to 43%), for children aged under 5 years (from 3% to 49%) and for pregnant women (from 3% to 49%). Since 2017, overall access to and use of ITNs has continued to decline in sub-Saharan Africa (**Fig. 7.2**). Survey results on key ITN coverage indicators, by country, are shown in **Annex 5-Ea**.

FIG. 7.2.

a) Indicators of population-level access to ITNs, sub-Saharan Africa, 2000–2020 and b) indicators of population-level use of ITNs, sub-Saharan Africa, 2000–2020 *Sources: ITN coverage model by Malaria Atlas Project (62).*



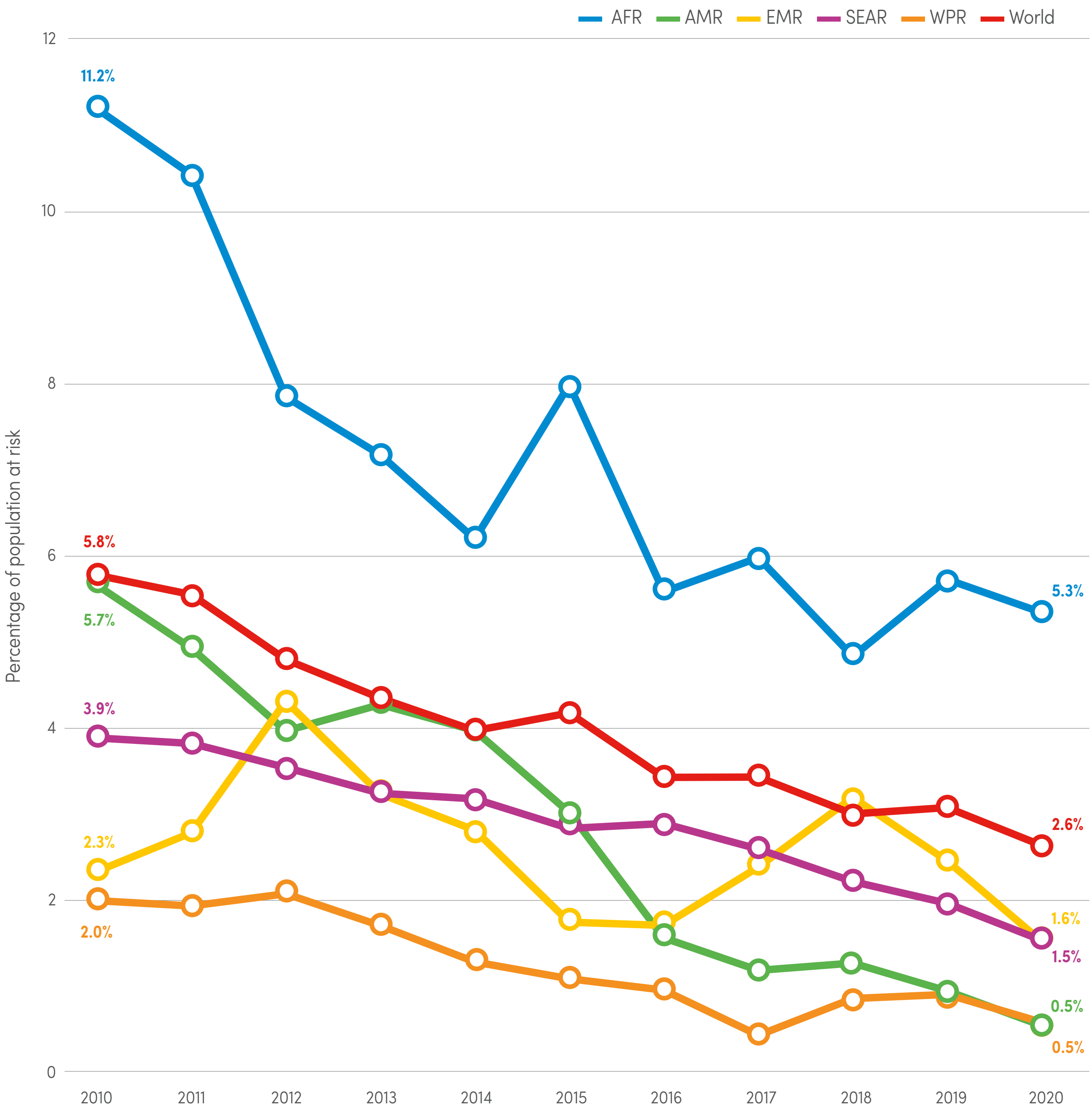
ITN: insecticide-treated mosquito net.

7.2 POPULATION PROTECTED WITH IRS

Globally, the percentage of the population at risk protected by IRS in countries that are currently malaria endemic declined from 5.8% in 2010 to 2.6% in 2020. The percentage of the population at risk protected by IRS has remained stable since 2016, but with less than 6% of the population protected in each WHO region (**Fig. 7.3**). The number of people protected by IRS globally fell from 161 million in 2010 to 127 million in 2015, and further declined to 87 million in 2020. In Ethiopia, India, Pakistan and Yemen, the number of people protected by IRS in 2020 was more than 1 million fewer than in 2019.

FIG. 7.3.

Percentage of the population at risk protected by IRS, by WHO region, 2010–2020[a] *Source: IVCC data and NMP reports.*



AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; IRS: indoor residual spraying; IVCC: Innovative Vector Control Consortium; NMP: national malaria programme; SEAR: WHO South-East Asia Region; WHO: World Health Organization; WPR: Western Pacific Region.

[a] Among malaria endemic countries, 2020.

7.3 SCALE-UP OF SMC

SMC has been implemented in 13 countries in the Sahel. The number of children reached with at least one dose of SMC has increased steadily from nearly 0.2 million in 2012 to about 33.5 million in 2020 (**Table 7.1**). Subnational areas in each country where SMC was delivered in 2020 are shown in **Fig. 7.4**. Of the additional 11.8 million children treated in 2020 compared with 2019, 78% were in Nigeria and 7% each

TABLE 7.1.

Number of children treated with at least one dose of SMC, by year, in countries implementing SMC, 2012–2020 *Sources: LSHTM and MMV.*

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020
Benin	0	0	0	0	0	0	0	114 165	214 123
Burkina Faso	0	0	307 770	860 058	2 648 083	2 949 901	3 298 397	3 298 397	4 136 042
Cameroon	0	0	0	0	1 070 865	1 581 183	1 636 658	1 681 737	1 780 742
Chad	10 000	263 972	27 307	322 493	824 806	899 320	1 184 706	1 491 905	2 259 851
Gambia	0	0	48 953	76 450	73 710	76 726	101 511	110 870	121 834
Ghana	0	0	0	115 309	151 510	327 446	329 953	964 956	1 033 812
Guinea	0	0	0	201 283	442 177	575 927	840 120	750 903	1 088 194
Guinea-Bissau[a]	0	0	0	0	36 681	166 162	90 998	86 107	86 107
Mali	160 000	537 294	699 880	1 999 987	3 849 672	3 990 096	4 278 401	3 767 205	3 739 238
Niger	0	225 970	518 110	646 173	1 994 345	2 545 885	3 810 884	4 151 103	4 516 729
Nigeria	0	209 451	370 280	787 399	1 579 229	2 284 915	3 460 733	4 110 152	13 359 530
Senegal	0	55 709	595 745	614 447	621 929	631 921	0	879 220	687 635
Togo	0	119 222	127 624	184 771	411 811	382 319	434 161	296 332	486 716
Total	**170 000**	**1 411 618**	**2 695 668**	**5 808 370**	**13 704 816**	**16 411 801**	**19 466 522**	**21 703 052**	**33 510 553**

LSHTM: London School of Hygiene & Tropical Medicine; MMV: Medicines for Malaria Venture; SMC: seasonal malaria chemoprevention.
[a] Values for 2020 were imputed from 2019.

TABLE 7.2.

Number of children targeted and treated, and total treatment doses targeted and delivered, in countries implementing SMC in 2020 *Sources: LSHTM and MMV.*

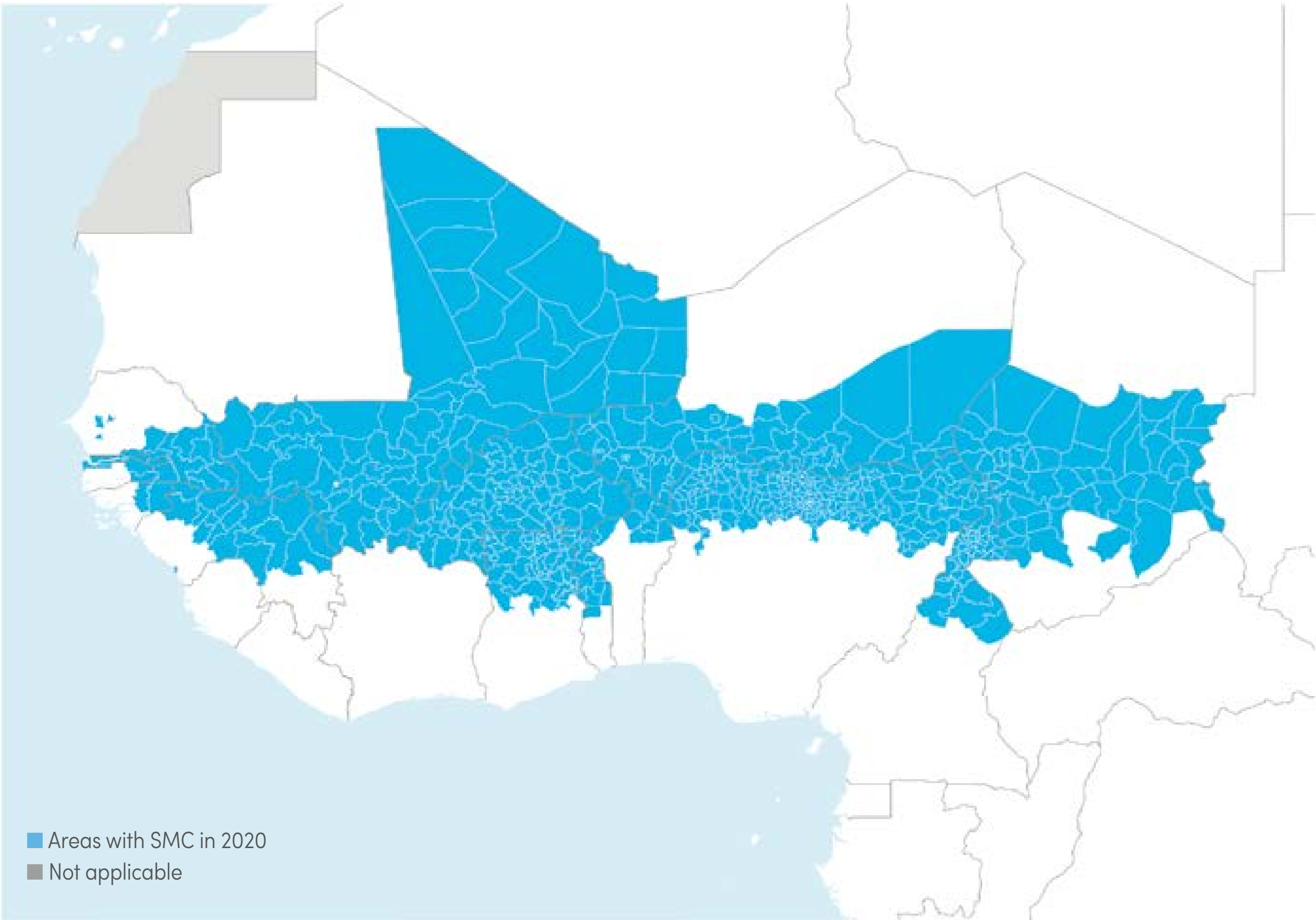
Country	Number of children targeted	Number of children treated	Total treatments targeted	Total treatments delivered
Benin	274 008	214 123	1 096 032	856 492
Burkina Faso	4 005 603	4 136 042	16 022 412	16 544 168
Cameroon	1 897 942	1 780 742	7 591 768	7 122 968
Chad	2 121 942	2 259 851	8 487 768	9 039 404
Gambia	210 950	121 834	843 800	487 336
Ghana	1 078 635	1 033 812	4 314 540	4 135 248
Guinea	1 077 467	1 088 194	4 309 868	4 352 776
Guinea-Bissau[a]	93 364	86 107	373 456	344 428
Mali	3 810 280	3 739 238	15 241 120	14 956 952
Niger	4 289 519	4 516 729	17 158 076	18 066 916
Nigeria	11 309 724	13 359 530	45 238 896	53 438 120
Senegal	634 376	687 635	2 537 504	2 750 540
Togo	493 618	486 716	1 974 472	1 946 864
Total	**31 204 064**	**33 510 551**	**124 816 256**	**134 042 204**

LSHTM: London School of Hygiene & Tropical Medicine; MMV: Medicines for Malaria Venture; SMC: seasonal malaria chemoprevention.
[a] Values for 2020 were imputed from 2019.

in Burkina Faso and Chad. In 2020, an additional 9.2 million children were reached with SMC compared with the original target contained in implementation planning (**Table 7.2**). This highlights a problem with the quality of microplanning information available to countries and indicates that considerable efficiency gains could be made if appropriate microplanning tools and resources were available.

FIG. 7.4.

Subnational areas where SMC was delivered in implementing countries in sub-Saharan Africa, 2020
Source: SMC Alliance and MMV.



MMV: Medicines for Malaria Venture; SMC: seasonal malaria chemoprevention.

7.4 COVERAGE OF IPTp USE BY DOSE

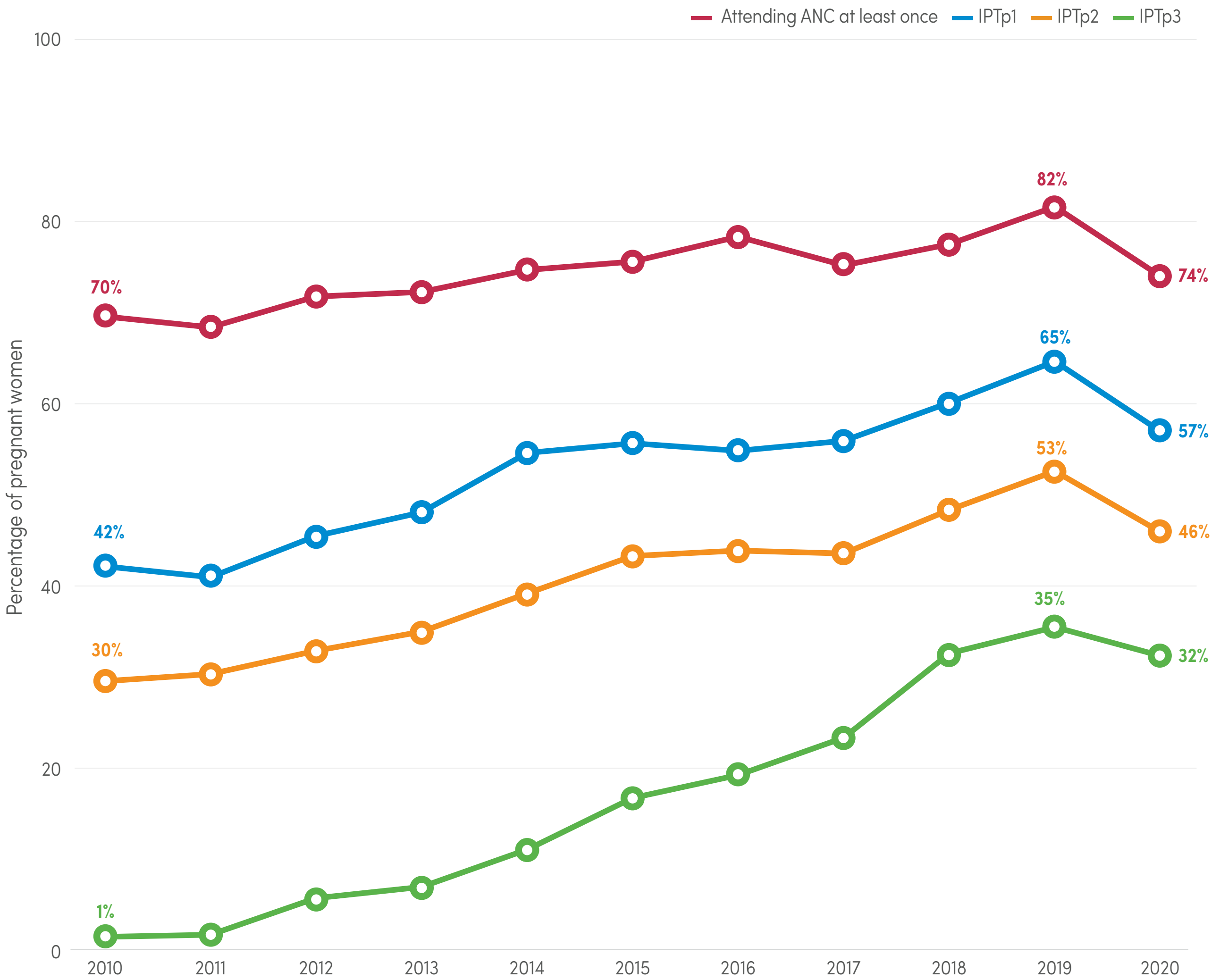
To date, 35 countries[1] in the WHO African Region have adopted IPTp to reduce the burden of malaria during pregnancy. Of these, 33 countries[2] of moderate and high malaria transmission reported routine data from health facilities in the public sector on the number of women visiting ANC clinics, and the number receiving the first, second, third and fourth doses of IPTp (i.e. IPTp1, IPTp2, IPTp3 and IPTp4). Using annual expected pregnancies as the denominator (adjusted for fetal loss and stillbirths), the percentage of IPTp use by dose was computed. ANC and IPTp coverages reported for 2020 were adjusted for disruptions in ANC services, as explained in **Annex 1**. Despite an increase in IPTp3 coverage from 17% in 2015 to 32% in 2020, coverage remains well below the target of at least 80%, underscoring the substantial number of missed opportunities, given that 57% of women received IPTp1 in 2020 (**Fig. 7.5**).

[1] The 35 countries that implement IPTp nationally are Angola, Benin, Burkina Faso, Burundi, Cameroon, the Central African Republic, Chad, the Comoros, the Congo, Côte d'Ivoire, the Democratic Republic of the Congo, Gabon, the Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, the Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, South Sudan, Togo, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe.

[2] The Comoros and Sao Tome and Principe are not included owing to their low malaria burden.

FIG. 7.5.

Percentage of pregnant women attending an ANC clinic at least once and receiving IPTp, by number of SP doses, sub-Saharan Africa, 2010–2020 *Sources: NMP reports, CDC estimates and WHO estimates.*



ANC: antenatal care; CDC: United States Centers for Disease Control and Prevention; IPTp: intermittent preventive treatment in pregnancy; IPTp1: first dose of IPTp; IPTp2: second dose of IPTp; IPTp3: third dose of IPTp; NMP: national malaria programme; SP: sulfadoxine-pyrimethamine; WHO: World Health Organization.

Note: In the following countries, 2019 coverage was used because of missing data in 2020: the Comoros, Guinea-Bissau, Equatorial Guinea, Liberia, the Niger, Togo, the United Republic of Tanzania and Zimbabwe.

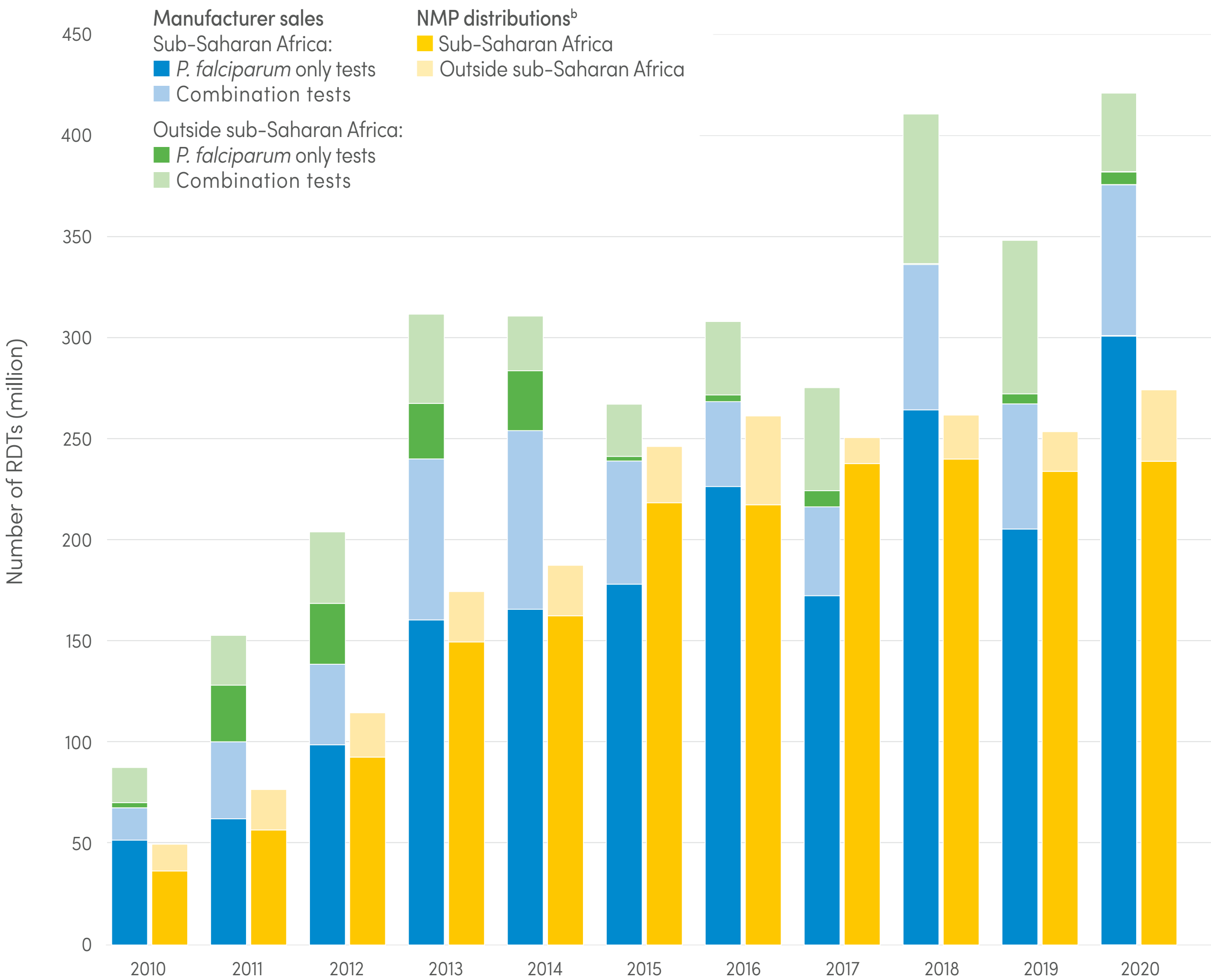
7.5 MALARIA DIAGNOSIS AND TREATMENT

This section presents information on manufacturer sales and deliveries and national distribution of RDTs and ACTs, treatment seeking for fever in children aged under 5 years, and population-level coverage of malaria diagnosis and treatment with ACTs. RDT data shown in this section reflect sales by manufacturers eligible for procurement by WHO based on the Malaria RDT Product Testing Programme from 2010 to 2017 and on WHO prequalification since 2018, and NMP distributions of RDTs. Manufacturer data on ACTs has been provided by eligible companies for WHO-prequalified products.

Globally, 3.1 billion RDTs for malaria were sold by manufacturers between 2010 and 2020, with more than 81% of sales being in sub-Saharan African countries. In the same period, NMPs distributed 2.2 billion RDTs – 88% in sub-Saharan Africa (**Fig. 7.6**). This difference may be due to the lack of reporting of RDTs that are yet to be distributed to health facilities or to inadequate reporting of RDT use from the private sector. In 2020, manufacturers reported about 419 million RDT sales. The true number of sales is likely to be higher because some eligible manufacturers did not report data. NMPs distributed 275 million RDTs in 2020, about 21 million more than in 2019, but this increase was due to missing data from India in 2019, which then reported 20 million RDT distributions in 2020.

FIG. 7.6.

Number of RDTs sold by manufacturers and distributed by NMPs for use in testing suspected malaria cases, 2010–2020 *Sources: NMP reports and sales data from manufacturers eligible for the WHO procurement criteria.*[a]



NMP: national malaria programme; *P. falciparum*: *Plasmodium falciparum*; RDT: rapid diagnostic test; WHO: World Health Organization.

[a] 2020 procurement volumes reflect sales by eight of the nine companies selling WHO-prequalified RDTs.

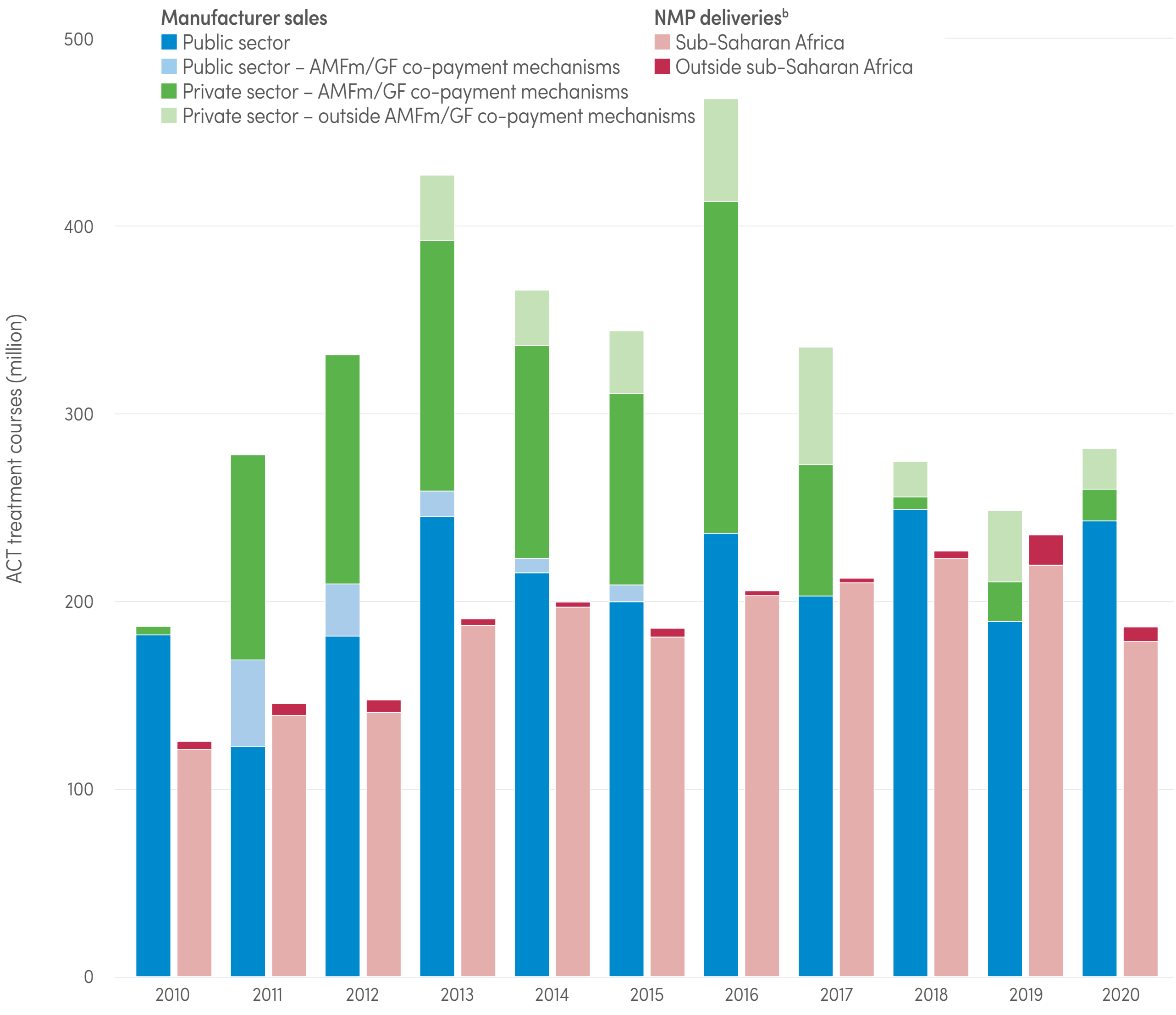
[b] NMP distributions do not reflect those RDTs still in storage that have yet to be delivered to health facilities and to community health workers.

More than 3.5 billion treatment courses of ACT were sold globally by manufacturers in 2010–2020 (**Fig. 7.7**). About 2.4 billion of these sales were to the public sector in malaria endemic countries; the rest was private sector deliveries, including Affordable Medicines Facility for malaria and Global Fund Co-Payment Mechanism. National data reported by NMPs show that, in the same period, 2.1 billion ACTs were delivered to health service providers to treat malaria patients in the public health sector. In 2020, some 243 million ACTs were delivered by manufacturers to the public health sector. NMPs distributed 191 million ACTs in 2020, 96% of which were in sub-Saharan Africa. There were about 48 million fewer distributions in 2020 than in 2019. In sub-Saharan Africa, more than 100 million ACTs were distributed in six countries: Uganda (26.7 million), the Democratic Republic of the Congo (19.1 million), Nigeria (17.9 million), Mozambique (17.5 million), Burkina Faso (11.3 million) and Kenya (8.5 million).

Aggregated data from household surveys conducted in sub-Saharan Africa between 2005 and 2020 were used to analyse coverage of treatment seeking, diagnosis and use of ACTs in children aged under 5 years (**Table 7.3**).

FIG. 7.7.

Number of ACT treatment courses delivered by manufacturers and distributed by NMPs to patients, 2010–2020[a] *Sources: Companies eligible for procurement by WHO/UNICEF and NMP reports.*



ACT: artemisinin-based combination therapy; AMFm: Affordable Medicines Facility for malaria; GF: Global Fund to Fight AIDS, Tuberculosis and Malaria; NMP: national malaria programme; UNICEF: United Nations Children's Fund; WHO: World Health Organization.

[a] AMFm/GF indicates that the AMFm operated from 2010 to 2013, with the GF Co-Payment Mechanism operating from 2014.

[b] NMP deliveries to patients reflect consumption reported in the public health sector.

Data were from 20 countries[1,2] with at least two surveys in this period (baseline, 2005–2011; and most recent, 2015–2019), conducted at any point during the year. Comparing the baseline and latest surveys, there was little change in prevalence of fever within the 2 weeks preceding the survey (median 25% versus 20%) or in treatment seeking for fever (median 65% versus 69%). Comparing the source of treatment between the baseline and latest surveys, the proportion who received care from public health facilities increased from a median of 62% to 71%, and the proportion who received care from the private sector fell from a median of 40% to 31%. Use of community health workers was low in both periods, at a median of 2%.

[1] Angola (MIS 2011; DHS 2015), Benin (DHS 2006; DHS 2017), Burkina Faso (DHS 2010; MIS 2017), Burundi (DHS 2010; DHS 2016), Cameroon (DHS 2011; DHS 2018), Ghana (DHS 2008; MIS 2019), Guinea (DHS 2005; DHS 2018), Kenya (DHS 2008; MIS 2015), Liberia (MIS 2011; DHS 2019), Madagascar (MIS 2011; MIS 2016), Malawi (DHS 2010; MIS 2017), Mali (DHS 2006; DHS 2018), Mozambique (DHS 2011; MIS 2018), Nigeria (MIS 2010; DHS 2018), Rwanda (DHS 2010; DHS 2019), Senegal (DHS 2010; DHS 2019), Sierra Leone (DHS 2008; DHS 2019), Uganda (DHS 2011; MIS 2018), the United Republic of Tanzania (DHS 2010; MIS 2017) and Zambia (DHS 2007; DHS 2018).

[2] Although surveys were available from Zimbabwe, data were not included owing to low case numbers. In addition, Ethiopia could not be included here because the interim mini-survey conducted in 2019 did not include questions on care seeking behaviour or fever.

TABLE 7.3.

Summary of coverage of treatment seeking for fever, diagnosis and use of ACTs for children aged under 5 years, from household surveys in sub-Saharan Africa, at baseline (2005–2011) and most recently (2015–2019) *Source: household surveys.*

Children aged under 5 years	Baseline (2005–2011)			Most recent survey (2015–2019)		
Indicator	**Median estimate**	**Lower bound**	**Upper bound**	**Median estimate**	**Lower bound**	**Upper bound**
Prevalence of fever						
With fever in past 2 weeks	25.0%	19.7%	34.4%	19.9%	16.1%	27.7%
Treatment seeking for fever						
With fever in past 2 weeks for whom treatment was sought	64.8%	58.8%	72.2%	69.3%	59.4%	74.2%
Source of treatment for fever among those who were treated						
Public sector (health facility)	62.3%	51.7%	80.6%	71.0%	47.5%	85.0%
Public sector (community health worker)	2.0%	0.7%	3.4%	1.3%	0.4%	5.0%
Private sector (formal and informal)	39.8%	21.4%	51.0%	30.8%	16.7%	55.0%
Diagnosis among those with fever and for whom care was sought						
Received a finger or heel prick	21.1%	6.2%	27.2%	38.5%	19.8%	49.1%
Use of ACTs among those for whom care was sought						
Received treatment with ACTs	38.9%	23.6%	68.2%	75.7%	32.2%	90.6%
Use of ACTs among those for whom care was sought and received a finger or heel prick						
Received ACTs	20.6%	16.3%	41.7%	28.8%	18.3%	53.2%

ACT: artemisinin-based combination therapy.

The proportion of children aged under 5 years with fever for whom care was sought and who received a diagnosis with a finger or heel prick increased from a median of 21% at baseline to 39% in the latest surveys among those seeking treatment. Use of ACTs also increased, from a median of 39% at baseline to 76% in the latest surveys. In the most recent surveys, among those who received a finger or heel prick, 29% were treated with ACTs, compared with 21% at baseline.

Data from the most recent household surveys, conducted between 2015 and 2019, were used to analyse coverage of treatment seeking, diagnosis and use of ACTs in children aged under 5 years by country (**Table 7.4**, **Annex 5-Ea** and **Eb**). The percentage of children for whom treatment for fever was sought ranged from 50.3% in Senegal to 86.9% in Uganda. The percentage of those with fever who received a diagnostic test and for whom care was sought ranged from 13.8% in Nigeria to 66.4% in Burundi. Among those for whom care was sought, the percentage who received ACTs ranged from 11.6% in Burundi to 98.4% in Mozambique. The proportion receiving ACTs among those for whom care was sought and who received a finger or heel prick ranged from 2.9% in Senegal to 64.9% in Uganda.

TABLE 7.4.

Summary of coverage of treatment seeking for fever, diagnosis and use of ACTs for children aged under 5 years from the most recent household survey for countries in sub-Saharan Africa *Source: household surveys.*

Country	Latest survey	Treatment seeking for fever	Diagnosis among those with fever and for whom care was sought	Use of ACTs among those for whom care was sought	Use of ACTs among those for whom care was sought and who received a finger or heel prick
		Median (lower bound–upper bound)	Median (lower bound–upper bound)	Median (lower bound–upper bound)	Median (lower bound–upper bound)
Angola	DHS 2015	55.1 (51.8–58.4)	34.3 (31.1–37.6)	75.7 (69.1–81.3)	27.0 (22.1–32.4)
Benin	DHS 2017	53.9 (50.7–57.0)	17.8 (16.0–19.8)	38.3 (32.8–44.0)	18.7 (14.7–23.4)
Burkina Faso	MIS 2017	73.8 (69.8–77.6)	49.1 (45.1–53.2)	79.9 (75.8–83.5)	60.1 (55.2–64.9)
Burundi	DHS 2016	69.7 (67.8–71.6)	66.4 (64.5–68.3)	11.6 (9.7–13.8)	8.3 (6.9–10.0)
Cameroon	DHS 2018	63.0 (58.7–67.1)	21.4 (18.1–25.2)	22.4 (17.6–28.2)	17.1 (11.5–24.7)
Ghana	MIS 2019	69.5 (64.9–73.8)	34.4 (30.3–38.8)	86.8 (81.2–90.9)	58.7 (51.4–65.6)
Guinea	DHS 2018	67.7 (64.4–70.9)	20.5 (17.6–23.7)	20.4 (14.7–27.6)	14.6 (9.0–22.9)
Kenya	MIS 2015	72.6 (69.0–76.0)	39.4 (35.6–43.3)	92.2 (87.3–95.3)	42.4 (36.0–49.1)
Liberia	DHS 2019	81.4 (78.0–84.4)	49.1 (44.8–53.5)	43.1 (37.4–49.1)	30.5 (26.3–35.2)
Madagascar	MIS 2016	60.0 (55.7–64.2)	15.5 (12.3–19.4)	17.3 (8.3–32.6)	3.7 (1.5–8.9)
Malawi	MIS 2017	54.1 (49.0–59.2)	37.7 (33.1–42.6)	97.4 (94.2–98.9)	61.0 (53.7–67.9)
Mali	DHS 2018	57.8 (53.8–61.8)	16.4 (13.9–19.4)	32.8 (25.9–40.5)	24.4 (17.8–32.4)
Mozambique	MIS 2018	69.1 (63.5–74.2)	48.0 (42.7–53.4)	98.4 (96.6–99.3)	57.9 (50.2–65.2)
Nigeria	DHS 2018	73.8 (72.1–75.4)	13.8 (12.6–15.0)	51.3 (48.8–53.9)	42.0 (37.9–46.2)
Rwanda	DHS 2019	62.9 (60.0–65.7)	40.7 (37.8–43.6)	92.3 (84.7–96.3)	18.9 (14.8–23.8)
Senegal	DHS 2019	50.3 (45.1–55.5)	15.8 (12.7–19.5)	43.0 (18.9–70.8)	2.9 (1.1–7.3)
Sierra Leone	DHS 2019	75.5 (72.7–78.1)	61.3 (57.8–64.6)	31.7 (27.4–36.4)	22.9 (19.2–27.0)
Uganda	MIS 2018	86.9 (84.7–88.8)	51.6 (47.4–55.7)	87.9 (83.9–91.0)	64.9 (59.0–70.3)
United Republic of Tanzania	MIS 2017	75.4 (72.2–78.3)	43.3 (39.2–47.4)	89.0 (82.7–93.2)	43.7 (36.6–51.1)
Zambia	DHS 2018	77.2 (74.2–79.9)	63.2 (59.4–66.9)	96.9 (94.8–98.2)	51.7 (46.8–56.5)

ACT: artemisinin-based combination therapy; DHS: demographic and health survey; MIS: malaria indicator survey.

8 GLOBAL PROGRESS TOWARDS THE GTS MILESTONES

The GTS calls for a reduction in malaria case incidence and mortality rates (compared with a 2015 baseline) of at least 40% by 2020, 75% by 2025 and 90% by 2030 (*2*). This year, the number of countries that achieved the GTS milestones for 2020 was derived from official burden estimates (rather than from projections as was done in the *World malaria report 2020*) (*4*). The updated estimates for 2020 included the effect of disruptions of malaria services during the pandemic. The malaria mortality estimates were based on a new method for quantifying the malaria CoD fraction (**Section 3**). Projections beyond 2020 if current malaria trends are sustained were informed by the trends observed between 2011 and 2020.

Trends in estimated malaria cases and deaths were used to make annual projections from 2021 to 2030, to track progress towards the future GTS milestones and targets for 2025 and 2030, as mandated to WHO by the World Health Assembly (*2*). The data and projections presented here have been adjusted for potential disruptions during the COVID-19 pandemic, which – despite commendable global and national efforts to maintain essential malaria services – has led to higher malaria morbidity and mortality in 2020 (**Section 2.6**).

8.1 GLOBAL PROGRESS

The GTS 2020 milestones for morbidity and mortality, based on the 2015 baseline, have not been achieved globally, despite the considerable progress made since 2000 (**Fig. 8.1**). The GTS and SDG 2025 and 2030 targets for malaria morbidity and mortality will also not be met unless urgent actions are taken to reverse this trend (**Fig. 8.1**). A malaria case incidence of 59 cases per 1000 population at risk in 2020 instead of the expected 35 cases per 1000 means that, globally, we are off track by 40% (i.e. the GTS target is 40% lower than the current case incidence); at the current trajectory, the world could be off track by 88% in 2030 (**Fig. 8.1a**). Malaria deaths per 100 000 population at risk decreased from 14.8 in 2015 to 13.8 in 2019 but increased to 15.3 in 2020. Globally, the world is off track by 42% (**Fig. 8.1b**) and, if this trajectory continues, by 2030 it will be off track by 91%.

Fig. 8.2 and **Fig. 8.3** present progress in all countries considered to be malaria endemic in 2015. Countries were ranked into eight categories to assess progress towards malaria case incidence and mortality rate milestones in 2020 from a 2015 baseline:

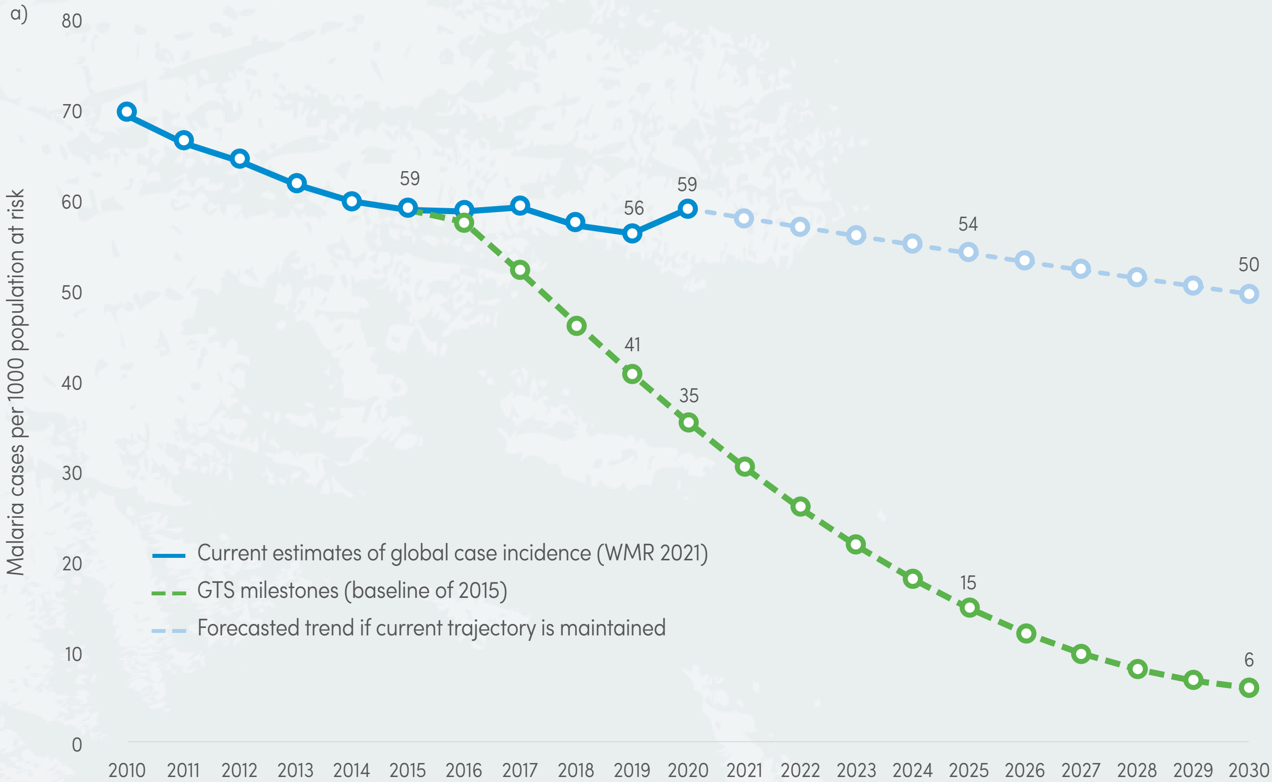
- on track (zero malaria cases in 2020);
- on track (decrease by 40% or more);
- decrease by between 25% and less than 40%;
- decrease by less than 25%;
- no increase or decrease since 2015 (less than 5% increase or decrease in case incidence or mortality rate);
- increase by less than 25%;
- increase by between 25% and less than 40%; and
- increase by 40% or more.

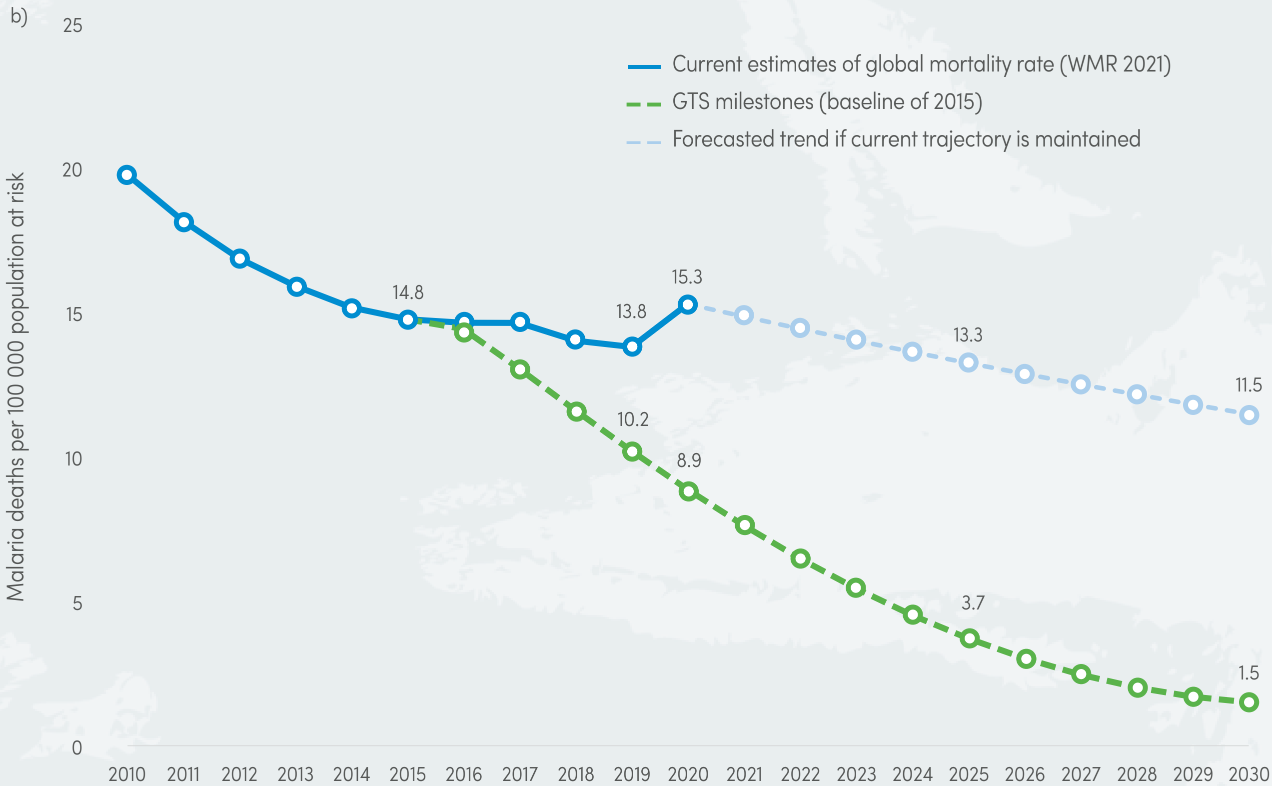
Of the 93 countries that were malaria endemic (including the territory of French Guiana) in 2015, 30 (32%) met the GTS morbidity milestone for 2020, having achieved a reduction of 40% or more in case incidence or reported zero malaria cases. About one quarter (24 countries; 26%) had made progress in reducing malaria case incidence but did not meet the GTS milestone. Thirty-two countries (34%) had experienced increased case incidence, with 17 countries (18%) experiencing an increase of 40% or more in 2020 compared with 2015. In seven countries (7.5%), malaria case incidence in 2020 was similar to that of 2015.

Forty countries (43%) that were malaria endemic in 2015 met the GTS mortality milestone for 2020, with 32 of them reporting zero malaria deaths. An additional 15 countries (16%) achieved reductions in the mortality rate, but progress was below the 40% target. Malaria mortality rates remained at the same level in 2020 as in 2015 in 14 countries (15%), while rates increased in 24 countries (26%), among which 12 countries had increases of 40% or more.

FIG. 8.1.

Comparison of global progress in malaria a) case incidence and b) mortality rate, considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green) *Source: WHO estimates.*

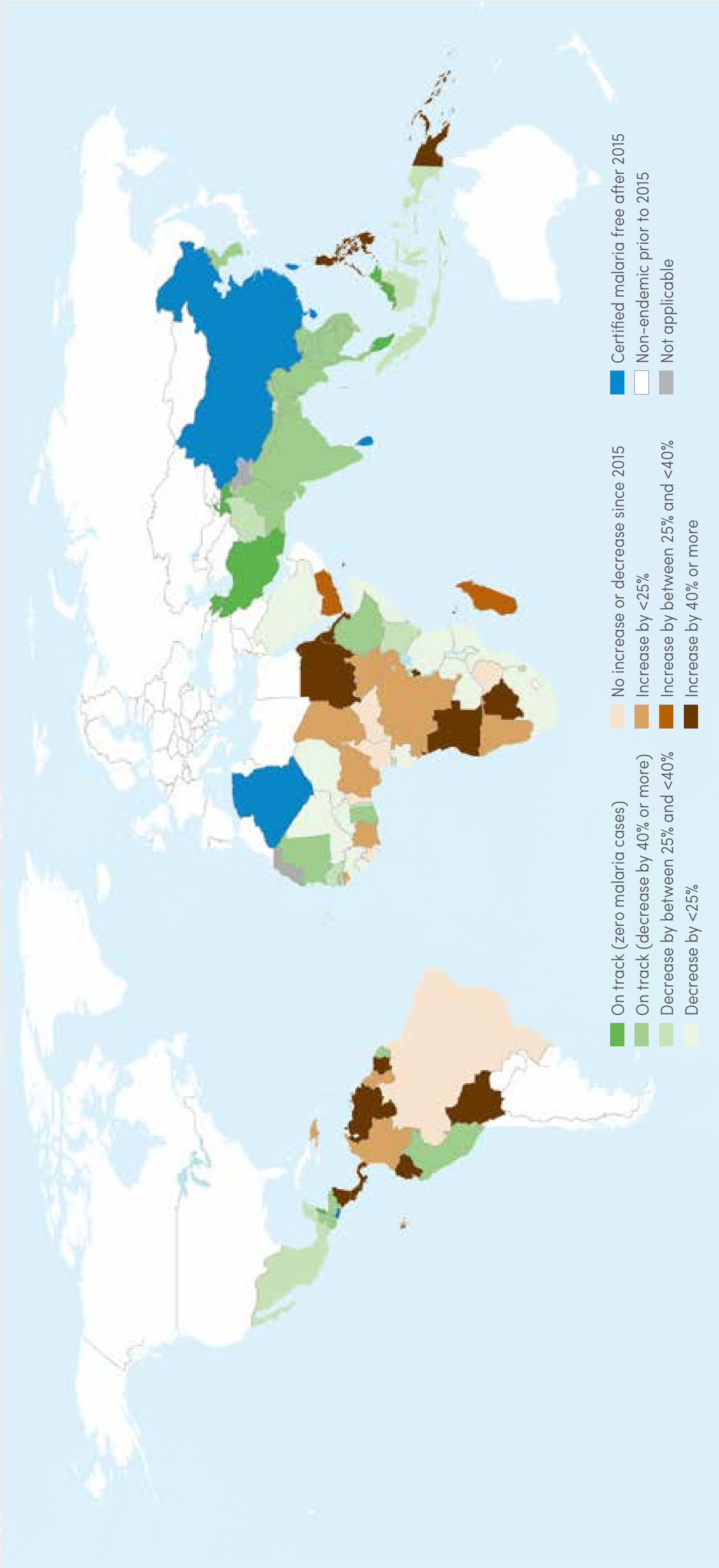




GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization; WMR: world malaria report.

FIG. 8.2.

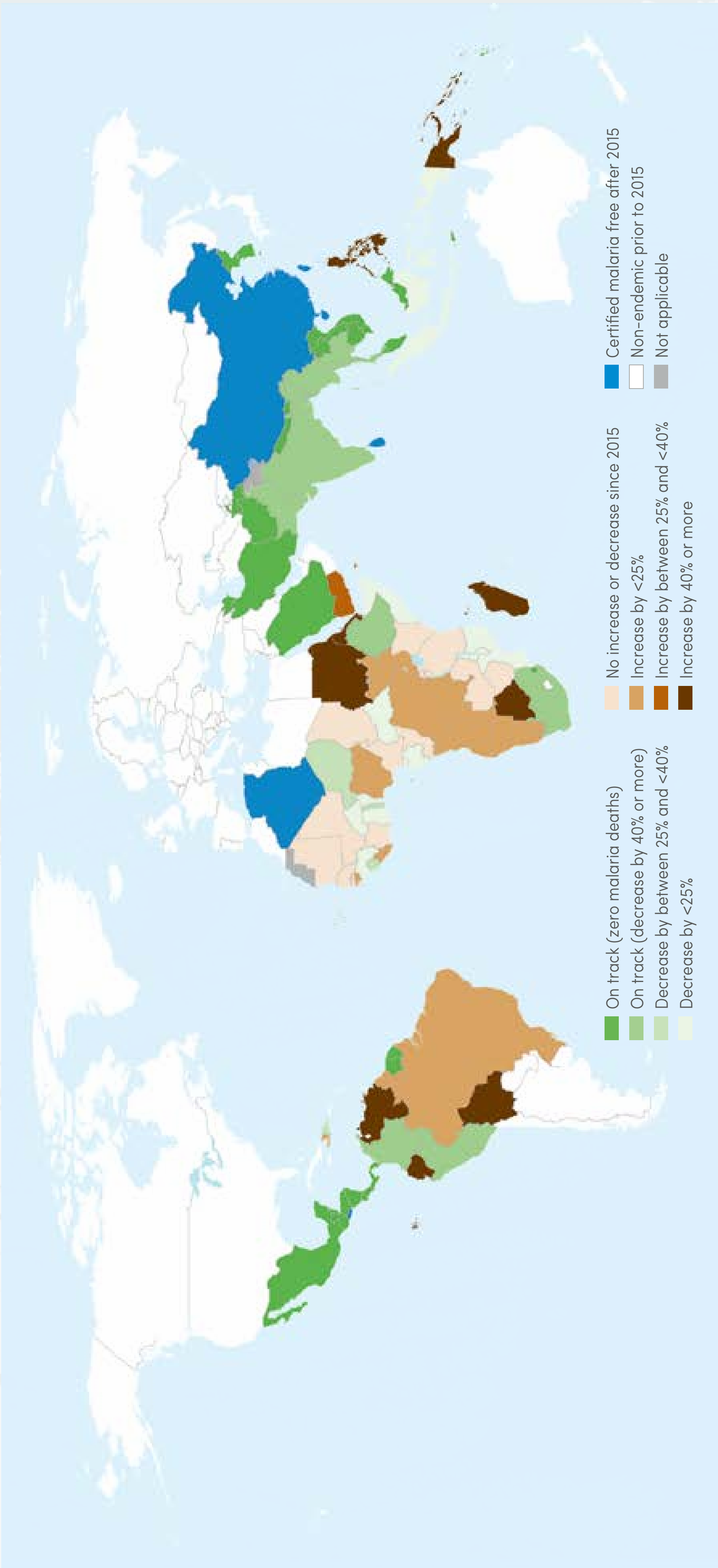
Map of malaria endemic countries (including the territory of French Guiana) showing progress towards the GTS 2020 malaria case incidence milestone of at least 40% reduction from a 2015 baseline *Source: WHO estimates.*



GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization.

FIG. 8.3.

Map of malaria endemic countries (including the territory of French Guiana) showing progress towards the GTS 2020 malaria mortality rate milestone of at least 40% reduction from a 2015 baseline *Source: WHO estimates.*



GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization.

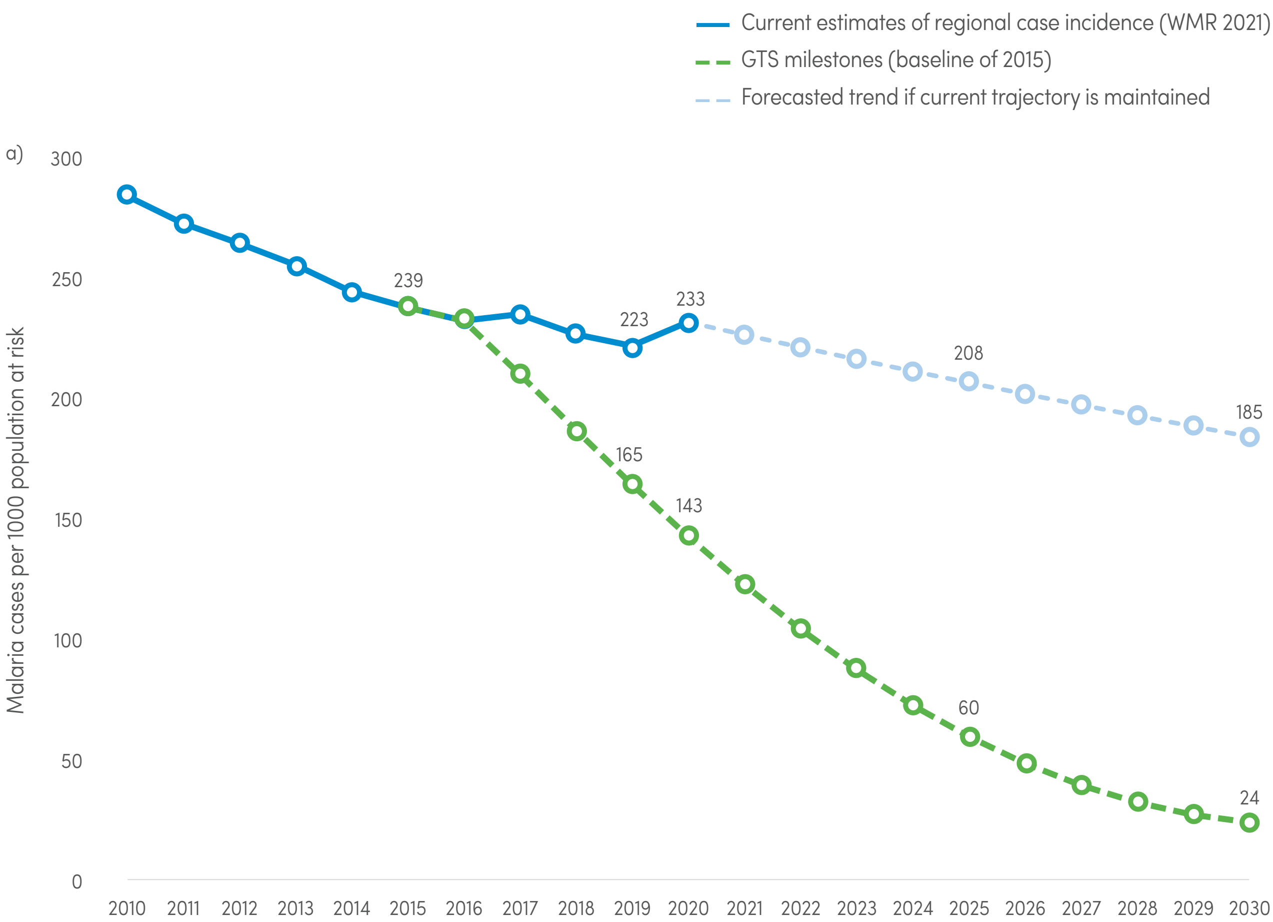
8.2 WHO AFRICAN REGION

Analysis of the trends by region shows that the WHO African Region is off track for both the malaria morbidity and mortality GTS 2020 milestones, by 38% and 40%, respectively (**Fig. 8.4**). Only Cabo Verde, Ethiopia, the Gambia, Ghana and Mauritania met the GTS 2020 target of a 40% reduction in malaria case incidence, and Algeria has already been certified malaria free. The projections presented last year showed that Botswana and Namibia were on track for achieving the GTS milestones for both case incidence and mortality; however, due to increases in the number of cases in 2020, neither country has achieved those milestones.

Although not on track, 18 countries (Burkina Faso, Equatorial Guinea, Eswatini, Gabon, Guinea, Kenya, Malawi, Mali, Mozambique, the Niger, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, Togo, the United Republic of Tanzania and Zambia) achieved reductions in malaria case incidence by 2020 compared with 2015 (**Fig. 8.2**). There was no difference (<5% increase or decrease) in case incidence in 2020 compared with 2015 in five countries (Benin, Cameroon, the Central African Republic, Liberia and Zimbabwe). Case incidence was higher in 2020 than in 2015 in 15 countries by less than 25% in Chad, the

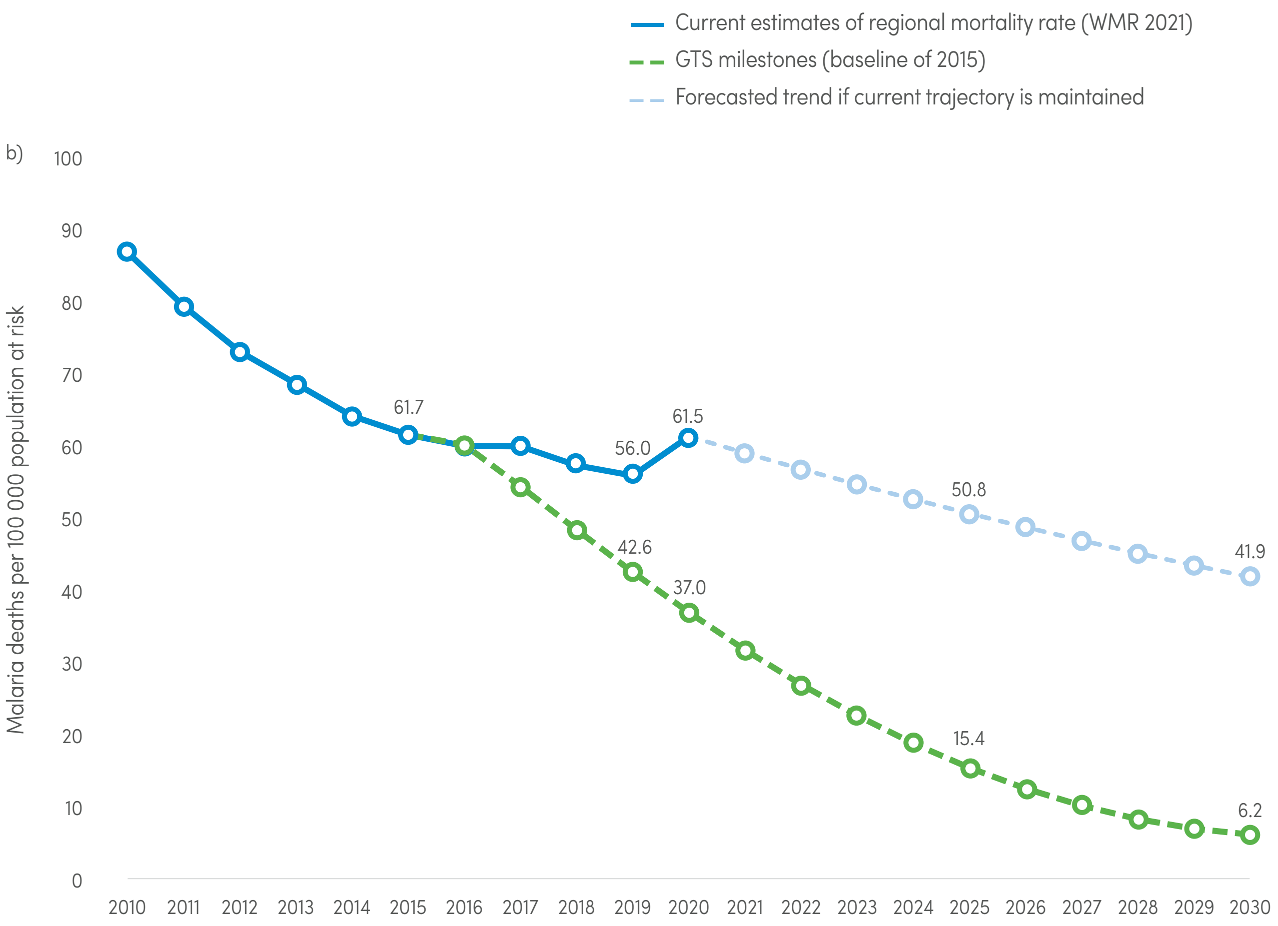
FIG. 8.4.

Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO African Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green)
Source: WHO estimates.



Congo, Côte d'Ivoire, the Democratic Republic of the Congo, Guinea-Bissau, Namibia, Nigeria, South Sudan and Uganda; increased by 25–40% in Madagascar; and increased by 40% or more in Angola, Botswana, Burundi, the Comoros and Eritrea.

Cabo Verde, Eswatini and Sao Tome and Principe reported zero malaria deaths in 2020 (**Fig. 8.3**), and Ethiopia and South Africa achieved a reduction in mortality rate of 40% or more. Although 12 countries did not meet the GTS 2020 mortality milestones (Benin, Burkina Faso, the Central African Republic, Equatorial Guinea, Gabon, Ghana, Guinea, Malawi, Mozambique, the Niger, Sierra Leone and Togo), these countries did achieve mortality rate reductions of less than 40%. Fourteen countries (Burundi, Cameroon, Chad, the Congo, Côte d'Ivoire, the Gambia, Kenya, Mali, Mauritania, Rwanda, Senegal, the United Republic of Tanzania, Zambia and Zimbabwe) showed no change (<5% decrease or increase) in mortality rate in 2020 compared with 2015, whereas increases in mortality rate of between 5% and 25% were seen in eight countries (Angola, the Democratic Republic of the Congo, Guinea-Bissau, Liberia, Namibia, Nigeria, South Sudan and Uganda) and increases of 40% or more were reported in Botswana, the Comoros, Eritrea and Madagascar.



GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization; WMR: world malaria report.

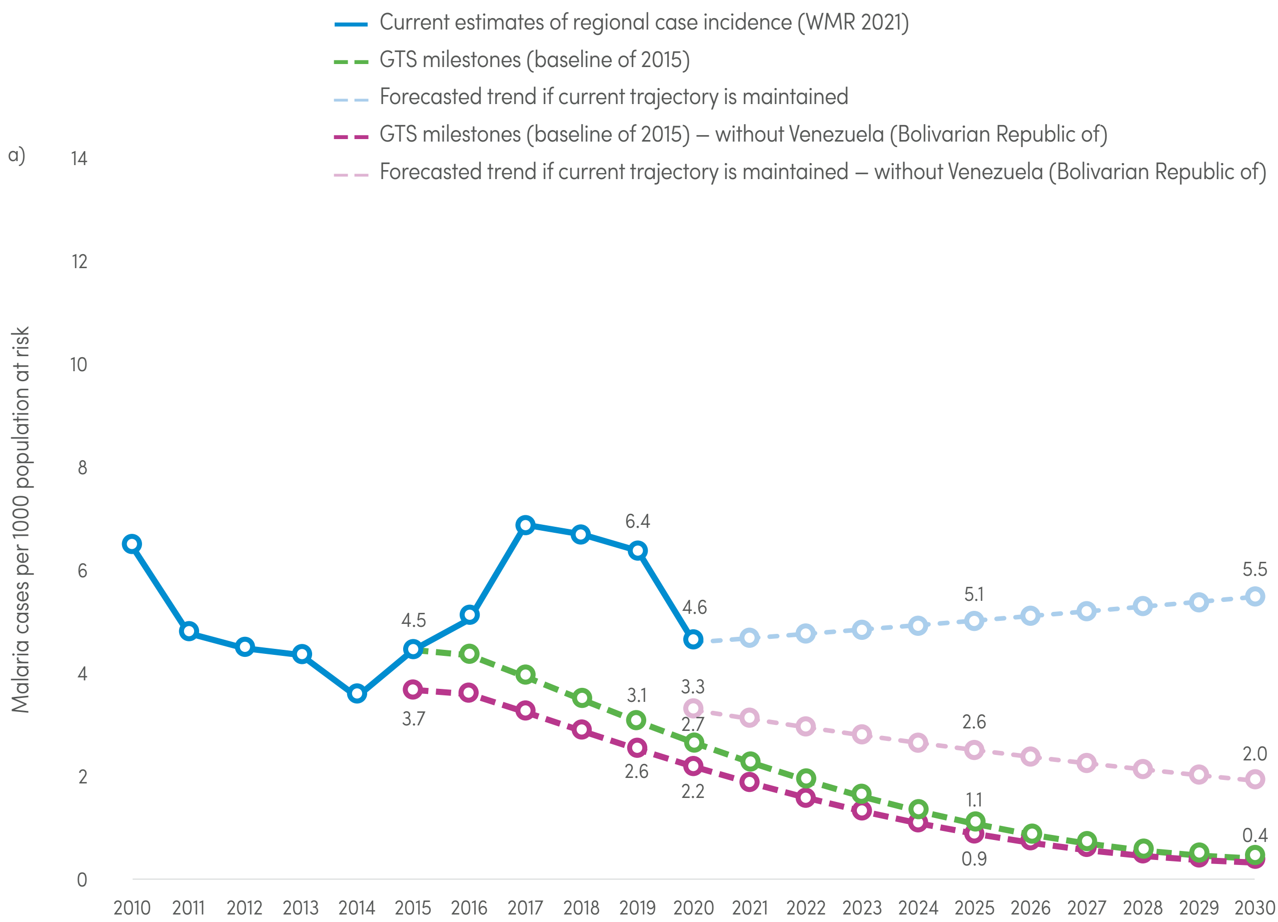
8.3 WHO REGION OF THE AMERICAS

In the WHO Region of the Americas, El Salvador was certified malaria free in 2021 and Belize reported zero malaria cases for the second consecutive year in 2020. French Guiana, Guatemala, Honduras and Peru all met the GTS 2020 malaria morbidity milestone of a reduction of at least 40% in case incidence (**Fig. 8.5**). Mexico was estimated to have reduced malaria case incidence by less than 40% in 2020 compared with 2015. In Colombia, the Dominican Republic, Guyana and Haiti, the estimated increase in case incidence was less than 25%, and in the Bolivarian Republic of Venezuela, Costa Rica, Ecuador, Nicaragua, Panama, the Plurinational State of Bolivia and Suriname estimated increases were 40% or more in 2020 compared with 2015. In Brazil, there was no change (<5% increase or decrease) in case incidence in 2020 compared with 2015.

Analysis of progress towards the GTS 2020 malaria case incidence milestone in the WHO Region of the Americas shows that the region is currently 42% off track, with a 3% increase in case incidence in 2020 compared with 2015. On the current trajectory, by 2030 there would be an increase in case incidence of 19%. At the regional level, most of the worsening of the trend is attributable to the epidemic in the Bolivarian Republic of Venezuela. When the estimated cases from the Bolivarian Republic of Venezuela are excluded from the

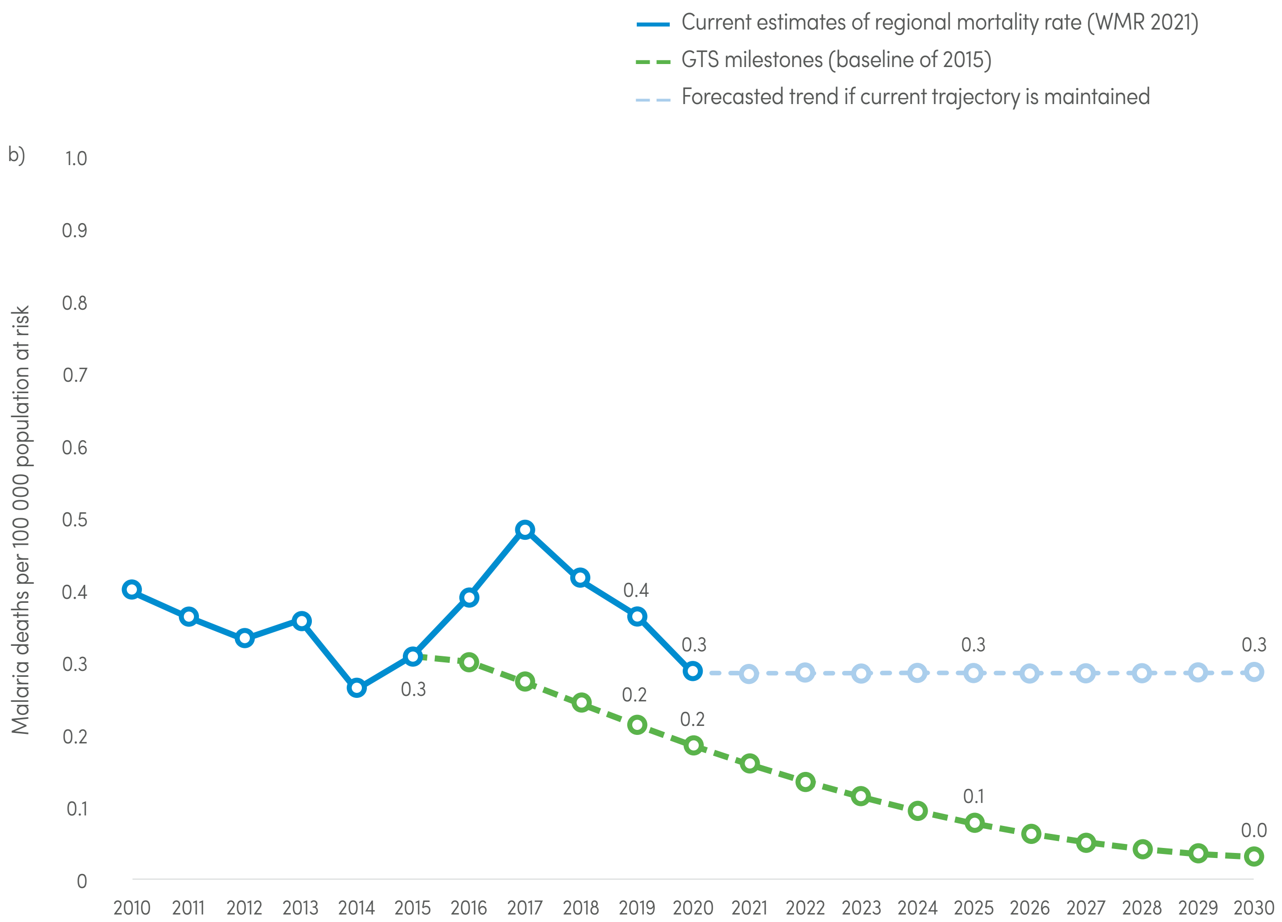
FIG. 8.5.

Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO Region of the Americas considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green) *Source: WHO estimates.*



analysis the trend is reversed, resulting in a decline in case incidence by 41% (**Fig. 8.5a**). Although the number of cases in the Bolivarian Republic of Venezuela in 2020 more than halved, this was not mainly a result of implementation of malaria interventions; rather, it was due to the COVID-19 pandemic and fuel shortages disrupting movement and logistics that affected the mining industry, which accounts for a large proportion of the malaria burden in the country. Restrictions on movements due to the COVID-19 pandemic also affected access to care (see **Section 3**). Control measures must be strengthened in this occupational sector and in the country in general to ensure that this decrease is sustained. To get the region back on track, the increasing trend in case incidence of 40% or more observed in several countries needs to be reversed.

There are few malaria deaths in the WHO Region of the Americas (**Fig. 8.5b**), and changes in 2020 relative to the 2015 GTS baseline should be interpreted with caution. For example, although the mortality rate in the Bolivarian Republic of Venezuela, Ecuador and the Plurinational State of Bolivia has increased by 40% or more (**Fig. 8.3**), it is estimated that the actual number of deaths would be 212 in the three countries. An estimated additional 167 deaths were from Brazil, Guyana and Haiti, where there were increases of 5–25% in the mortality rate. Nevertheless, the region is currently off track for achieving all current and future GTS mortality rate milestones, with no change in trend projected between 2020 and 2030.



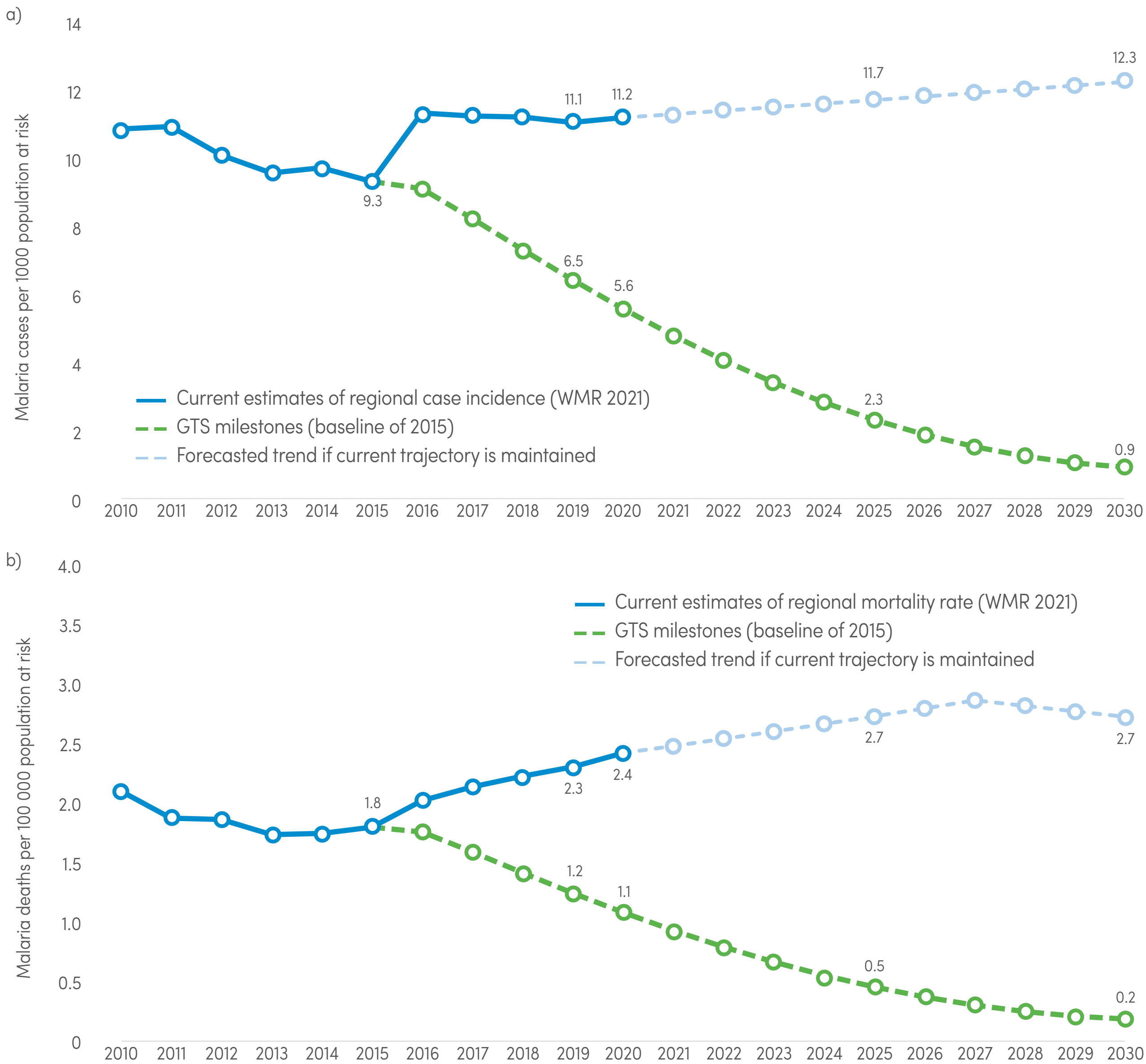
GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization; WMR: world malaria report.

8.4 WHO EASTERN MEDITERRANEAN REGION

The WHO Eastern Mediterranean Region did not meet the GTS 2020 milestones for malaria morbidity and mortality, which were off target by 50% and 55%, respectively (**Fig. 8.6**). There was a 20% increase in case incidence and a 35% increase in mortality rate. The Islamic Republic of Iran reported no indigenous malaria cases for the third consecutive year in 2020, and Pakistan reduced case incidence by 40% or more in 2020 compared with 2015. Although the GTS 2020 case incidence milestones were not met, Afghanistan, Saudi Arabia and Somalia also reduced case incidence, but by less than 40%. Djibouti and the Sudan were off track, with malaria case incidence higher by 40% or more. Case incidence also increased in Yemen but by less than 25% (**Fig. 8.2**). Malaria mortality rates decreased by 40% or more in Pakistan and by less than 25% in Somalia in 2020 compared with 2015. There were increases in deaths in Djibouti, the Sudan and Yemen. Zero malaria deaths have been reported in Saudi Arabia since 2000 and zero malaria deaths have been reported in the Islamic Republic of Iran since 2018.

FIG. 8.6.

Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO Eastern Mediterranean Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green) *Source: WHO estimates.*



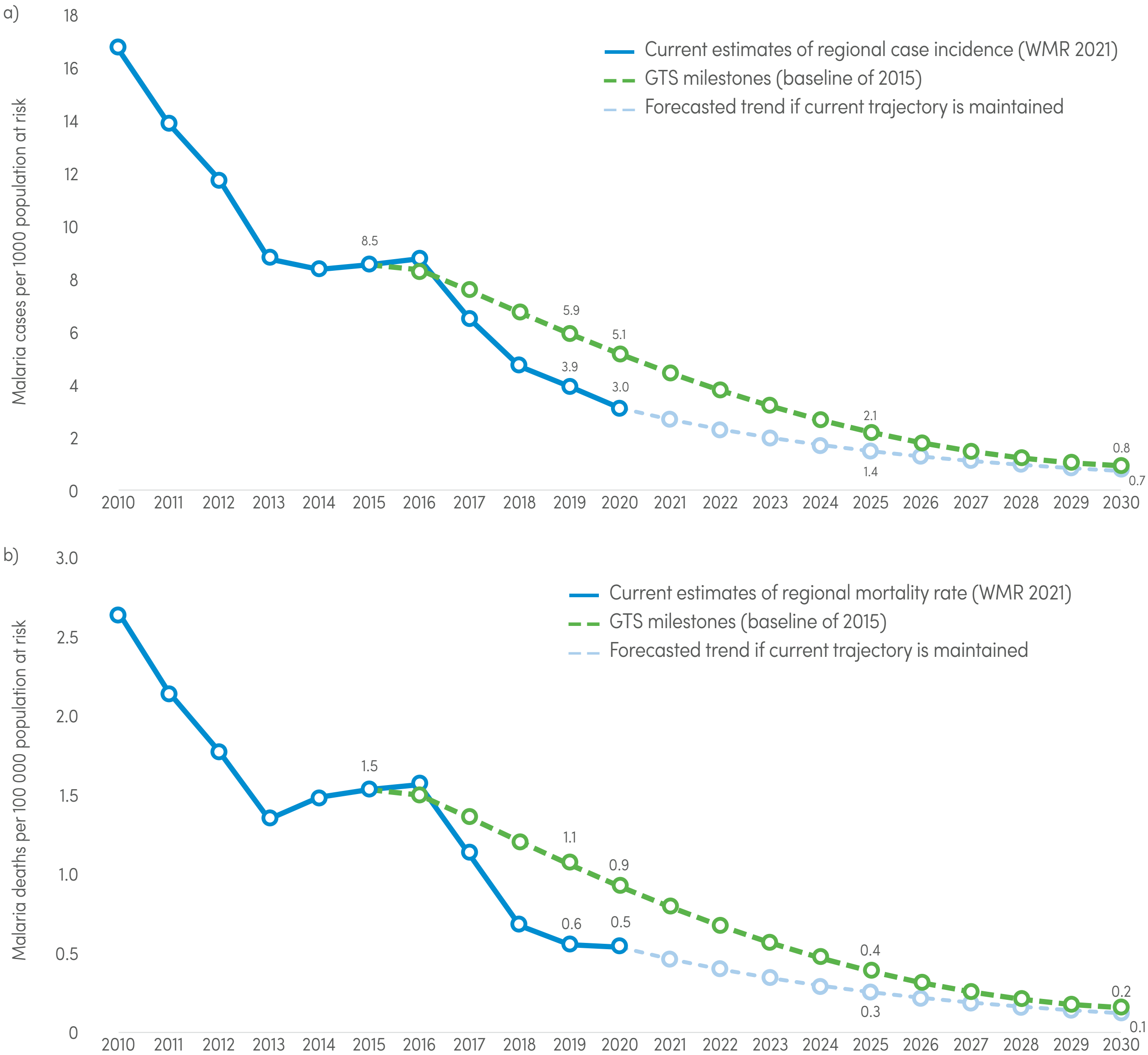
GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization; WMR: world malaria report.

8.5 WHO SOUTH-EAST ASIA REGION

The WHO South-East Asia Region met the GTS 2020 milestones for both mortality and morbidity (**Fig. 8.7**). Sri Lanka was certified malaria free in 2016 and remains malaria free. Bhutan and Indonesia reduced malaria case incidence by less than 40%, but all other countries reduced malaria case incidence by 40% or more (**Fig. 8.2**). Zero malaria deaths were reported in Bhutan, the Democratic People's Republic of Korea, Nepal and Timor-Leste. All other countries in the region had reductions in mortality rate of 40% or more, except Indonesia, where the reduction was less than 25% (**Fig. 8.3**).

FIG. 8.7.

Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO South-East Asia Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green) *Source: WHO estimates.*



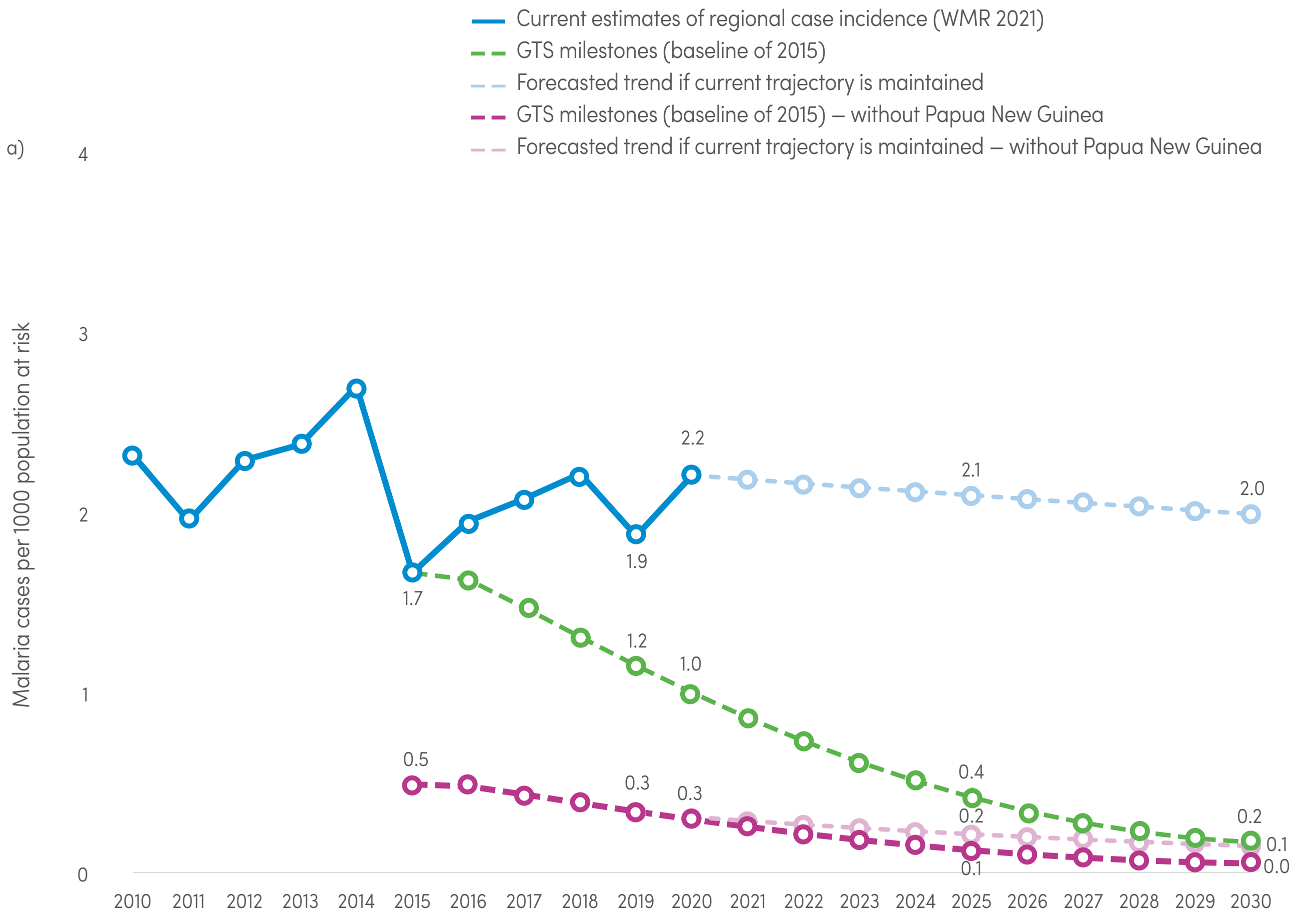
GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization; WMR: world malaria report.

8.6 WHO WESTERN PACIFIC REGION

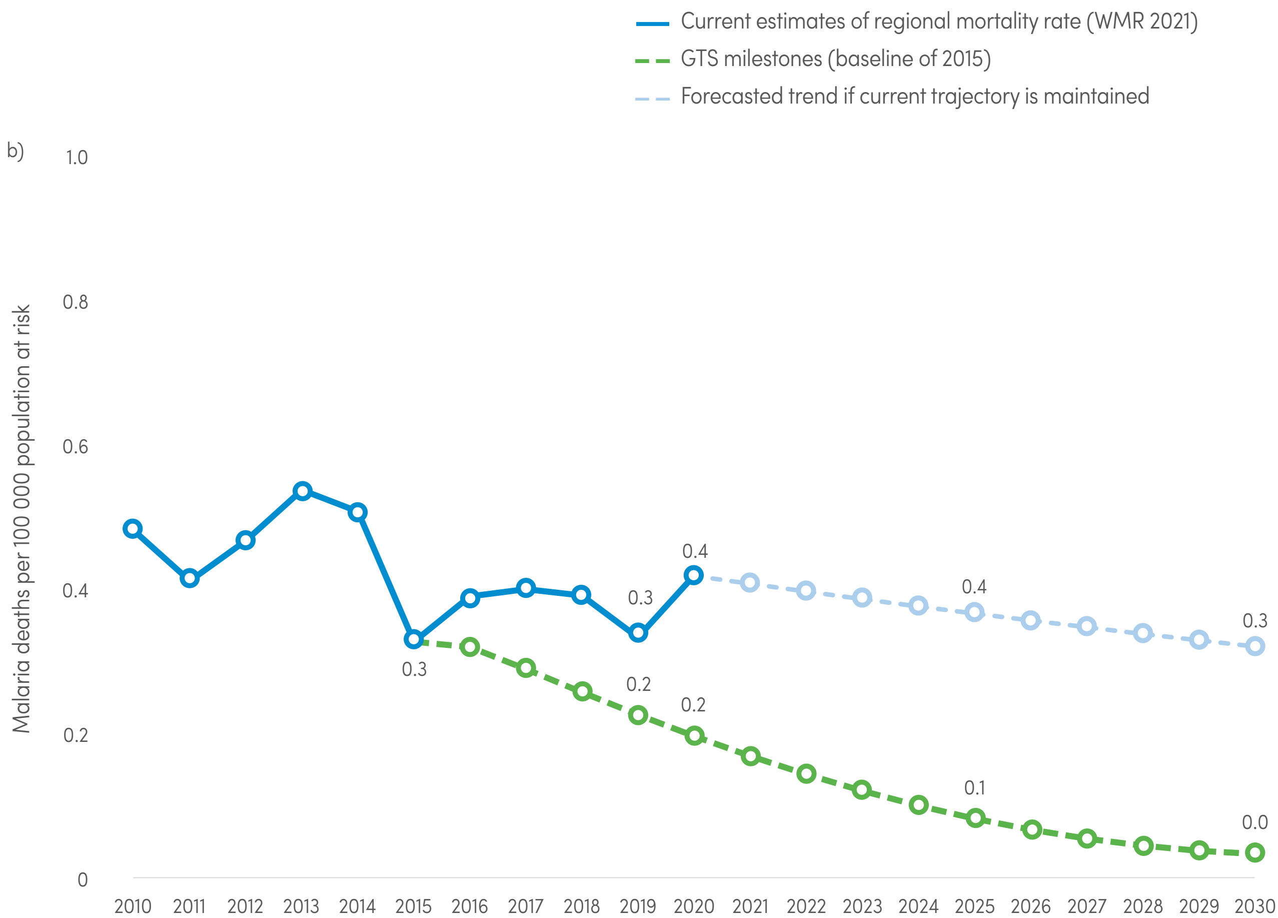
The WHO Western Pacific Region did not achieve the GTS 2020 milestones for malaria morbidity or mortality, being off target by 55% and 53%, respectively (**Fig. 8.8**). Between 2015 and 2020, case incidence increased by 33% and mortality rate by 28%. At the current trajectory, the burden is predicted to remain the same until 2030, with only a modest 23% reduction in mortality rate (**Fig. 8.8b**). The lack of reduction in malaria case incidence and mortality rates is mainly due to an increase of 40% or more in cases and deaths in Papua New Guinea, which accounts for about 80% of the burden of malaria in the region. If cases from Papua New Guinea are excluded from the analysis, then by 2030 the GTS case incidence milestone is estimated to be off track by 66%, whereas it is off track by 92% if cases from Papua New Guinea are included in the projections (**Fig. 8.8b**). Increases of 40% or more in case incidence were also seen in the Philippines and in Solomon Islands, which also account for a large proportion of cases in the region. China reported zero

FIG. 8.8.

Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO Western Pacific Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green) *Source: WHO estimates.*



cases for the fourth consecutive year in 2020 and was certified malaria free in 2021, and Malaysia reported zero malaria cases for the third consecutive year in 2020. Decreases in case incidence of 40% or more occurred in all other countries in the region, except Vanuatu, which had no change in case incidence in 2020 compared with the GTS 2015 baseline (**Fig. 8.2**). In 2015, Vanuatu was affected by a major cyclone that severely disrupted malaria diagnostic services and care seeking. As a result, malaria cases in 2015 are likely to be underestimated. This confounds assessment of progress towards the 2020 GTS target relative to a 2015 baseline for Vanuatu. Between 2016 and 2020 estimated case incidence declined by 80%. Cambodia, the Lao People's Democratic Republic, Malaysia, the Republic of Korea, Vanuatu and Viet Nam all reported zero malaria deaths.



GTS: *Global technical strategy for malaria 2016–2030*; WHO: World Health Organization; WMR: world malaria report.

9 BIOLOGICAL THREATS

9.1 DELETIONS IN *P. FALCIPARUM* HISTIDINE-RICH PROTEIN 2 AND PROTEIN 3 GENES

Histidine-rich protein 2 (HRP2) is the predominant target of the 419 million *P. falciparum*-detecting malaria RDTs sold each year. Parasites that no longer express HRP2 may not be detectable by RDTs based on HRP2, and those that no longer express both HRP2 and histidine-rich protein 3 (HRP3) are completely undetectable by these RDTs. Deletions in the *P. falciparum* genes for HRP2 (*pfhrp2*) and HRP3 (*pfhrp3*) in clinical isolates were first reported in 2010 in the Peruvian Amazon basin, by researchers characterizing blood samples that were negative by HRP2-based RDTs but positive by microscopy (*63*). In recent years, *pfhrp2/3*-deleted parasites have been documented outside of South America, including in Asia, the Middle East, and central, east, southern and west Africa. Prevalence estimates vary widely, both within and between countries. The examples of Eritrea and Peru – where the prevalence of dual *pfhrp2*- and *pfhrp3*-deleted parasites among symptomatic patients reached as high as 80% – demonstrate that these parasites can become dominant in the population, posing a serious global threat to malaria patients and increasing the risk of missed cases progressing to severe disease and deaths.

WHO has published guidance on investigating suspected *pfhrp2/3* deletions (*64*) and recommends that countries that have reports of *pfhrp2/3* deletions, and their neighbouring countries, should conduct representative baseline surveys among suspected malaria cases, to determine whether the prevalence of *pfhrp2/3* deletions causing false negative RDT results has reached a threshold that requires a change of RDT (>5% *pfhrp2* deletions causing false negative RDT results). Alternative RDT options (e.g. based on detection of *Plasmodium* lactate dehydrogenase) are limited; in particular, there are currently no WHO-prequalified non-HRP2 combination tests that can detect and distinguish between *P. falciparum* and *P. vivax*.

WHO is tracking published reports of *pfhrp2/3* deletions using the Malaria Threats Map application (*65*, *66*), and is encouraging a harmonized approach to mapping and reporting of *pfhrp2/3* deletions through publicly available survey protocols. However, few countries have taken up representative surveys or conducted any form of surveillance activities for *pfhrp2/3* deletions. In 2020–2021, surveys from multiple countries in the Horn of Africa reported high levels of *pfhrp2* deletions, including a 2-year follow-up survey after a switch away from HRP2 RDTs in Eritrea and multiple surveys in several regions of Djibouti (*67*), Ethiopia (*68–70*) and Somalia (unpublished). There were also additional reports of *pfhrp2/3* deletions in travellers returning from other countries in the region (South Sudan and the Sudan) (*71*, *72*). These collective findings prompted the WHO MPAG to release a statement calling for urgent action to address the increased prevalence of *pfhrp2* gene deletions in all endemic countries, with the most urgent action required in the Horn of Africa (*73*). MPAG emphasized that it is imperative that all countries start and maintain surveillance, and respond when the prevalence of *pfhrp2/3* gene deletions exceeds the WHO criteria for RDT replacement if more than 5% of *P. falciparum* cases are missed. When these criteria are exceeded, countries should respond by changing to quality-assured non-HRP2 RDTs, to prevent unnecessary morbidity and deaths and to safeguard inroads that have been made towards malaria elimination, particularly in sub-Saharan Africa.

Based on literature searches informing the Malaria Threats Map, there were 17 new publications between September 2020 and September 2021. These publications included data from 13 countries – Australia, Brazil, the Democratic Republic of the Congo, Djibouti, Ethiopia, Germany, Ghana, Ireland, Liberia, the Sudan, Uganda, the United Kingdom and the United Republic of Tanzania. The studies in Australia, Germany, Ireland and the United Kingdom used samples from travellers returning from various malaria endemic countries. Of these, only the study in Liberia did not identify any *pfhrp2* deletions. The studies from Australia, Djibouti, Germany, Ireland and Liberia were the first *pfhrp2* papers published from these countries. Based on all data from publications included in the Malaria Threats Map, some form of investigation for *pfhrp2/3* deletions has been conducted in 44 countries and the presence of deletions has been confirmed in 37 (84%).

The WHO Global Response Plan for *pfhrp2/3* deletions outlines several areas for action beyond scaling up surveillance. These other areas for action include identifying new biomarkers, improving the performance of non-HRP2 RDTs, undertaking market forecasting and strengthening laboratory networks to support the demand for using molecular characterization to determine the presence or absence of these gene deletions.

9.2 STATUS OF ANTIMALARIAL DRUG EFFICACY AND RESISTANCE (2015–2020)

Effective treatment for malaria is a key component in the fight against this disease. The emergence of resistance to artemisinin and partner drugs is a significant risk for the global effort to reduce the malaria burden. In the GTS, WHO calls on malaria endemic countries and global malaria partners to monitor the efficacy of antimalarial medicines, to ensure that the most effective treatments are selected for national treatment policy (*2*).

Antimalarial drug efficacy is monitored through therapeutic efficacy studies (TES), which track clinical and parasitological outcomes among patients receiving antimalarial treatment. Studies conducted according to the criteria established in the WHO protocol (*74*) help to detect changes in treatment efficacy over time. Polymerase chain reaction (PCR) correction is required to distinguish between cases with treatment failure caused by reinfection and those due to recrudescence. TES are considered the gold standard by which NMPs can best determine their national treatment policies. In countries where malaria transmission is low and in countries pursuing elimination, surveillance systems for case management have been strengthened so that all malaria cases are detected, treated and followed up to ensure cure. In this context, drug efficacy monitoring can be conducted by integrated drug efficacy surveillance (iDES). Cambodia, the Lao People's Democratic Republic, Thailand and Viet Nam have successfully adopted this approach to monitoring drug efficacy.

Antimalarial drug resistance can be assessed using several tools. Molecular marker studies identify and track the prevalence of key molecular mutations. For example, partial resistance to artemisinin is monitored using an established list of validated and candidate *PfKelch13* markers that are associated with decreased sensitivity to artemisinin (*75*). Resistance to sulfadoxine-pyrimethamine (an ACT partner drug and chemoprevention treatment) is identified by the detection of mutations in the dihydrofolate reductase (*dhfr*) and dihydropteroate synthase (*dhps*) genes of *P. falciparum*. Resistance to mefloquine is associated with an increase in *Pfmdr1* copy numbers. Similarly, resistance to piperaquine is associated with an increase in *Pfplasmepsin 2/3* copy numbers.

This section of the report summarizes the status of antimalarial drug efficacy and resistance in malaria endemic countries. Key results are presented for TES of treatments for *P. falciparum* and *P. vivax*, for each WHO region, from 2015 to 2020. Treatment failure rates are calculated using the per protocol method, unless otherwise indicated. A minimum sample size of 20 patients was applied to the analysis. Recent findings on relevant molecular markers, from studies with at least 20 samples, are also presented. All studies referenced here are also published in the Malaria Threats Map (*65*).

9.2.1 WHO African Region

In the WHO African Region, the first-line treatments for *P. falciparum* include artemether-lumefantrine (AL), artesunate-amodiaquine (AS-AQ), artesunate-pyronaridine (AS-PY) and dihydroartemisinin-piperaquine (DHA-PPQ). TES conducted according to the WHO standard protocol have demonstrated good efficacy among the ACTs recommended in the region. Although high levels of treatment failure have been documented in Africa, these results should be treated with caution, given significant deviations from the WHO standard protocol. For example, in Angola, high failure rates were detected following treatment with AL in Zaire province in 2015 (13.6%) and 2019 (9.2%), and in Lunda Sul province in 2019 (12.9%). However, treatment failure rates were calculated using a PCR-correction method based on microsatellites and a Bayesian algorithm (*76*) which, in high transmission settings, can yield higher treatment failure rates than those determined using the WHO standard protocol (*77*). In Burkina Faso, high failure rates were observed in 2017 following treatment with AL (10.1% in Niangoloko, 31.2% in Gourcy and 42.6% in Nanoro) and with DHA-PPQ in two of the same sites (18.7% in Gourcy and 13.3% in Nanoro) (*78*). However, a subsequent review of these studies found several important deviations from the WHO standard protocol (*79*).

Surveillance of *PfKelch13* polymorphisms associated with artemisinin resistance has been undertaken throughout the WHO African Region (*65*). There is now evidence of the clonal expansion of *PfKelch13* mutations in Rwanda and Uganda (*14*, *15*). In Rwanda, the R561H mutation was first identified in 2014. Several studies undertaken in 2018 and 2019 found R561H in more than 15% of the samples (*80*). Further, the presence of the R561H mutation has recently been associated with delayed parasite clearance among patients treated with AL (*80*, *81*). Rwanda was the first country in Africa to confirm the presence of artemisinin partial resistance. In Uganda, the candidate markers of artemisinin partial resistance, C469Y and A675V, were also identified; in addition, in a recent survey of samples from 2018 and 2019, the two mutations were found in more than 15% of samples in three sites (*15*). Treatment failure rates in Rwanda and Uganda remain below 10%, because the partner drug is still effective. Additionally, R622I, a candidate marker of artemisinin partial resistance, is now found in an increasing proportion of samples in the Horn of Africa, particularly in Eritrea. Further studies are needed to determine the extent of the spread of the *PfKelch13* polymorphisms in east Africa, and to investigate any relationships between these mutations and changes to parasite clearance time and in vitro resistance.

P. vivax is endemic in only a few countries in the WHO African Region. The efficacy of chloroquine (CQ) and DHA-PPQ for the treatment of *P. vivax* was investigated in Ethiopia: all seven studies of CQ and one study of DHA-PPQ demonstrated treatment failure rates of less than 5%.

9.2.2 WHO Region of the Americas

The first-line treatments for *P. falciparum* in the WHO Region of the Americas include AL (in the Bolivarian Republic of Venezuela, Brazil, Colombia, Ecuador, French Guiana, Guyana, Panama, Paraguay, the Plurinational State of Bolivia and Suriname), artesunate-mefloquine (AS-MQ) (in the Bolivarian Republic of Venezuela, Brazil and Peru) and CQ (in the Dominican Republic, Guatemala, Haiti, Honduras and Nicaragua). Recent TES of AL in Brazil (2015) and Colombia (2018) demonstrated high efficacy; no treatment failures were observed in either study.

All malaria endemic countries in the WHO Region of the Americas recommend CQ as a first-line treatment for *P. vivax*. The only studies conducted during the past 5 years are four studies from Brazil on CQ, all of which demonstrated high efficacy, with treatment failure rates of less than 2%.

In Guyana, the C580Y mutation was sporadically observed between 2010 and 2017; recent evidence indicates that there has been no drastic increase in the prevalence of the mutation in Guyana (*82*).

9.2.3 WHO South-East Asia Region

The first-line treatments for *P. falciparum* in this region include AL (Bangladesh, Bhutan, India, Myanmar, Nepal and Timor-Leste), AS-MQ (Myanmar), AS-PY (north-eastern Thailand), artesunate plus sulfadoxine-pyrimethamine (AS+SP) (India) and DHA-PPQ (Bangladesh, Indonesia, Myanmar and Thailand). TES of AL were conducted in Bangladesh, India and Myanmar; all studies found less than 10% treatment failure. In India, treatment failures with AS+SP remained low; however, a study conducted in Chhattisgarh state between 2015 and 2017 detected combined *dhfr* and *dhps* mutations in 82% of 180 patients, high levels of in vitro resistance to both sulfadoxine and pyrimethamine and in vivo parasite recrudescences associated with triple *dhfr–dhps* combined mutations (*83*). These findings could be an early warning, in the same way as earlier reports of high treatment failures associated with high prevalence of *dhfr* and *dhps* combined mutations in India's north-eastern region, which prompted a treatment policy change there in 2013. TES of DHA-PPQ conducted in Indonesia and Myanmar demonstrated high rates of efficacy, with failure rates of less than 5%. In Thailand, drug efficacy is assessed using iDES. In a recent study of routine patient data extracted from the Malaria Information System, failure rates following treatment with DHA-PPQ plus primaquine in 2018, 2019 and 2020 were all less than 10% (*84*). However, a disproportionately high treatment failure rate was detected in Sisaket province, with failure rates of up to 50% in 2019. This led the province to change its first-line therapy to AS-PY in 2020.

In the GMS, *PfKelch13* mutations associated with artemisinin resistance have reached high prevalence. Among samples collected in Myanmar and western Thailand between 2015 and 2020, *PfKelch13* wild-type parasites were found in 65.5% of samples. Two mutations, R539T and C580Y, are prevalent throughout the GMS, with a higher prevalence in the eastern part of the subregion. Some mutations (e.g. F446I, R561H, P441L and P574L) are frequently found in Myanmar and western Thailand, but rarely or never in the eastern part of the subregion.

The first-line treatments for *P. vivax* are CQ in Bangladesh, Bhutan, the Democratic People's Republic of Korea, India, Myanmar, Nepal and Thailand; AL in Timor-Leste; and DHA-PPQ in Indonesia. High treatment efficacy was found in all 22 studies of CQ conducted in the Democratic People's Republic of Korea, India, Myanmar, Nepal and Thailand, all of which found failure rates of less than 10%. In Indonesia, the efficacy of DHA-PPQ was demonstrated in five studies, with only one treatment failure observed in a combined total of 247 patients. In Myanmar, no treatment failures were observed among four TES of AS-PY.

9.2.4 WHO Eastern Mediterranean Region

The first-line treatments for *P. falciparum* in the WHO Eastern Mediterranean Region are AL (in Afghanistan, Pakistan, Somalia, the Sudan and Yemen) and AS+SP (in the Islamic Republic of Iran and Saudi Arabia). TES of AL were available from Afghanistan, Pakistan, Somalia, the Sudan and Yemen, where all studies found treatment failure rates of less than 10%. High treatment failure rates with AS+SP in Somalia and the Sudan between 2011 and 2015 led to a subsequent treatment policy change to AL in both countries. TES of DHA-PPQ were conducted in Pakistan, Somalia and the Sudan; all studies had treatment failure rates of less than 5%.

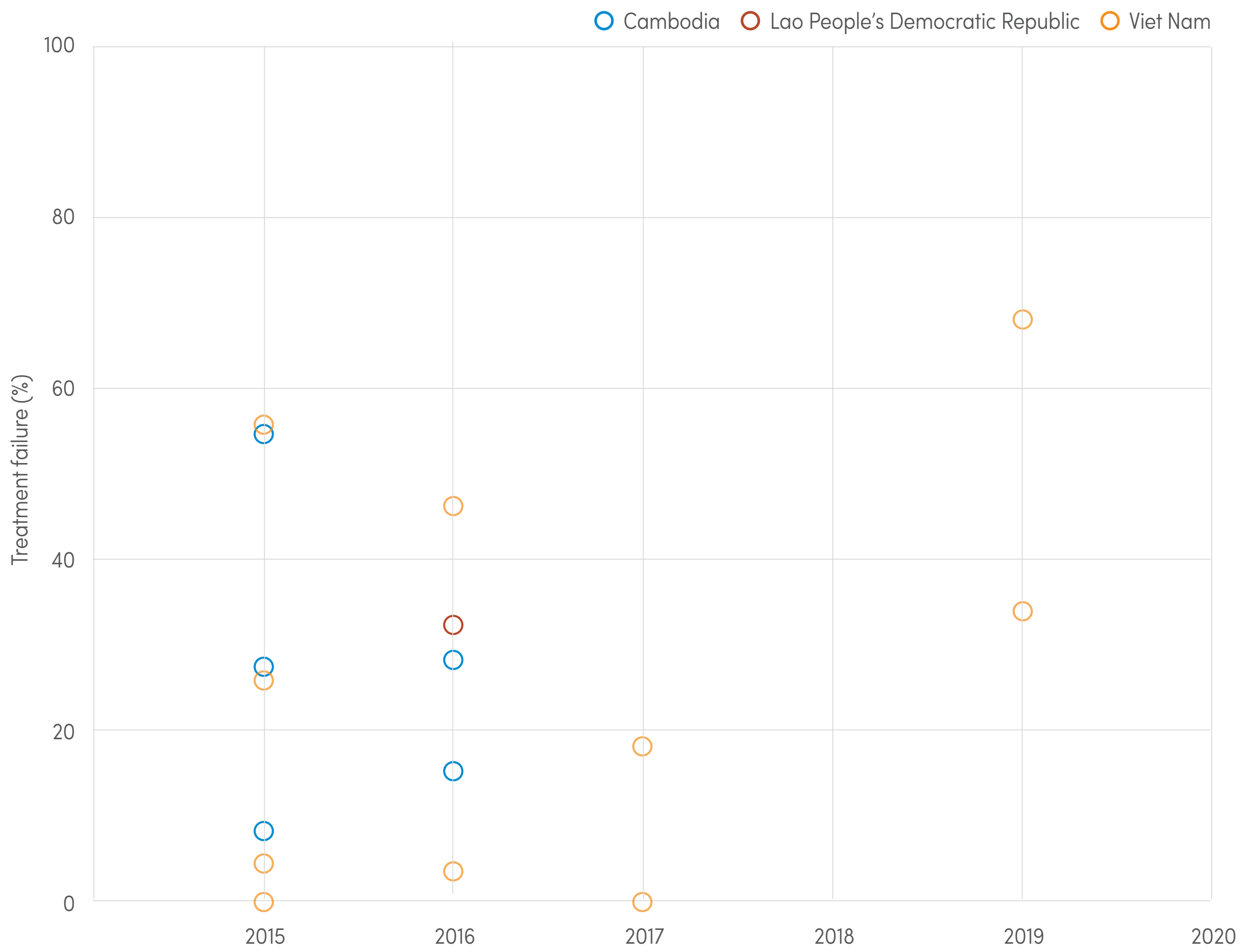
The first-line treatments for *P. vivax* are AL in Somalia and the Sudan, and CQ in all other countries in the region. Data on the efficacy of first-line treatments are available from one study of AL in Somalia and one study on the efficacy of CQ in Afghanistan. No treatment failures were observed in either study.

9.2.5 WHO Western Pacific Region

The first-line treatments for *P. falciparum* in the WHO Western Pacific Region include AL (in the Lao People's Democratic Republic, Malaysia, Papua New Guinea, the Philippines, Solomon Islands and Vanuatu), AS-MQ (in Cambodia), AS-PY (in selected provinces of Viet Nam) and DHA-PPQ (in Viet Nam). TES of AL were conducted in the Lao People's Democratic Republic, Malaysia, Papua New Guinea and the Philippines. Treatment failure rates with AL were generally low in all countries where studies were conducted. In the Lao People's Democratic Republic, a high treatment failure rate was observed with AL in one study in Sekong province in 2017 (17.2%); however, the study was limited to 29 patients. AL was subsequently found to be effective in the Lao People's Democratic Republic provinces of Champassak, Salavan and Savannakhet in 2019, with failure rates of 5% or less. TES of AS-MQ were conducted in Cambodia and Viet Nam, where treatment failure rates were less than 2% in all studies. TES of AS-PY were conducted in Cambodia, the Lao People's Democratic Republic and Viet Nam; treatment failure rates were 5% or less in all studies. High rates of treatment failure were detected with DHA-PPQ in Cambodia, the Lao People's Democratic Republic and Viet Nam, as shown in **Fig. 9.1**. In Cambodia, the findings prompted the replacement of DHA-PPQ with

FIG. 9.1.

Treatment failure rates among patients infected with *P. falciparum* and treated with DHA-PPQ in Cambodia, the Lao People's Democratic Republic and Viet Nam (2015–2020), among studies with at least 20 patients *Source: WHO global database on antimalarial drug efficacy and resistance.*



DHA-PPQ: dihydroartemisinin-piperaquine; *P. falciparum*: *Plasmodium falciparum*; WHO: World Health Organization.

AS-MQ as the first-line treatment in 2016. In Viet Nam, AS-PY has replaced DHA-PPQ in provinces where high treatment failure rates were detected.

An analysis of molecular markers in Cambodia provides insight into the genetic background of the changing trends in antimalarial drug sensitivity in that country. It appears that the percentage of samples with the *PfKelch13* mutation C580Y and *Pfplasmepsin* multiple copy numbers is decreasing (**Fig. 9.2a-b**). In contrast, studies have found a high percentage of samples with *Pfmdr1* multiple copy numbers and *PfKelch13* wild type (**Fig. 9.2c-d**). The presence of *Pfmdr1* multiple copy numbers has thus far not affected AS-MQ efficacy. Wild-type parasites were found in 29.9% of samples in Cambodia, the Lao People's Democratic Republic and Viet Nam. The most prevalent markers of artemisinin resistance in these countries are R539T, C580Y, Y493H, P553L and C469F.

The presence of a triple mutant, comprising *Pfplasmepsin* and *Pfmdr1* multiple copy numbers and the *PfKelch13* C580Y mutant allele (*85*), will be a challenge for the proposed DHA-PPQ+MQ triple combination therapy. The success of an alternate triple therapy, AL+AQ, will depend on the efficacy of AS-AQ and AL in the region. The presence of AQ resistance was documented in Cambodia in 2016–2017, demonstrated

FIG. 9.2.

Trends in molecular markers associated with drug resistance, Cambodia 2015–2020, among studies with at least 20 samples *Source: WHO global database on antimalarial drug efficacy and resistance.*

WHO: World Health Organization.

by high treatment failure rates with AS-AQ in the provinces of Pursat (13.8%) and Mondulkiri (22.6%) (*86*).

The first-line treatments for *P. vivax* in the WHO Western Pacific Region are AL (in the Lao People's Democratic Republic, Malaysia, Papua New Guinea, Solomon Islands and Vanuatu), AS-MQ (in Cambodia) and CQ (in China, the Philippines, the Republic of Korea and Viet Nam). Recent TES have demonstrated high efficacy with AL in the Lao People's Democratic Republic in 2019 and with AS-MQ in Cambodia in 2018 and 2020, with treatment failure rates of less than 5%. Studies showed CQ to be effective in 2015 in China and in 2016 in the Philippines. In Viet Nam, one study of CQ found treatment failure rates of 9.8% in 2015.

9.3 VECTOR RESISTANCE TO INSECTICIDES

Vector control has made a remarkable contribution to the reduction of the global malaria burden. The current vector control interventions recommended for large-scale deployment – ITNs and IRS – rely on insecticides. ITNs primarily rely on pyrethroids, whereas most IRS is now conducted with organophosphate and neonicotinoid insecticides. Insecticide resistance in malaria vectors is a recognized threat to global malaria control and elimination efforts. Urgent action is required to slow or prevent the development and further spread of insecticide resistance, including development and evaluation of new insecticides and interventions that aim to maintain effective vector control.

9.3.1 Update on procedures for monitoring insecticide resistance

In 2021, the WHO test procedures were expanded to include discriminating concentrations and procedures for monitoring resistance in malaria vectors against chlorfenapyr, clothianidin, transfluthrin, flupyradifurone and pyriproxyfen. In addition, discriminating concentrations for pirimiphos-methyl and alpha-cypermethrin were revised. An update to the WHO test procedures to include this latest guidance is underway and will be published by the end of 2021. Countries should adjust their monitoring of insecticide resistance in malaria vectors to align with these new procedures.

9.3.2 Update on data reporting

During 2010–2020, 88 countries, 85 of which are currently malaria endemic, reported insecticide resistance data for *Anopheles* mosquitoes to WHO. The geographical extent and consistency of insecticide resistance reporting varied considerably between countries. Although the number of sites reporting insecticide resistance data has increased since 2010, the number of sites reporting these data in each country continued to vary greatly; at present it ranges from 1 to 334 sites per country. Regular reporting to WHO continues to be an obstacle to monitoring trends in insecticide resistance. Of the malaria endemic countries, only 28 countries consistently reported resistance monitoring results every year over the past 3 years, and only 16 reported resistance data every year for the past 10 years.

More than 90% of the data reported by countries since 2010 were generated using resistance bioassays. The proportion of data derived from resistance intensity or PBO synergist bioassays has increased since 2016. Data on pyrethroids account for more than 50% of all bioassay results reported to WHO since 2010. Between 2010 and 2020, a total of 38 countries reported data on the intensity of resistance to pyrethroids, and 32 countries reported data on the ability of PBO to restore susceptibility to pyrethroids. Reporting on organophosphate resistance has increased over time; however, reporting for carbamates and the organochlorine insecticide dichlorodiphenyl-trichloroethane (DDT) has decreased, presumably because of significantly decreased use of these classes of insecticides. The number of countries that reported insecticide resistance test results for carbamate insecticides declined from 40 in 2014 to 16 in 2020. The number of countries that reported insecticide resistance test results for DDT declined from 44 in 2014 to 10 in 2020.

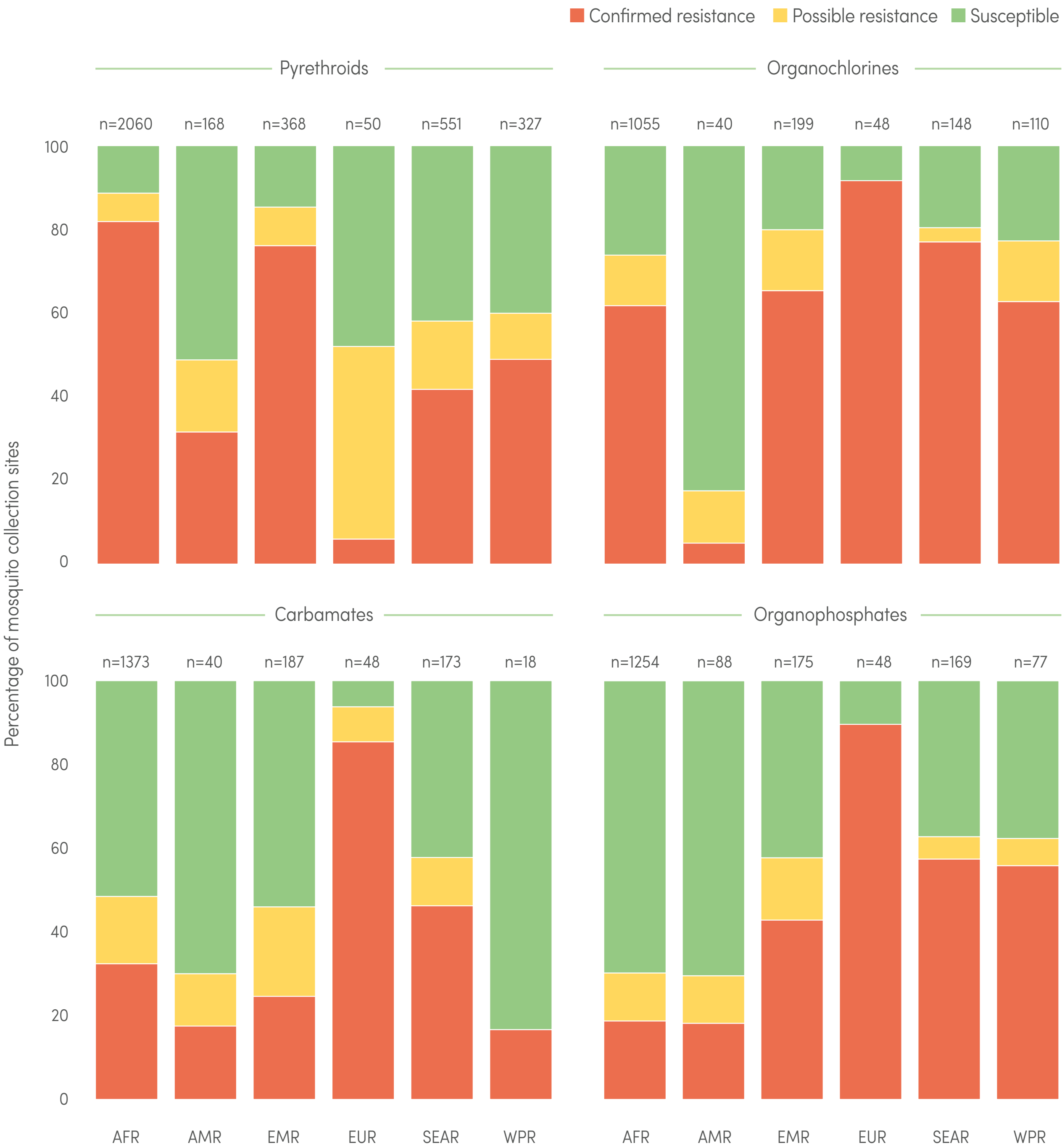
9.3.3 Update on insecticide resistance

Of the 88 countries that reported insecticide resistance monitoring data to WHO from 2010 to 2020, 78 confirmed resistance to at least one insecticide in one malaria vector species from one mosquito collection site. Of these countries, 29 confirmed resistance to four insecticide classes – pyrethroids, organophosphates, carbamates and organochlorines – in at least one malaria vector species across different sites in the country (**Fig. 9.3**). Of these 29, 19 identified at least one site where resistance was confirmed for all these four classes in at least one local vector.

Globally, resistance to pyrethroids was detected in at least one malaria vector in 87% of the countries and 68% of the sites, to organochlorines in 82% of the countries and 64% of the sites, to carbamates in 69% of the countries and 34% of the sites, and to organophosphates in 60% of the countries and 28% of the sites.

FIG. 9.3.

Reported insecticide resistance status as a proportion of sites for which monitoring was conducted, by WHO region, 2010–2020, for pyrethroids, organochlorines, carbamates and organophosphates Status was based on mosquito mortality where <90% = confirmed resistance, 90–97% = possible resistance, and ≥98% = susceptible. Where multiple insecticide classes or types, mosquito species or time points were tested at an individual site, the highest resistance status was considered. Numbers above bars indicate the total number of sites for which data were reported. *Sources: reports from NMPs and national health institutes, their implementation partners, research institutions and scientific publications.*



AFR: WHO African Region; AMR: WHO Region of the Americas; EMR: WHO Eastern Mediterranean Region; EUR: WHO European Region; n: number; NMP: national malaria programme; SEAR: WHO South-East Asia Region; WHO: World Health Organization; WPR: WHO Western Pacific Region.

Resistance to these four insecticide classes was confirmed in all WHO regions but its geographical extent varied considerably between regions (**Fig. 9.4**). Maps showing the status of resistance to different insecticides at each site are available in the Malaria Threats Map application.

Of the 38 countries that reported data on the intensity of pyrethroid resistance, high intensity resistance was detected in 27 countries and 293 sites, moderate to high intensity resistance in 34 countries and 406 sites, and moderate intensity resistance in 21 countries and 78 sites. High intensity resistance to pyrethroids has been detected in west Africa more frequently than in other regions.

Between 2019 and 2020, WHO Member States reported results of 835 bioassays conducted with chlorfenapyr and 603 with clothianidin. None of the tests with clothianidin were conducted using the recently established standard WHO concentrations and procedures; hence, interpretation of the data so far reported to WHO is not feasible. For chlorfenapyr, WHO requirements are more elaborate than for previous procedures for testing of mosquito resistance to other insecticides. Specifically, bottles need to be coated with 1 mL of chlorfenapyr-acetone mixture at the discriminating dose 24 hours before the test; tests need to be conducted strictly within a temperature range of 27±2 °C and a humidity range of 80%±10%; mosquito mortality has to be measured 72 hours after exposure in bottles; and a susceptible colony has to be tested in parallel to the wild mosquitoes. Resistance can only be confirmed when mortality in the exposed wild vector population 72 hours after exposure is less than 90% and mortality in the susceptible colony tested in parallel is more than 98%; the same mortality must be recorded in at least three bioassays conducted at the same site with the same wild vector population at different time points. To date, WHO has received results from 80 tests conforming to these requirements, conducted in 62 sites across seven countries. Until three complete tests are available from each of these sites, WHO cannot interpret these results.

Results of biochemical and molecular assays to detect metabolic resistance mechanisms were available for 35 countries and 364 sites for the period 2010–2020. Mono-oxygenases were detected in 68.3% of the sites for which reports were available, glutathione *S*-transferases were detected in 81.9% of the sites, esterases in 78.5% of the sites and acetylcholinesterases in 73.5% of the sites. Results of assays to detect target-site resistance mechanisms were available for 40 countries and 596 sites. *Kdr L1014F* was detected in 76.0% of the sites and *Kdr L1014S* in 53.1% of the sites.

Insecticide resistance data collected using WHO procedures are included in the WHO global database on insecticide resistance (*87*) and are publicly available via the Malaria Threats Map (*65*). This tool provides a summary table showing the status of phenotypic resistance and resistance mechanisms by country; presents maps to inform discussions on the deployment of pyrethroid-PBO nets; allows selected datasets to be downloaded; and includes an animation of insecticide resistance evolution over time, according to reports received by WHO.

Update on ability of PBO to restore susceptibility to pyrethroids

The number of countries and sites reporting results on the ability of PBO to restore susceptibility to pyrethroids continues to increase. Four more countries reported such data in 2020, and the number of sites from which reports were received almost doubled. Of the 32 countries and 613 sites that reported data between 2010 and 2020, full restoration of pyrethroid susceptibility was detected in 29 countries and 283 sites, partial restoration was detected in 29 countries and 409 sites, and no restoration was detected in 15 countries and 100 sites. These data are important to guide the deployment of PBO nets in countries.

Monitoring insecticide resistance

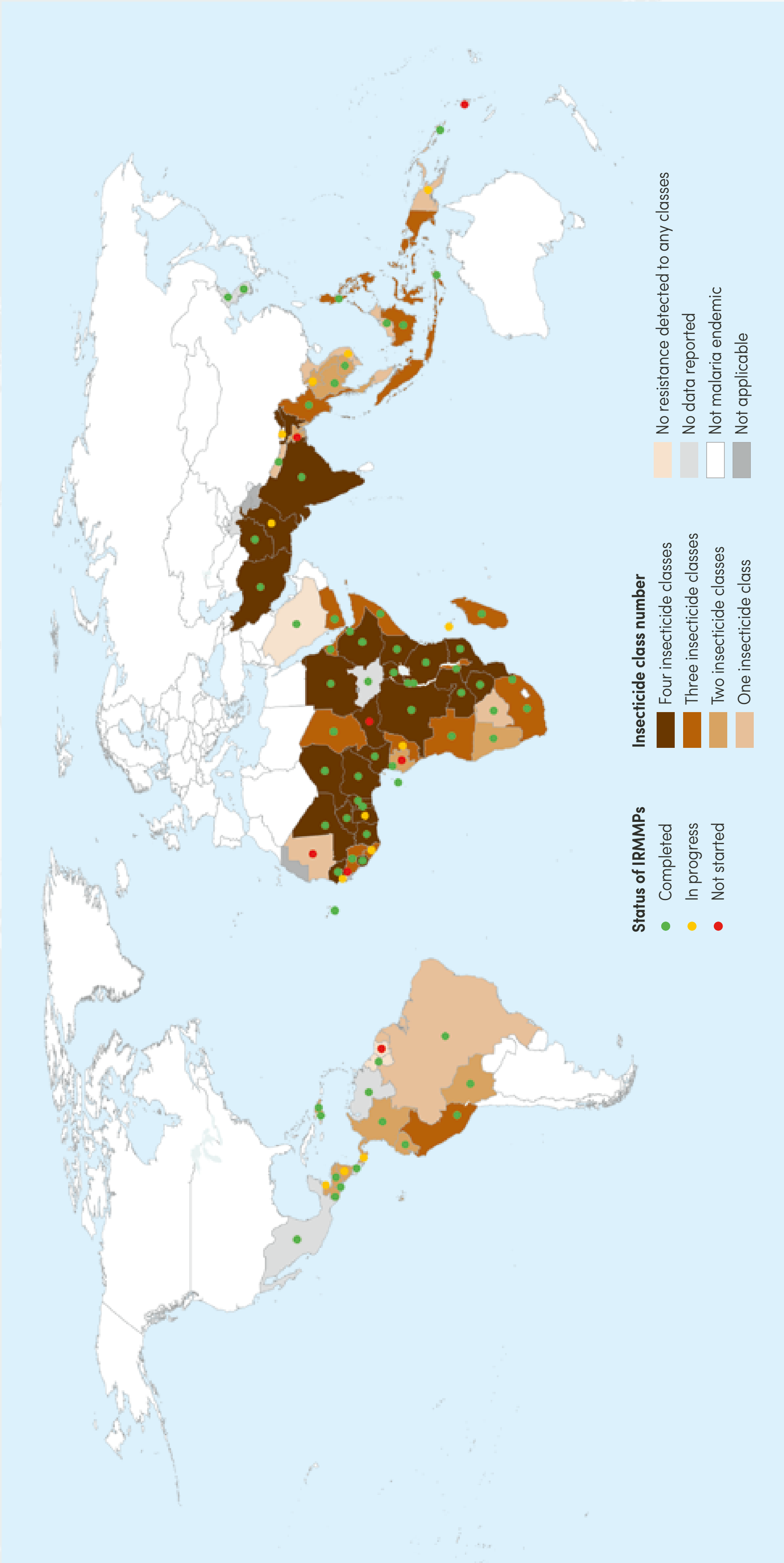
Interventions that rely on insecticides are only fully effective when local vectors are susceptible to the insecticides used on them. Thus, the selection of vector control interventions should ideally be based on representative data on the susceptibility of local vectors to the insecticide(s) deployed. In addition, insecticide resistance data provide an important contribution to datasets compiled to investigate suboptimal performance of malaria control interventions in a given area. To contribute towards such monitoring or investigational undertakings, countries and their partners are advised to conduct regular insecticide resistance monitoring following the WHO *Test procedures for insecticide resistance monitoring in malaria vector mosquitoes* (*88*), and to report and share results in a timely manner with WHO. To facilitate reporting, WHO has developed data reporting templates and District Health Information Software 2 (DHIS2) modules (*89*) for use by Member States and their implementing partners, and is supporting their rollout.

Mitigating and managing insecticide resistance

Malaria programmes using insecticide-based vector control interventions to control malaria should develop an insecticide resistance monitoring and management

FIG. 9.4.

Number of classes to which resistance was confirmed in at least one malaria vector in at least one monitoring site, 2010–2020 *Sources: reports from NMPs and national health institutes, their implementation partners, research institutions and scientific publications.*



IRMMP: insecticide resistance monitoring and management plan; NMP: national malaria programme.

plan. This plan should aim to delay the emergence of resistance, or, if resistance has already been detected, to strategically deploy available interventions in the most efficient way to maintain effective malaria control. WHO provides guidance to develop such plans through its *Framework for a national plan for monitoring and management of insecticide resistance in malaria vectors* (*90*).

By 2020, many countries had made considerable progress in developing an insecticide resistance monitoring and management plan; 70 countries reported having a national plan, compared with 54 in 2019, and 17 are in the process of developing a plan. Unfortunately, countries have reported difficulties in implementing their plans due to funding and logistical challenges. Further technical and funding support will be required to ensure that all malaria endemic countries have a resistance management plan in place, that it is regularly updated and that the resources required to implement it are made available.

Since 2017, two new vector control interventions have been recommended by WHO for malaria vector control and their associated products have been prequalified. The interventions – pyrethroid-PBO nets and neonicotinoid insecticides for IRS – should be considered as part of an insecticide resistance management plan. According to data provided by manufacturers, between 2018 and 2020, pyrethroid-PBO nets were shipped to 40 different malaria endemic countries, accounting for 10% of all nets shipped during that period. In 2020 alone, pyrethroid-PBO nets were shipped to 30 countries, accounting for 19% of all nets shipped that year. During the same year, 10 countries used clothianidin-containing products for IRS. Several other new vector control interventions are undergoing evaluation and will be considered for recommendation once evidence of epidemiological impact against malaria is available and a WHO recommendation supporting their deployment has been developed. Maps showing sites where criteria for PBO targeting are met are available in a dedicated section of the Malaria Threats Map that will be expanded to include similar resources for new vector control interventions once relevant data are available.

9.4 *ANOPHELES STEPHENSI* INVASION AND SPREAD

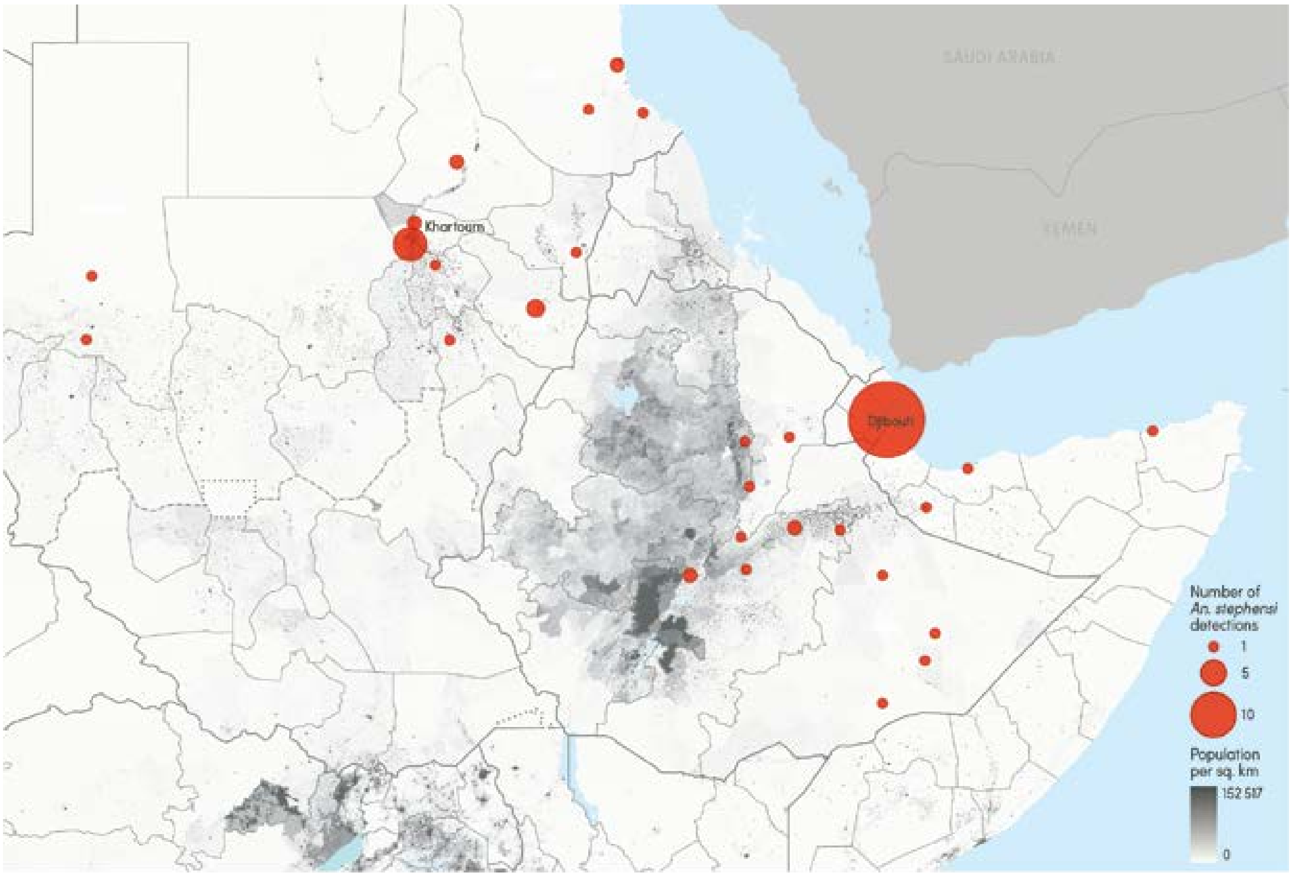
An. stephensi is an efficient vector of both *P. falciparum* and *P. vivax* parasites. It was originally native to parts of Asia and the Arabian Peninsula, where it is a major malaria vector in rural and urban areas. In 2012, it was detected in Djibouti and was implicated in two consecutive malaria outbreaks (*91*). Since then, it has continued to spread in the Horn of Africa. To date, WHO has received reports of *An. stephensi* detections from 46 different sites across Djibouti, Ethiopia, Somalia and the Sudan (**Fig. 9.5**).

The characteristics of this vector make its control challenging. *An. stephensi* breeds in human-made water storage containers in urban areas and appears to quickly adapt itself to the local environment (including cryptic habitats such as deep wells). It also survives extremely high temperatures during the dry season, when malaria transmission usually reaches a seasonal low. Insecticide resistance data reported to WHO show that *An. stephensi* has exhibited resistance to pyrethroids, organophosphates, carbamates and organochlorines in the Arabian Peninsula and Asia. In the Horn of Africa, it has exhibited resistance to pyrethroids, organophosphates and carbamates.

An. stephensi poses a threat to malaria control and elimination in Africa, the Arabian Peninsula and southern Asia. If uncontrolled, its spread across the Horn of Africa, combined with rapid and poorly planned urbanization, may increase the risk of malaria outbreaks in African cities. WHO therefore encourages countries where *An. stephensi* invasion is suspected or has been confirmed to take immediate action. WHO recommends that countries conduct vector surveillance to delineate the geographical spread of this vector, and use the data to implement interventions aimed at preventing its further spread, especially into urban and periurban areas. Research institutions and implementation partners are encouraged to immediately report any detection of *An. stephensi* to ministries of health and WHO, to inform national and global responses. Further guidance on how to monitor and control *An. stephensi* is provided in the relevant WHO vector alert (*92*).

FIG. 9.5.

Detections of *An. stephensi* in the Horn of Africa reported to WHO since 2012 *Sources: reports from NMPs and national health institutes, their implementation partners, research institutions, scientific publications and WorldPop (93, 94).*



An. stephensi: Anopheles stephensi; NMP: national malaria programme; WHO: World Health Organization.

10 KEY FINDINGS AND CONCLUSION

The world malaria report tracks progress in several important health and development goals in the global efforts to reduce the burden of malaria overall and eliminate the disease where possible. These goals are outlined in the SDG framework (*1*), the WHO GTS (*2*) and the RBM Partnership to End Malaria *Action and investment to defeat malaria 2016–2030* (*3*).

In this year's report, the estimates of the malaria burden for the target year 2020 take into account the impact of service disruptions during the COVID-19 pandemic. In addition, WHO has changed its method for quantifying the CoD fraction in children aged under 5 years (*37*); this change has raised the point estimate of the number of malaria deaths across the period 2000–2020, independent of the impact of malaria service disruptions during the COVID-19 pandemic. The report also has a new subsection on severe malaria in children in areas of sub-Saharan Africa, looking at variation in clinical features by endemicity and at changes in age patterns due to changes in malaria transmission. An updated analysis of progress – globally, and by region and country – towards the GTS milestones for 2020 and for the trajectory towards 2025 and 2030 is presented. The report also presents information on overall access to and use of malaria interventions, and key biological threats.

10.1 COUNTRIES MADE STRENUOUS AND IMPRESSIVE EFFORTS TO MITIGATE THE IMPACT OF SERVICE DISRUPTIONS DURING THE COVID-19 PANDEMIC

During the COVID-19 pandemic, countries and their partners mounted an urgent and strenuous response, adapting WHO guidance on maintaining essential services. At the same time, several countries were dealing with humanitarian emergencies unrelated to the pandemic. Despite their commendable response to the pandemic and other emergencies, many countries experienced disruptions to malaria prevention, diagnosis and treatment.

Nearly three quarters of the ITNs planned for distribution through mass campaigns reached their target communities, although distribution was often delayed. In 13 of the 31 countries (42%) that had planned ITN distribution campaigns, those campaigns spilled over to 2021. Many countries in sub-Saharan Africa showed a decline in outpatient attendance and malaria testing during the initial phase of the pandemic, and reductions generally coincided with peaks in COVID-19 transmission. Selected health facilities were tracked in 23 high-burden countries, 15 of which saw reductions of more than 20% in malaria tests performed in April–June 2019 compared with the same period in 2020. Levels of malaria testing improved considerably in the latter part of 2020 through to 2021. In terms of global disruptions to malaria treatment, NMPs distributed about 48 million fewer courses of ACTs in 2020 than in 2019. Sixty-five malaria endemic countries responded to two rounds of WHO surveys to track disruptions in essential health services during 2020. Many of those countries reported partial disruptions (of up to 50%) to the provision of malaria treatment. However, most countries that provide SMC and IRS to their communities continued to do so in 2020.

10.2 MALARIA IS AN ACUTE DISEASE AND EVEN MODERATE DISRUPTIONS IN SERVICES HAVE A CONSIDERABLE IMPACT ON THE BURDEN OF MALARIA

Disruptions in the delivery of malaria services had a major effect, contributing to considerable increases in numbers of malaria cases (14 million) and deaths (69 000) between 2019 and 2020. This highlights the consequences of even moderate service disruptions to malaria services in large populations at risk where there is substantial malaria transmission. Despite these increases in the burden of malaria, country efforts averted the worst-case scenario projected by WHO early in the COVID-19 pandemic – the prediction was that malaria deaths could double if malaria services were severely disrupted. At country level, the biggest increases in burden due to disruptions during the COVID-19 pandemic occurred in the moderate and high transmission countries in sub-Saharan Africa, where there was an estimated 13% increase in malaria deaths in 2020 compared with 2019.

10.3 NEW WHO METHODOLOGY FOR QUANTIFYING CoD IN CHILDREN AGED UNDER 5 YEARS SUGGESTS THAT MALARIA HAS HAD A BIGGER TOLL ON CHILDREN THAN PREVIOUSLY ESTIMATED

This year's report applied the results from a new statistical method, developed by WHO and partners, to calculate the number of malaria deaths since 2000 among children aged under 5 years. WHO is using this new methodology for the estimation of various diseases in young children. The new method provides more precise CoD estimates for all key childhood diseases, including malaria; for example, it has increased the malaria attributable fraction of deaths in children aged under 5 years, globally, from 4.8% to 7.8% for 2019. The change in method affected 32 sub-Saharan African countries that account for over 93% of malaria deaths globally, and it revealed higher numbers of estimated malaria deaths across the entire period 2000–2020, compared with previous analyses. In 2020, there were an estimated 627 000 malaria deaths worldwide. Although the estimates of malaria deaths shifted upwards over the period 2000–2020, the trend remained largely similar to estimates derived from previous methods, with the exception of adjustments for the impact of disruptions during the COVID-19 pandemic.

10.4 THE COVID-19 PANDEMIC STARTED AT A TIME WHEN THE PROGRESS IN MALARIA HAD PLATEAUED AND A GLOBAL RESPONSE WAS TAKING SHAPE

Even before the emergence of COVID-19, global gains against malaria were levelling off, and the world was not on track to reach the 2020 milestones of the GTS. To reinvigorate progress, WHO and partners catalysed HBHI, a new, country-driven approach to malaria control in high-burden countries. The new approach, which had started to gain momentum when COVID-19 struck, has led to an extensive exercise of subnational tailoring of interventions in the 11 highest burden countries globally, informing new national strategic plans and the development of funding proposals to governments and donors. However, as countries were planning to scale up interventions defined in the new strategic plans, the pandemic started, thwarting their efforts. These challenges will continue as the pandemic continues, especially as new variants of the virus emerge and lead to new waves of transmission. Nonetheless, the experience of the HBHI approach, based on demand from countries, will be expanded to several other moderate and high transmission malaria endemic countries.

10.5 DESPITE THE STALLING OF PROGRESS AND DISRUPTIONS DURING THE PANDEMIC, SOME COUNTRIES CONTINUE TO MAKE PROGRESS

On a global scale, progress against malaria remains uneven, despite the pandemic. In particular, countries with a relatively low burden and with relatively strong health systems continue to make progress, with many moving steadily towards the goal of malaria elimination. In 2020, there were 47 countries with fewer than 10 000 cases. Two countries – China and El Salvador – were certified malaria free by WHO in 2021. India, one of the highest burden countries globally, reported reductions in malaria burden between 2019 and 2020, although the rate of reduction was lower than it had been before the pandemic.

10.6 THERE ARE SIGNIFICANT AND GROWING COVERAGE GAPS FOR WHO-RECOMMENDED TOOLS

Global progress against malaria over the past 2 decades was achieved, in large part, through the massive scale-up and use of WHO-recommended tools that prevent, detect and treat the disease. The most recent data demonstrate these gains, while also highlighting the significant and sometimes widening gaps in access to life-saving tools for people at risk of malaria, even before the pandemic. ITN coverage in sub-Saharan Africa has been declining since 2017. This decline may partly reflect better targeting of ITNs, which is masked by the use of the national population at risk as a denominator. However, in a few high-burden countries, declines have also been observed in areas that would benefit from improved ITN coverage. The proportion of the population in malaria endemic countries protected with IRS has fallen steadily over time, and access to malaria diagnosis remains modest in most of sub-Saharan Africa. However, the scaling-up of SMC since 2012 saw an additional 11.8 million children receiving treatment in 2020 compared with 2019, mainly due to the expansion of SMC to new areas in Nigeria.

10.7 CONVERGENCE OF THREATS COULD THWART THE FIGHT AGAINST MALARIA IN SUB-SAHARAN AFRICA

Despite the impressive progress for most of the past 2 decades, the situation remains concerning, especially in sub-Saharan Africa, where the malaria burden remains unacceptably high and rose in most countries in 2020. A convergence of threats poses an added challenge to disease control efforts; these threats include biological threats (e.g. *pfhrp2/3* deletions), invasion of *An. stephensi* in the Horn of Africa, increasing insecticide resistance and humanitarian emergencies. Also of great concern are the recent reports of the emergence of partial artemisinin resistance, independently, in areas of sub-Saharan Africa. The first-line ACTs remain efficacious in all countries in this region, and although there is no immediate cause for alarm, WHO will urgently work with countries and partners to develop an effective response plan. At the same time, the COVID-19 pandemic continues, and the pace of economic recovery is uncertain and has reversed in malaria endemic during the first year of the pandemic. Without immediate and accelerated action, key 2030 targets of the GTS will be missed, and additional ground may be lost.

10.8 WHAT IS NEEDED TO REACH GLOBAL MALARIA TARGETS

In 2021, WHO updated the GTS to reflect lessons learned over the past 5 years (*5*). The updated strategy reflects lessons learned from the global malaria response over the period 2016–2020, including stalled progress, the HBHI approach and the COVID-19 pandemic. The strategy's guiding principles provide a roadmap for getting the world back on track for the GTS milestones and, in particular the 2030 targets:

- *Tailor malaria responses to local settings* – The updated GTS advises countries to move away from a "one-size-fits-all" approach to malaria control, and instead to apply an optimal mix of tools tailored to local settings for maximum benefit. By adopting this more targeted, data-driven approach, countries can maximize available resources while ensuring efficiency and equity in their malaria responses. Improving the process of subnational tailoring requires more and better data, and urgent and substantive investments in surveillance systems, including civil and vital registration systems, and innovative approaches to community surveys.
- *Harness innovation* – Investment is needed to accelerate R&D. No single tool that is available today will solve the problem of malaria in moderate and high burden settings. Investments that will bring new diagnostics, vector control approaches, antimalarial medicines and vaccines will be needed to speed the pace of progress against malaria and attain global targets. This report estimates that US$ 8.5 billion will be needed for R&D between 2021 and 2030, an average annual investment of US$ 851 million, compared with the US$ 619 million invested in 2020.

  Harnessing innovation also requires the rapid expansion of new innovative and impactful tools, such as RTS,S, the world's first WHO-recommended malaria vaccine; by inducing human immunity, the vaccine acts in a different and synergistic way to other malaria prevention interventions. Investment in RTS,S will also provide lessons for the future scale-up of more efficacious malaria vaccines within Expanded Programme of Immunization (EPI) platforms.
- *Strengthen health systems* – Continued progress against malaria, a disease that places nearly half the world's population at risk, depends on an accelerated response in the face of a global pandemic and other growing threats. That response must be anchored in strong health systems, funded and equipped to deliver quality health care to all.

The control and elimination of malaria depends on resolute political commitment to universal health care, inclusive of malaria prevention, diagnosis and treatment, as part of both primary health care systems and broader development initiatives.

- *Ensure robust global malaria funding* – According to this report, 2020 funding for malaria control and elimination was estimated at US$ 3.3 billion compared with a target of US$ 6.8 billion. To reach the 2030 global malaria targets, current funding levels will need to more than triple, to US$ 10.3 billion per year. Sources of funding for malaria control and elimination have remained relatively constant over the past 10 years. In both 2020 and the period 2010–2020, domestic funding by malaria endemic countries accounted for almost one third of all funding, and international sources accounted for just over two thirds. The ability of malaria endemic countries to expand domestic investments has been hampered by the severe economic downturn in many of these countries during the COVID-19 pandemic. Greater sectoral efficiencies within countries and increased global funding for malaria are critical if the global GTS targets for 2030 are to be achieved.

References

1. Sustainable development goals: 17 goals to transform our world [website]. United Nations; 2015 (https://www.un.org/sustainabledevelopment/sustainable-development-goals).
2. Global technical strategy for malaria 2016–2030. Geneva: World Health Organization; 2015 (http://apps.who.int/iris/bitstream/handle/10665/176712/9789241564991_eng.pdf;jsessionid=02F0657EB47EB043AD211FC20B1E2F1F?sequence=1).
3. Roll Back Malaria Partnership Secretariat. Action and investment to defeat malaria 2016–2030. For a malaria-free world. Geneva: World Health Organization; 2015 (https://endmalaria.org/sites/default/files/RBM_AIM_Report_0.pdf).
4. World malaria report 2020. Geneva: World Health Organization; 2020 (https://www.who.int/publications-detail-redirect/9789240015791).
5. Global technical strategy for malaria 2016–2030, 2021 update. Geneva: World Health Organization; 2021 (https://www.who.int/publications/i/item/9789240031357).
6. RBM Partnership Strategic Plan 2021–25. Geneva: RBM Partnership to End Malaria Strategy; 2020 (https://endmalaria.org/sites/default/files/RBM%20Partnership%20to%20End%20Malaria%20Strategic%20plan%20for%202021-2025_web_0.pdf).
7. Global Fund Strategy 2023–2028 [website]. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2021 (https://www.theglobalfund.org/en/strategy/).
8. Where we work [website]. Washington, DC: United States President's Malaria Initiative; 2021 (https://www.pmi.gov/where-we-work/).
9. End malaria faster. Washington, DC: United States President's Malaria Initiative; 2021 (https://d1u4sg1s9ptc4z.cloudfront.net/uploads/2021/10/10.04Final_USAID_PMI_Report_50851.pdf).
10. WHO guidelines for malaria. Geneva: World Health Organization; 2021 (https://app.magicapp.org/#/guideline/5700).
11. WHO. Malaria vaccine: WHO position paper - January 2016. Wkly Epidemiol Rec. No 4, 2016; 91:33-52. (https://www.who.int/wer/2016/wer9104.pdf).
12. WHO recommends groundbreaking malaria vaccine for children at risk. Geneva: World Health Organization; 2021 (https://www.who.int/news/item/06-10-2021-who-recommends-groundbreaking-malaria-vaccine-for-children-at-risk).
13. The RTS,S malaria vaccine. Geneva: World Health Organization; 2021 (https://www.who.int/multi-media/details/the-rts-s-malaria-vaccinev2).
14. Uwimana A, Legrand E, Stokes BH, Ndikumana JM, Warsame M, Umulisa N et al. Emergence and clonal expansion of in vitro artemisinin-resistant Plasmodium falciparum kelch13 R561H mutant parasites in Rwanda. Nat Med. 2020;26(10):1602–8 (https://pubmed.ncbi.nlm.nih.gov/32747827/).
15. Asua V, Conrad MD, Aydemir O, Duvalsaint M, Legac J, Duarte E et al. Changing prevalence of potential mediators of aminoquinoline, antifolate, and artemisinin resistance across Uganda. J Infect Dis. 2021;223(6):985–94 (https://pubmed.ncbi.nlm.nih.gov/33146722/).
16. Rasmussen C, Alonso P, Ringwald P. Current and emerging strategies to combat antimalarial resistance. Expert Rev Anti Infect Ther. 2021:1–20 (https://pubmed.ncbi.nlm.nih.gov/34348573/).
17. Country health cluster / sector dashboard, December 2020. Geneva: World Health Organization; 2020 (https://www.who.int/health-cluster/countries/GHC-dashboard-Q4-2020-final.pdf).
18. History of Ebola virus disease (EVD) outbreaks [website]. Atlanta: Centers for Disease Control and Prevention (CDC); 2021 (https://www.cdc.gov/vhf/ebola/history/chronology.html).
19. Rentschler J, Salhab M. People in harm's way. Flood exposure and poverty in 189 countries. Policy Research Working Paper 9447. Washington, DC: World Bank; 2020 (https://documents1.worldbank.org/curated/en/669141603288540994/pdf/People-in-Harms-Way-Flood-Exposure-and-Poverty-in-189-Countries.pdf).
20. Mwananyanda L, Gill CJ, MacLeod W, Kwenda G, Pieciak R, Mupila Z et al. Covid-19 deaths in Africa: prospective systematic postmortem surveillance study. BMJ. 2021;372:n334 (https://www.bmj.com/content/372/bmj.n334).
21. Status of COVID-19 vaccines within WHO EUL/PQ evaluation process. Geneva: World Health Organization; 2021 (https://extranet.who.int/pqweb/sites/default/files/documents/Status_COVID_VAX_29Sept2021_0.pdf).
22. Gavi. COVAX [website]. 2021 (https://www.gavi.org/covax-facility).
23. Coronavirus disease (COVID-19) dashboard [website]. Geneva: World Health Organization; 2021 (https://covid19.who.int/).
24. Tailoring malaria interventions in the COVID-19 response. Geneva: World Health Organization; 2020 (https://www.who.int/docs/default-source/documents/publications/gmp/tailoring-malaria-interventions-covid-19.pdf).
25. COVID-19: operational guidance for maintaining essential health services during an outbreak: interim guidance, 25 March 2020. Geneva: World Health Organization; 2020 (https://apps.who.int/iris/handle/10665/331561).
26. The potential impact of health service disruptions on the burden of malaria. A modelling analysis for countries in sub-Saharan Africa. Geneva: World Health Organization; 2020 (https://www.who.int/publications-detail-redirect/9789240004641).

27. Global Fund thanks the United States for US$3.5 billion emergency investment to fight COVID-19. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2021 (https://www.theglobalfund.org/en/news/2021-03-11-global-fund-thanks-the-united-states-for-usd3-5-billion-emergency-investment-to-fight-covid-19/).

28. Our response to COVID-19. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2021 (https://www.theglobalfund.org/en/covid-19/).

29. Statistics and research: coronavirus (COVID-19) vaccinations [website]. Oxford: Our World in Data; 2021 (https://ourworldindata.org/covid-vaccinations).

30. Second round of the national pulse survey on continuity of essential health services during the COVID-19 pandemic. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/bitstream/handle/10665/340937/WHO-2019-nCoV-EHS-continuity-survey-2021.1-eng.pdf?sequence=1&isAllowed=y).

31. Global Fund survey: majority of HIV, TB and malaria programs face disruptions as a result of COVID-19. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2020 (https://www.theglobalfund.org/en/covid-19/news/2020-06-17-global-fund-survey-majority-of-hiv-tb-and-malaria-programs-face-disruptions-as-a-result-of-covid-19/).

32. Global malaria dashboard [website]. Geneva: RBM Partnership to End Malaria; 2020 (https://endmalaria.org/dashboard).

33. End-use verification survey. Washington, DC: USAID Global Health Supply Chain Program; 2021 (https://www.ghsupplychain.org/euvsurvey).

34. AMP [website]. Geneva: The Alliance for Malaria Prevention (AMP); 2021 (https://allianceformalariaprevention.com/).

35. Pulse survey on continuity of essential health services during the COVID-19 pandemic: interim report, 27 August 2020. Geneva: World Health Organization; 2020 (https://www.who.int/publications/i/item/WHO-2019-nCoV-EHS_continuity-survey-2020.1).

36. Liu L, Oza S, Hogan D, Perin J, Rudan I, Lawn JE et al. Global, regional, and national causes of child mortality in 2000–13, with projections to inform post-2015 priorities: an updated systematic analysis. Lancet. 2015;385(9966):430–40.

37. Perin J, Mulick A, Yeung D, Villavicencio F, Lopez G, Strong K L et al. Global, regional, and national causes of under-5 mortality in 2000–19: an updated systematic analysis with implications for the Sustainable Development Goals. Lancet. 2021; S2352-4642(21)00311-4.

38. Greenwood B, Marsh K, Snow R. Why do some African children develop severe malaria? Parasitol Today. 1991;7(10):277–81 (https://www.sciencedirect.com/science/article/abs/pii/0169475891900967).

39. Kamau A, Akech S, Mpimbaza A, Khazenzi C, Ogweru M, Mumo E et al. Malaria hospitalisation in East Africa: age, phenotype and transmission intensity. BMC Med. In press.

40. Severe malaria. Trop Med Int Health. 2014;19 Suppl 1:7–131 (https://pubmed.ncbi.nlm.nih.gov/25214480/).

41. Marsh K, Forster D, Waruiru C, Mwangi I, Winstanley M, Marsh V et al. Indicators of life-threatening malaria in African children. NEJM. 1995;332(21):1399–404 (https://pubmed.ncbi.nlm.nih.gov/7723795/).

42. Bejon P, Berkley JA, Mwangi T, Ogada E, Mwangi I, Maitland K et al. Defining childhood severe falciparum malaria for intervention studies. PLoS Med. 2007;4(8):e251 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1949845/).

43. Guinovart C, Sigaúque B, Bassat Q, Loscertales MP, Nhampossa T, Acácio S et al. The changing epidemiology of severe malaria: twenty years of malaria admissions at Manhiça district hospital, Mozambique. Lancet Glob Health. Under review.

44. Guinovart C, Bassat Q, Sigaúque B, Aide P, Sacarlal J, Nhampossa T et al. Malaria in rural Mozambique. Part I: children attending the outpatient clinic. Malar J. 2008;7:36 (https://pubmed.ncbi.nlm.nih.gov/18302770/).

45. Galatas B, Guinovart C, Bassat Q, Aponte JJ, Nhamússua L, Macete E et al. A prospective cohort study to assess the micro-epidemiology of *Plasmodium falciparum* clinical malaria in Ilha Josina Machel (Manhiça, Mozambique). Malar J. 2016;15(1):444 (https://pubmed.ncbi.nlm.nih.gov/27577880/).

46. Bassat Q, Guinovart C, Sigaúque B, Aide P, Sacarlal J, Nhampossa T et al. Malaria in rural Mozambique. Part II: children admitted to hospital. Malar J. 2008;7:37 (https://pubmed.ncbi.nlm.nih.gov/18302771/).

47. World malaria report 2019. Geneva: World Health Organization; 2019 (https://www.who.int/publications/i/item/9789241565721).

48. Walker PG, ter Kuile FO, Garske T, Menendez C, Ghani AC. Estimated risk of placental infection and low birthweight attributable to *Plasmodium falciparum* malaria in Africa in 2010: a modelling study. Lancet Glob Health. 2014;2(8):e460–7 (https://pubmed.ncbi.nlm.nih.gov/25103519).

49. Walker PG, Griffin JT, Cairns M, Rogerson SJ, Van Eijk AM, ter Kuile F et al. A model of parity-dependent immunity to placental malaria. Nat Commun. 2013;4(1):1–11 (https://www.nature.com/articles/ncomms2605).

50. Malaria indicator surveys [website]. Rockville, MD: RBM Partnership to End Malaria; 2021 (https://www.malariasurveys.org/).

51. The DHS program: demographic and health surveys [website]. Washington, DC: United States Agency for International Development; 2021 (https://dhsprogram.com/).

52. Total fertility rate (live births per woman) [website]. United Nations Statistics Division; 2021 (http://data.un.org/Data.aspx?d=PopDiv&f=variableID%3A54).

53. El Salvador certified as malaria-free by WHO. Geneva: World Health Organization; 2021 (https://www.who.int/news/item/25-02-2021-el-salvador-certified-as-malaria-free-by-who).

54. High burden to high impact: a targeted malaria response. Geneva: World Health Organization; 2019 (https://www.who.int/publications/i/item/WHO-CDS-GMP-2018.25).

55. Statistics on international development: final UK aid spend 2020. United Kingdom: Foreign, Commonwealth & Development Office; 2020 (https://www.gov.uk/government/statistics/statistics-on-international-development-provisional-uk-aid-spend-2020).

56. Choosing Interventions that are Cost-Effective (WHO-CHOICE) [website]. Geneva: World Health Organization; 2021 (https://www.who.int/teams/health-systems-governance-and-financing/economic-analysis).
57. Malaria: the results. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2021 (https://data.theglobalfund.org/results/Malaria).
58. World Bank country and lending groups [website]. Washington DC: World Bank; 2021 (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups).
59. COVID-19 likely to shrink global GDP by almost one per cent in 2020 [website]. New York: United Nations Department of Economic and Social Affairs; 2020 (https://www.un.org/hi/desa/covid-19-likely-shrink-global-gdp-almost-one-cent-2020).
60. Real GDP growth: annual percent change [website]. Washington, DC: International Monetary Fund; 2021 (https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD).
61. Policy Cures Research: G-FINDER data portal [website]. Sydney, Australia: Policy Cures Research; 2021 (https://gfinderdata.policycuresresearch.org).
62. Malaria Atlas Project [website]. 2021 (https://malariaatlas.org).
63. Gamboa D, Ho MF, Bendezu J, Torres K, Chiodini PL, Barnwell JW et al. A large proportion of P. falciparum isolates in the Amazon region of Peru lack pfhrp2 and pfhrp3: implications for malaria rapid diagnostic tests. PLoS One. 2010;5(1):e8091 (https://www.ncbi.nlm.nih.gov/pubmed/20111602).
64. False-negative RDT results and implications of new reports of P. falciparum histidine-rich protein 2/3 gene deletions. Geneva: World Health Organization; 2017 (https://apps.who.int/iris/bitstream/10665/258972/1/WHO-HTM-GMP-2017.18-eng.pdf).
65. Malaria threats map [website]. Geneva: World Health Organization; 2021 (https://apps.who.int/malaria/maps/threats/).
66. Thomson R, Parr JB, Cheng Q, Chenet S, Perkins M, Cunningham J. Prevalence of Plasmodium falciparum lacking histidine-rich proteins 2 and 3: a systematic review. Bull World Health Organ. 2020;98(8):558 (http://dx.doi.org/10.2471/BLT.20.250621).
67. Iriart X, Menard S, Chauvin P, Mohamed HS, Charpentier E, Mohamed MA et al. Misdiagnosis of imported falciparum malaria from African areas due to an increased prevalence of pfhrp2/pfhrp3 gene deletion: the Djibouti case. Emerg Microbes Infect. 2020;9(1):1984–7 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7534257/).
68. Alemayehu GS, Blackburn K, Lopez K, Dieng CC, Lo E, Janies D et al. Detection of high prevalence of Plasmodium falciparum histidine-rich protein 2/3 gene deletions in Assosa zone, Ethiopia: implication for malaria diagnosis. Malar J. 2021;20(1):1–11 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8095343/#MOESM3).
69. Golassa L, Messele A, Amambua-Ngwa A, Swedberg G. High prevalence and extended deletions in Plasmodium falciparum hrp2/3 genomic loci in Ethiopia. PloS One. 2020;15(11):e0241807 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7644029/).
70. Feleke SM, Reichert EN, Mohammed H, Brhane BG, Mekete K, Mamo H et al. Plasmodium falciparum is evolving to escape malaria rapid diagnostic tests in Ethiopia. Nat Microbiol. 2021:1–11 (https://www.nature.com/articles/s41564-021-00962-4).
71. Prosser C, Gresty K, Ellis J, Meyer W, Anderson K, Lee R et al. Plasmodium falciparum histidine-rich protein 2 and 3 gene deletions in strains from Nigeria, Sudan, and South Sudan. Emerg Infect Dis. 2021;27(2):471 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7853540/).
72. Nolder D, Stewart L, Tucker J, Ibrahim A, Gray A, Corrah T et al. Failure of rapid diagnostic tests in Plasmodium falciparum malaria cases among travelers to the UK and Ireland: Identification and characterisation of the parasites. Int J Infect Dis. 2021;108:137–44 (https://www.sciencedirect.com/science/article/pii/S1201971221004094).
73. Statement by the Malaria Policy Advisory Group on the urgent need to address the high prevalence of pfhrp2/3 gene deletions in the Horn of Africa and beyond. Geneva: World Health Organization; 2021 (https://www.who.int/news/item/28-05-2021-statement-by-the-malaria-policy-advisory-group-on-the-urgent-need-to-address-the-high-prevalence-of-pfhrp2-3-gene-deletions-in-the-horn-of-africa-and-beyond).
74. Methods for surveillance of antimalarial drug efficacy. Geneva: World Health Organization; 2009 (https://www.who.int/docs/default-source/documents/publications/gmp/methods-for-surveillance-of-antimalarial-drug-efficacy.pdf?sfvrsn=29076702_2).
75. Report on antimalarial drug efficacy, resistance and response: 10 years of surveillance (2010-2019). Geneva: World Health Organization; 2020 (https://www.who.int/publications/i/item/9789240012813).
76. Dimbu PR, Horth R, Cândido ALM, Ferreira CM, Caquece F, Garcia LEA et al. Continued low efficacy of artemether-lumefantrine in Angola in 2019. Antimicrob Agents Chemother. 2021;65(2):e01949-20 (https://pubmed.ncbi.nlm.nih.gov/33168604/).
77. Rasmussen C, Ringwald P. Continued low efficacy of artemether-lumefantrine in Angola? Antimicrob Agents Chemother. 2021;65(6):e00220-21 (https://pubmed.ncbi.nlm.nih.gov/33753339/).
78. Gansané A, Moriarty LF, Ménard D, Yerbanga I, Ouedraogo E, Sondo P et al. Anti-malarial efficacy and resistance monitoring of artemether-lumefantrine and dihydroartemisinin-piperaquine shows inadequate efficacy in children in Burkina Faso, 2017–2018. Malar J. 2021;20(1):48 (https://doi.org/10.1186/s12936-021-03585-6).
79. Rasmussen C, Ringwald P. Is there evidence of anti-malarial multidrug resistance in Burkina Faso? Malar J. 2021;20(1):1–5 (https://malariajournal.biomedcentral.com/articles/10.1186/s12936-021-03845-5).
80. Straimer J, Gandhi P, Renner KC, Schmitt EK. High prevalence of P. falciparum K13 mutations in Rwanda is associated with slow parasite clearance after treatment with artemether-lumefantrine. J Infect Dis. 2021;(https://pubmed.ncbi.nlm.nih.gov/34216470/).
81. Uwimana A, Umulisa N, Venkatesan M, Svigel SS, Zhou Z, Munyaneza T et al. Association of Plasmodium falciparum kelch13 R561H genotypes with delayed parasite clearance in Rwanda: an open-label, single-arm, multicentre, therapeutic efficacy study. Lancet Infect Dis. 2021;21(8):1120–8 (https://www.sciencedirect.com/science/article/abs/pii/S1473309921001420).
82. Mathieu LC, Cox H, Early AM, Mok S, Lazrek Y, Paquet JC et al. Local emergence in Amazonia of Plasmodium falciparum k13 C580Y mutants associated with in vitro artemisinin resistance. Elife. 2020;9:e51015 (https://pubmed.ncbi.nlm.nih.gov/32394893/).

83. Das S, Kar A, Manna S, Mandal S, Mandal S, Das S et al. Artemisinin combination therapy fails even in the absence of Plasmodium falciparum kelch13 gene polymorphism in Central India. Sci Rep. 2021;11 (https://www.researchgate.net/publication/351491421_Artemisinin_combination_therapy_fails_even_in_the_absence_of_Plasmodium_falciparum_kelch13_gene_polymorphism_in_Central_India).

84. Sudathip P, Saejeng A, Khantikul N, Thongrad T, Kitchakarn S, Sugaram R et al. Progress and challenges of integrated drug efficacy surveillance for uncomplicated malaria in Thailand. Malar J. 2021;20(1):261 (https://pubmed.ncbi.nlm.nih.gov/34107955/).

85. Rossi G, De Smet M, Khim N, Kindermans JM, Menard D. Emergence of Plasmodium falciparum triple mutant in Cambodia. Lancet Infect Dis. 2017;17(12):1233 (https://pubmed.ncbi.nlm.nih.gov/29173875/).

86. Mairet-Khedim M, Leang R, Marmai C, Khim N, Kim S, Ke S et al. Clinical and in vitro resistance of Plasmodium falciparum to artesunate-amodiaquine in Cambodia. Clin Infect Dis. 2020;73(3) (https://www.researchgate.net/publication/341710203_Clinical_and_In_Vitro_Resistance_of_Plasmodium_falciparum_to_Artesunate-Amodiaquine_in_Cambodia).

87. WHO global database on insecticide resistance in malaria vectors [website]. Geneva: World Health Organization; 2021 (https://www.who.int/teams/global-malaria-programme/prevention/vector-control/global-database-on-insecticide-resistance-in-malaria-vectors).

88. Test procedures for insecticide resistance monitoring in malaria vector mosquitoes (second edition). Geneva: World Health Organization; 2018 (https://apps.who.int/iris/bitstream/handle/10665/250677/9789241511575-eng.pdf;jsessionid=2CD03D28D8A369CCCECD522989BEDC7C?sequence=1).

89. DHIS2-based entomology and vector control data collection and collation tools [website]. Geneva: World Health Organization; 2020 (https://www.who.int/teams/global-malaria-programme/prevention/vector-control/dhis-data-collection-and-collation-tools).

90. Framework for a national plan for monitoring and management of insecticide resistance in malaria vectors. Geneva: World Health Organization; 2017 (https://apps.who.int/iris/handle/10665/254916).

91. Faulde MK, Rueda LM, Khaireh BA. First record of the Asian malaria vector Anopheles stephensi and its possible role in the resurgence of malaria in Djibouti, Horn of Africa. Acta Tropica. 2014;139:39–43 (https://pubmed.ncbi.nlm.nih.gov/25004439/).

92. Vector alert: Anopheles stephensi invasion and spread. Geneva: World Health Organization; 2019 (https://www.who.int/publications/i/item/WHO-HTM-GMP-2019.09).

93. WorldPop [website]. (http://www.worldpop.org/).

94. Linard C, Gilbert M, Snow RW, Noor AM, Tatem AJ. Population distribution, settlement patterns and accessibility across Africa in 2010. PLoS ONE. 2012;7(2):e31743 (https://pubmed.ncbi.nlm.nih.gov/22363717/).

Annexes

Fig. 2.1. GTS at a glance

Figure extracted and adapted from the 2021 update of the *Global technical strategy for malaria 2016–2030* (GTS) (*1*).

Fig. 2.2. RBM Partnership to End Malaria 2021–2025 strategy framework

Figure extracted and adapted from the RBM Partnership strategic plan (*2*).

Fig. 2.3. Summary of the Global Fund Strategy 2023–2028

Figure extracted and adapted from the Global Fund strategy document (*3*).

Fig. 2.4. PMI's strategic framework

Figure extracted and adapted from a 2021 publication from the United States (US) President's Malaria Initiative (PMI) (*4*).

Fig. 2.5. The consolidated *WHO guidelines for malaria*: examples of two vector control interventions recommended for large-scale deployment

Examples extracted and adapted from a 2021 World Health Organization (WHO) publication, the *WHO guidelines for malaria*, published on the MAGICapp platform (*5*).

Fig. 2.6. RTS,S malaria vaccine evaluation pilots and main results

Graphics obtained and adapted from a 2021 WHO publication (*6*).

Fig. 2.7. Map of ongoing armed conflicts as of October 2021

Obtained from the WHO country health cluster/sector dashboard (*7*).

Fig. 2.8. Relative population exposure to 15 cm or more flood inundation risk at the country level (percentage)

Obtained from a 2020 publication from Rentschler and Salhab (*8*).

Fig. 2.9. Trends in COVID-19 cases and deaths in malaria endemic countries globally and by WHO region (as of 3 October 2021)

Graph is built on daily numbers of coronavirus disease (COVID-19) cases and deaths reported to WHO (*9*).

Fig. 2.10. Percentage of the population fully vaccinated against COVID-19 by 25 October 2021

Percentage of the population fully vaccinated against COVID-19, adapted from data from *Our world in data* (*10*).

Fig. 2.11. A graph of data from 13 out of 31 countries that had planned ITN distribution campaigns in 2020 but had not completed them by the end of this year showing a) percentage of ITNs planned for distribution in 2020 that were distributed by the end of 2020 (dark bars), and b) percentage of ITNs from 2020 that were distributed in 2021 (lighter bars)

Figure summarizes the planned insecticide-treated mosquito net (ITN) campaign distributions in 2020 and their spill over to 2021 in 31 malaria endemic countries. Data were submitted by countries to WHO, the Alliance for Malaria Prevention and the RBM Partnership to End Malaria.

Fig. 2.12. Percentage of ITNs planned for distribution in 2021 that were distributed to communities by October 2021

Figure summarizes progress in ITN distribution campaigns in 2021 (excluding carryover from 2020) in 20 malaria endemic countries. Data were submitted by countries to WHO, the Alliance for Malaria Prevention and the RBM Partnership to End Malaria.

Fig. 2.13. Percentage of service delivery points that experienced disruptions to clinical services per country (same coloured bars)

Data were obtained through end-use verification (EUV) surveys implemented by PMI as a rapid point-in-time assessment of malaria commodity availability at central warehouses and health facilities in PMI-supported countries (*11*). The graph summarizes findings from EUV surveys in July 2021 in Angola, Benin, Burkina Faso, Ethiopia, Ghana, Guinea, Liberia, Mali, the Niger, Nigeria and Zimbabwe.

Fig. 2.14. Percentage of facilities experiencing different levels of disruptions to clinical services

See methods for **Fig. 2.13**.

Fig. 2.15. Trends in the number of outpatients (all causes), malaria tests performed and malaria treatments prescribed in selected health facilities in 23 malaria endemic countries in sub-Saharan Africa, April 2019 to March 2021

Graphs were developed using data from selected health facilities tracked from April 2019 to March 2021 and submitted by national malaria programmes (NMPs) to WHO and the Global Fund.

Table 2.1. Differences in the number of malaria tests performed across similar periods using data from selected health facilities in 23 malaria endemic countries in sub-Saharan Africa, April 2019 to March 2021

See methods for **Fig. 2.15**.

Fig. 2.16. Results from WHO surveys on the number of countries experiencing disruptions to malaria diagnosis and treatment services during the COVID-19 pandemic: a) Round 1 survey (conducted May–September 2020) and b) Round 2 survey (conducted December 2020–March 2021)

Data used in these graphs are based on rounds 1 and 2 of the essential health service disruptions surveys implemented by the WHO Integrated Health Services Department.

Fig. 3.1. Countries with indigenous cases in 2000 and their status by 2020

Data on the number of indigenous cases (an indicator of whether countries are endemic for malaria) were as reported to WHO by NMPs. Countries with 3 consecutive years of zero indigenous cases are considered to have eliminated malaria.

Table 3.1. Global estimated malaria cases and deaths, 2000–2020

a) Global estimated malaria cases

The number of malaria cases was estimated by one of the three methods described below.

Method 1

Method 1 was used for countries and areas outside the WHO African Region, and for low transmission countries and areas in the African Region as follows: Afghanistan, Bangladesh, the Bolivarian Republic of Venezuela, Botswana, Brazil, Cambodia, Colombia, the Dominican Republic, Eritrea, Ethiopia, French Guiana, the Gambia, Guatemala, Guyana, Haiti, Honduras, India, Indonesia, the Lao People's Democratic Republic, Madagascar, Mauritania, Myanmar, Namibia, Nepal, Nicaragua, Pakistan, Panama, Papua New Guinea, Peru, the Philippines, the Plurinational State of Bolivia, Rwanda, Senegal, Solomon Islands, Timor-Leste, Vanuatu, Viet Nam, Yemen and Zimbabwe.

Estimates were made by adjusting the number of reported malaria cases for completeness of reporting, the likelihood that cases were parasite positive, and the extent of health service use. The procedure, which is described in the *World malaria report 2008* (*12*), combines national data annually reported by NMPs (i.e. reported cases, reporting completeness and likelihood that cases are parasite positive) with data obtained from nationally representative household surveys on health service use among children aged under 5 years, which was assumed to be representative of the service use in all ages. Briefly:

$T = (a + (c \times e))/d \times (1+f/g+(1-g-f)/2/g)$

where:

a is malaria cases confirmed in public sector

b is suspected cases tested

c is presumed cases (not tested but treated as malaria)

d is reporting completeness

e is test positivity rate (malaria positive fraction) = a/b

f is fraction seeking treatment in private sector

g is fraction seeking treatment in public sector

No treatment seeking factor: $(1-g-f)$

Cases in public sector: $(a + (c \times e))/d$

Cases in private sector: $(a + (c \times e))/d \times f/g$

To estimate the uncertainty around the number of cases, the test *positivity rate* was assumed to have a normal distribution centred on the test positivity rate value and standard deviation – defined as $0.244 \times f0.5547$, and truncated to be in the range 0, 1. *Reporting completeness* (*d*), when reported as a range or below 80%, was assumed to have one of three distributions, depending on the value reported by the NMP. If the value was reported as a range greater than 80%, the distribution was assumed to be triangular, with limits of 0.8 and 1.0, and the peak at 0.8. If the value was more than 50% but less than or equal to 80%, the distribution was assumed to be rectangular, with limits of 0.5 and 0.8. Finally, if the value was less than or equal to 50%, the distribution was assumed to be triangular, with limits of 0 and 0.5, and the peak at 0.5 (*13*). If the reporting completeness was reported as a value and was more than 80%, a beta distribution was assumed, with a mean value of the reported value (maximum of 95%) and confidence intervals (CIs) of 5% around the mean value. The fraction of children brought for care in the public sector and in the private sector was assumed to have a beta distribution, with the mean value being the estimated value in the survey and the standard deviation being calculated from the range of the estimated 95% CIs. The fraction of children not brought for care was assumed to have a rectangular distribution, with the lower limit being 0 and the upper limit calculated as 1 minus the proportion that were brought for care in the public and private sectors. The three distributions (fraction seeking treatment in public sector, fraction seeking treatment in private sector only and fraction not seeking treatment) were constrained to add up to 1.

Sector-specific care-seeking fractions were linearly interpolated between the years that had a survey and were extrapolated for the years before the first or after the last survey. The parameters used to propagate uncertainty around these fractions were also imputed in a similar way or, if there was no value for any year in the country or area, were imputed as a mixture of the distributions of the region for that year. CIs were obtained from 10 000 draws of the convoluted distributions. The data were analysed using R statistical software, using the *convdistr* R package to propagate uncertainty and manage distributions (*14*).

For India, the values were obtained at subnational level using the same methodology but adjusting the private sector for an additional factor because of the active case detection, which was estimated as the ratio of the test positivity rate in active case detection over the test positivity rate for passive case detection. This factor was assumed to have a normal distribution, with mean value and standard deviation calculated from the values reported in 2010. An additional adjustment was applied in several states in India, to control for the reductions in reported testing rates associated with disruptions in health services related to the COVID-19 pandemic. The malaria burden in countries outside of the WHO African Region were affected by the COVID-19 pandemic in different ways. In several countries, the movement disruptions led to transmission reductions, while in other cases, testing rates remained unchanged. This made it challenging to apply a single source of data for correction to all countries, while the reported data were not easy to relate to the essential health services response. The states with reductions in testing rates below the expected – defined as a change in testing rates of more than 10% observed between 2018 and 2019 – were Bihar, Chandigarh, Chhattisgarh, Dadra and Nagar Haveli, Delhi, Goa, Jharkhand, Karnataka, Puducherry, Punjab, Uttar Pradesh, Uttarakhand and West Bengal. In these states, the excess number of indigenous cases expected in the absence of diagnostic disruptions was calculated by estimating the number of additional tests that would have been conducted if testing rates were similar to those observed in 2019, and applying the test positivity ratio observed in 2019 (or in 2020, for Jharkhand and Delhi) to this number. The number of presumed cases in Pakistan was estimated for 2019 and 2020 based on the ratio of presumed to indigenous cases reported in 2018 (2.56), the last year when presumed cases were reported. No adjustment for private sector treatment seeking was made for the following countries and areas because they report cases from the private and public sector together: Bangladesh, the Bolivarian Republic of Venezuela, Botswana, Brazil, Colombia, the Dominican Republic, French Guiana, Guatemala, Guyana, Haiti, Honduras, Myanmar (since 2013), Nicaragua, Panama, Peru, the Plurinational State of Bolivia and Rwanda.

Method 2

Method 2 was used for high transmission countries in the WHO African Region and for countries in the WHO Eastern Mediterranean Region in which the quality of surveillance data did not permit a robust estimate from the number of reported cases: Angola, Benin, Burkina Faso, Burundi, Cameroon, the Central African Republic, Chad, the Congo, Côte d'Ivoire, the Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Malawi, Mali, Mozambique, the Niger, Nigeria, Sierra Leone, Somalia, South Sudan, the Sudan, Togo, Uganda, the United Republic of Tanzania and Zambia. In this method, estimates of the number of malaria cases were derived from information on parasite prevalence obtained from household surveys.

First, data on parasite prevalence from nearly 60 000 survey records were assembled within a spatio-temporal Bayesian geostatistical model, together with environmental and sociodemographic covariates, and data distribution on interventions such as ITNs, antimalarial drugs and indoor residual spraying (IRS) (*15*), which are updated yearly to review the model. The geospatial model enabled predictions of *Plasmodium falciparum* prevalence in children aged 2–10 years, at a resolution of 5 × 5 km^2, throughout all malaria endemic WHO African Region countries for each year from 2000 to 2020. Second, an ensemble model was developed to predict malaria incidence as a function of parasite prevalence (*16*). The model was then applied to the estimated parasite prevalence, to obtain estimates of the malaria case incidence at 5 × 5 km^2 resolution for each year from 2000 to 2020.[1] Data for each 5 × 5 km^2 area were then aggregated within country and regional boundaries, to obtain both national and regional estimates of malaria cases (*18*).

In 2020, additional cases estimated using this method were added, to account for the disruptions in malaria prevention, diagnostic and treatment services as a result of the COVID-19 pandemic and other events that occurred during this year. Disruption information was reported per country and was obtained from the national pulse surveys on continuity of essential health services during the COVID-19 pandemic conducted by WHO (first round in May–July 2020 and second in January–March 2021) (*19*, *20*). The medium, minimum and maximum (with a limit of 50%) values of the ranges provided by countries to define disruptions were used to quantify the percentage of malaria service disruptions and introduce them as covariates in the case-estimation spatio-temporal models. Country-specific adjustment ratios were calculated, and uncertainty propagated around them following a normal distribution, by comparing the incidence estimates for 2020 in the presence and absence of diagnosis and treatment disruptions in the spatio-temporal model, with both models accounting for disruptions to prevention interventions. The resulting ratios and distributions for countries with unreliable disruption data (the Central African Republic, Kenya, Somalia, South Sudan and Uganda) were calculated as the average of each country's neighbouring countries. Inflation ratios were then applied to the number of malaria cases estimated in the absence of malaria diagnostic and treatment disruptions for 2020, to estimate the number of cases expected in light of reported disruptions. For countries for which the estimates with the updated spatio-temporal model were considerably different from previous estimates without addition of new data, or trends in reported cases were significantly different in direction (Ghana, Mali, Somalia and Uganda), the case series of the *World malaria report 2020* (*18*) was used until 2019, and the values for 2020 were estimated by applying the disruption inflation ratios to the 2019 values, and adjusting for population changes between 2019 and 2020.

[1] See the Malaria Atlas Project website for methods on the development of maps (*17*).

Method 3

For most of the elimination countries and countries at the stage of prevention of reintroduction, the number of indigenous cases registered by NMPs are reported without further adjustments. The countries in this category were Algeria, Argentina, Armenia, Azerbaijan, Belize, Bhutan, Cabo Verde, China, the Comoros, Costa Rica, the Democratic People's Republic of Korea, Djibouti, Ecuador, Egypt, El Salvador, Eswatini, Georgia, Iraq, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Malaysia, Mexico, Morocco, Oman, Paraguay, the Republic of Korea, Sao Tome and Principe, Saudi Arabia, South Africa, Sri Lanka, Suriname, the Syrian Arab Republic, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates and Uzbekistan.

Country-specific adjustments

For some years, information for certain countries was not available or could not be used because it was of poor quality. For countries in this situation, the number of cases was imputed from other years where the quality of the data was better (adjusting for population growth), as follows: for Afghanistan, values for 2000 and 2001 were imputed from 2002–2003; and for Bangladesh, values for 2001–2005 were imputed from 2006–2008. For Ethiopia, values for 2000–2019 were taken from a mixed distribution between values from Method 1 and Method 2 (50% from each method). For the Gambia, values for 2000–2010 were imputed from 2011–2013; for Haiti, values for 2000–2005, 2009 and 2010 were imputed from 2006–2008; for Indonesia, values for 2000–2003 and 2007–2009 were imputed from 2004–2006; for Mauritania, values for 2000–2010 were imputed from a mixture of Method 1 and Method 2, starting with 100% values from Method 2 for 2001 and 2002, with that percentage decreasing to 10% of Method 1 in 2010. For Myanmar, values for 2000–2005 were imputed from 2007–2009; for Namibia, values for 2000 were imputed from 2001–2003, and for 2012 from 2011 and 2013. For Pakistan, values for 2000 were imputed from 2001–2003; for Papua New Guinea, values for 2012 were imputed from 2009–2011. For Rwanda, values for 2000–2006 were imputed from a mixture of Method 1 and Method 2, starting with 100% values from Method 2 in 2000, with that percentage decreasing to 10% in 2006. For Senegal, values for 2000–2006 were imputed from a mixture of Method 1 and Method 2, with 90% of Method 2 in 2000, decreasing to 10% of Method 2 in 2006. For Thailand, values for 2000 were imputed from 2001–2003; for Timor-Leste, values for 2000–2001 were imputed from 2002–2004; and for Zimbabwe, values for 2000–2006 were imputed from 2007–2009.

Estimation of *P. vivax* cases

The number of malaria cases caused by *P. vivax* in each country was estimated by multiplying the country's reported proportion of *P. vivax* cases (computed as 1 – *P. falciparum*) by the total number of estimated cases for the country. For countries where the estimated proportion was not 0 or 1, the proportion of *P. falciparum* cases was assumed to have a beta distribution and was estimated from the proportion of *P. falciparum* cases reported by NMPs.

Population at risk

To transform malaria cases into incidence, an estimate of population at risk was used. The proportion of the population at high, low or no risk of malaria was provided by NMPs. This was applied to United Nations (UN) population estimates, to compute the number of people at risk of malaria. This number was sustained through time to ensure comparability of incidence estimates across years in the same cohort of countries endemic since 2000. The population at risk at regional and global level was aggregated and includes the population of all endemic countries since 2000, even if some of them have achieved elimination during this time.

b) Global estimated malaria deaths

Numbers of malaria deaths were estimated using methods from Category 1, 2 or 3, as outlined below.

Category 1 method

The Category 1 method was used for low transmission countries and areas, both within and outside Africa: Afghanistan, Bangladesh, the Bolivarian Republic of Venezuela, Botswana, Cambodia, the Comoros, Djibouti, Eritrea, Eswatini, Ethiopia, French Guiana, Guatemala, Guyana, Haiti, Honduras, India, Indonesia, the Lao People's Democratic Republic, Madagascar, Myanmar, Namibia, Nepal, Pakistan, Papua New Guinea, Peru, the Philippines, the Plurinational State of Bolivia, Solomon Islands, Somalia, the Sudan, Timor-Leste, Vanuatu (between 2000 and 2012), Viet Nam, Yemen and Zimbabwe.

A case fatality rate of 0.256% was applied to the estimated number of *P. falciparum* cases, which represents the average of case fatality rates reported in the literature (*21-23*) and rates from unpublished data from Indonesia, 2004–2009.[1] The proportion of deaths then follows a categorical distribution of 0.01%, 0.19%, 0.30%, 0.38% and 0.40%, with each having equal probability. A case fatality rate of 0.0375% was applied to the estimated number of *P. vivax* cases, representing the midpoint of the range of case fatality rates reported in a study by Douglas et al. (*24*), following a rectangular distribution of between 0.012% and 0.063%. Following the nonlinear association explained for the Category 2 method below, the proportion of deaths in children aged under 5 years was estimated as:

$$\text{Proportion of deaths}_{\text{under 5}} = -0.2288 \times \text{Mortality}_{\text{overall}}^{2} + 0.823 \times \text{Mortality}_{\text{overall}} + 0.2239$$

where $\text{Mortality}_{\text{overall}}$ is the number of estimated deaths over the estimated population at risk per 1000 (see **Annex 5** for national estimates of population at risk).

[1] Dr Ric Price, Menzies School of Health Research, Australia, personal communication (November 2014).

Category 2 method

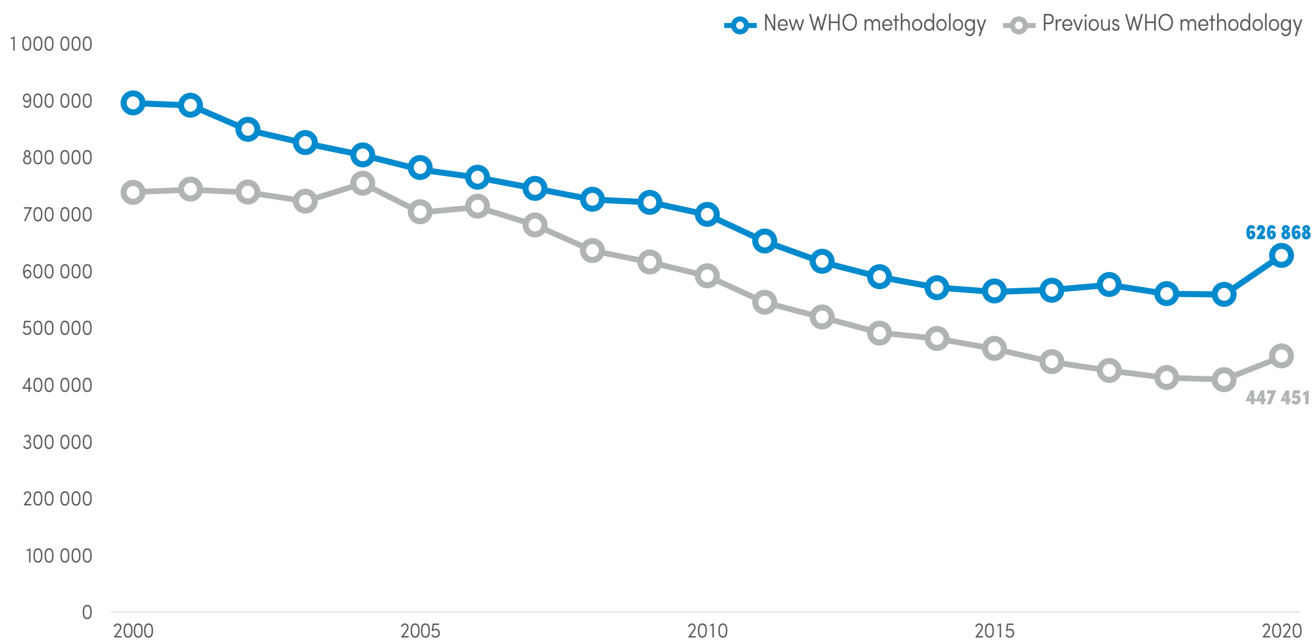
The Category 2 method was used for countries in the WHO African Region with a high proportion of deaths due to malaria: Angola, Benin, Burkina Faso, Burundi, Cameroon, the Central African Republic, Chad, the Congo, Côte d'Ivoire, the Democratic Republic of the Congo, Equatorial Guinea, Gabon, the Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Malawi, Mali, Mauritania, Mozambique, the Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Sudan, Togo, Uganda, the United Republic of Tanzania and Zambia.

With this method, child malaria deaths were estimated using a new multinomial Bayesian least absolute shrinkage and selection operator (LASSO) model that was reviewed by the WHO Maternal and Child Health Epidemiology Estimation Group (MCEE) in 2021, to produce updated estimates of cause of death (CoD) in children aged 1–59 months between 2000 and 2019 (*25*). Mortality estimates (and 95% CIs) were derived for eight causes of post-neonatal death (pneumonia, diarrhoea, malaria, tuberculosis, meningitis, injuries, pertussis and other disorders), four causes arising in the neonatal period (prematurity, birth asphyxia and trauma, sepsis and other conditions of the neonate) and other causes (e.g. malnutrition). Deaths due to measles, unknown causes and HIV/AIDS were estimated separately. The resulting cause-specific estimates were adjusted, country by country, to fit the estimated all-cause mortality envelope of 1–59 months (excluding HIV/AIDS and measles deaths) for corresponding years.

In previous years, malaria deaths were estimated based on the CoD fractions obtained from a multinomial logistic regression model based on verbal autopsy data available before 2015 and projected beyond that point (*26*). The shift to a Bayesian approach made it easier to address data scarcity, enhance covariate selection, produce more robust estimates, offer increased flexibility, allow for country random effects, propagate coherent uncertainty and improve model stability. The new model also used updated national vital registration data, new country-based studies and revisions to single CoD estimates from a variety of sources (*25*). Malaria-specific CoD fractions were further affected by the inclusion of an updated time series of estimated prevalence of malaria parasites, which led to substantially different fractions compared with the model used in previous reports (*26*). This change led to higher malaria death estimates globally for the period of 2000 to 2020 compared with the estimates obtained when applying the CoD fraction of the previous methodology (**Fig. A1**). An additional adjustment was applied to the CoD fraction obtained from Mali in 2015 to mirror the corrections to the incidence estimates applied in this and last year's report, by applying an inflation factor that compared the prevalence to incidence estimates published in the *World malaria report 2020* between 2015 and 2019. The same CoD fraction estimated for 2019 was used in 2020.

FIG. A1.

Estimated number of global deaths* using the new (blue) and previous (grey) methodology for the estimation of malaria cause of death fractions in countries for which this method is used to estimate malaria deaths



WHO: World Health Organization.
* For all malaria endemic countries since 2000, including those for which alternative methods for the estimation of malaria deaths are used.

The number of malaria deaths among children aged under 5 years was calculated by applying the country-specific yearly malaria CoD fraction to the all-cause mortality envelope of 1–59 months. It was considered that the number of deaths follows a rectangular distribution, with limits being the estimated 95% CI. The malaria deaths for 2020 were calculated by extrapolating from the all-cause mortality envelope of 1–59 months for 2020, based on the change in trends observed between 2018 and 2019, and applying the malaria-specific CoD fraction to the extrapolated values.

The malaria mortality rate in children aged under 5 years estimated with this method was then used to infer malaria-specific mortality in those aged 5 years and over, using the relationship between levels of malaria mortality in a series of age groups and the intensity of malaria transmission (*27*), and assuming a nonlinear association between under-5-years mortality and over-5-years mortality, as follows:

$\text{Proportion of deaths}_{\text{over 5}} = -0.293 \times \text{Mortality}_{\text{under 5}}^{2} + 0.8918 \times \text{Mortality}_{\text{under 5}} + 0.2896$

where $\text{Mortality}_{\text{under 5}}$ is estimated from the number of deaths from the MCEE model over the population at risk per 1000.

In 2020, additional deaths estimated using this method were added, to account for the disruptions in malaria diagnostic and treatment services as a result of the COVID-19 pandemic. Country-specific mortality inflation ratios were calculated by comparing the mortality estimates for 2020 in the presence and absence of diagnosis and treatment disruptions from the models, with both estimates accounting for disruptions to prevention interventions. The countries with unreliable ratios (the Central African Republic) were calculated as the average of the country's neighbouring countries. Inflation ratios were then applied to the number of malaria deaths for 2020 to estimate the number of deaths expected, considering the reported disruptions.

Category 3 method

For the Category 3 method, the number of indigenous malaria deaths registered by NMPs is reported without further adjustments. This category is used in the following countries: Algeria, Argentina, Armenia, Azerbaijan, Belize, Bhutan, Brazil, Cabo Verde, China, Colombia, Costa Rica, the Democratic People's Republic of Korea, the Dominican Republic, Ecuador, Egypt, El Salvador, Georgia, Iraq, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Malaysia, Mexico, Morocco, Nicaragua, Oman, Panama, Paraguay, the Republic of Korea, Sao Tome and Principe, Saudi Arabia, South Africa, Sri Lanka, Suriname, the Syrian Arab Republic, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan and Vanuatu (2013 to 2020).

Fig. 3.2. Global trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) distribution of malaria cases and d) deaths by country, 2020

See methods notes for **Table 3.1**.

Table 3.2. Estimated malaria cases and deaths in the WHO African Region, 2000–2020

See methods notes for **Table 3.1**.

Fig. 3.3. Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO African Region, 2020

See methods notes for **Table 3.1**.

Table 3.3. Estimated malaria cases and deaths in the WHO South-East Asia Region, 2000–2020

See methods notes for **Table 3.1**.

Fig. 3.4. Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO South-East Asia Region, 2020

See methods notes for **Table 3.1**.

Table 3.4. Estimated malaria cases and deaths in the WHO Eastern Mediterranean Region, 2000–2020

See methods notes for **Table 3.1**.

Fig. 3.5. Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO Eastern Mediterranean Region, 2020

See methods notes for **Table 3.1**.

Table 3.5. Estimated malaria cases and deaths in the WHO Western Pacific Region, 2000–2020

See methods notes for **Table 3.1**.

Fig. 3.6. Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO Western Pacific Region, 2020

See methods notes for **Table 3.1**.

Table 3.6. Estimated malaria cases and deaths in the WHO Region of the Americas, 2000–2020

See methods notes for **Table 3.1**.

Fig. 3.7. Trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2020; and c) malaria cases by country in the WHO Region of the Americas, 2020

See methods notes for **Table 3.1**.

Fig. 3.8. Cumulative number of cases and deaths averted globally and by WHO region, 2000–2020

See methods notes for **Table 3.1** for information on estimation of cases and deaths. Estimated cases and deaths averted over the period 2000-2020 were computed by comparing current estimates for each year since 2000 with the malaria case incidence and mortality rates from 2000, assuming that they remained constant throughout the same period adjusting for population growth.

Fig. 3.9. Percentage of a) cases and b) deaths averted by WHO region, 2000–2020

See methods notes for **Table 3.1** for information on estimation of cases and deaths. See **Fig. 3.8** for methods used to estimate cases and deaths averted. The percentage of cases and deaths averted was estimated using overall global cases and deaths averted as denominator, and regional cases and deaths averted as numerator.

Fig. 3.10. Average monthly all-age malaria admissions by age across four endemicity classes from about 52 000 admissions in 21 hospitals in east Africa, 2006–2021

Data on severe malaria with patient history were assembled directly from 21 hospitals in east Africa over the period 2006–2021, to investigate age distribution and phenotype by transmission intensity. Data were obtained from the KEMRI-Wellcome Trust Research Programme.

Fig. 3.11. Distribution of common clinical manifestations of severe malaria across four endemicity classes from 6245 malaria admissions from 21 hospitals in east Africa covering 49 time-site periods

See methods for **Fig. 3.10**.

Fig. 3.12. Mean age (years) of admitted malaria and non-malaria (other diagnoses) cases, by year

Data were obtained from the hospital records at the survey area for the demographic and health survey (DHS) run by the Centro de Investigação em Saúde de Manhiça in Mozambique, with support from ISGlobal at the University of Barcelona in Spain.

Fig. 3.13. Total number of admissions with severe malaria syndromes (bars) and percentage of malaria admissions with respective severe malaria syndromes (line), by year

See methods for **Fig. 3.12**.

Fig. 3.14. Estimated prevalence of exposure to malaria infection during pregnancy, overall and by subregion in 2020, in moderate to high transmission countries in the WHO African Region

Estimates of malaria-exposed pregnancies and preventable malaria-attributable low birthweight (LBW) deliveries in the absence of pregnancy-specific malaria prevention (i.e. long-lasting insecticidal net [LLIN] delivery based on intermittent preventive treatment in pregnancy [IPTp] or antenatal care [ANC]) were obtained using a model of the relationship between these outcomes, slide microscopy prevalence in the general population, and age- and gravidity-specific fertility patterns. This model was developed by fitting an established model of the relationship between malaria transmission and malaria infection by age (*28*) to patterns of infection in placental histology (*29*) and attributable LBW risk by gravidity, in the absence of IPTp or other effective chemoprevention (*30*). The model was run across a 0.2 degree (5 km^2) longitude/latitude grid for 100 realizations of the Malaria Atlas Project (MAP) joint posterior estimated slide prevalence in children aged 2–10 years in 2018 (*31*). Country-specific, age-specific or gravidity-specific fertility rates, stratified by urban rural status, were obtained from DHS and malaria indicator surveys (MIS), where such surveys had been carried out since 2014 and were available from the DHS programme website (*32*). Countries where surveys were not available were allocated fertility patterns from a survey undertaken in another country, matched on the basis of total fertility rate (*33*) and geography. Fertility patterns of individual women within simulations at each grid-point were simulated based on the proportion of women estimated to be living in urban or rural locations. Urban or rural attribution at a 1 km^2 scale was conducted based on WorldPop 1 km^2 population estimates from 2018 (*34*) and an urban/rural threshold of 386 people per km^2 (*35*); the estimates were then aggregated to the 0.2 degree (5 km^2) resolution of the MAP surfaces. This provided a risk of malaria infection and malaria-attributable LBW in the absence of prevention during pregnancy, along with a modelled per capita pregnancy rate for each grid-point, which was aggregated to country level (using WorldPop population estimates) to provide a per-pregnancy risk of malaria infection and a per live birth estimate of malaria-attributable LBW in the absence of prevention. These were then multiplied by country-level estimates of pregnancies and estimates of LBW in 2020 (**Fig. 3.15**).

Fig. 3.15. Estimated number of low birthweights due to exposure to malaria infection during pregnancy, overall and by subregion in 2020, in moderate to high transmission countries in sub-Saharan Africa

Methods for estimating malaria infection in pregnancy and malaria-attributable LBWs are described in Walker et al. (2014) (*30*). Numbers of pregnancies were estimated from the latest UN population-estimated number of births and were adjusted for the rate of abortion, miscarriage and stillbirths (*36,37*). The underlying *P. falciparum* parasite prevalence estimates were from the updated MAP series, using methods described in Bhatt et al. (2015) (*31*).

Fig. 3.16. Estimated number of low birthweights averted if current levels of IPTp coverage are maintained, and additional number averted if coverage of IPTp1 was optimized to match levels of coverage of ANC1 in 2020 while maintaining IPTp2 and IPTp3 at current levels, in moderate to high transmission countries in the WHO African Region

Efficacy of IPTp was modelled as a per sulfadoxine-pyrimethamine (SP) dose reduction in the attributable risk of LBW, fitted to data from trials of IPTp-SP efficacy before the implementation of the intervention as policy; thus, the results reflect the impact on drug-sensitive parasites, with the central estimate being based on an assumed malaria-attributable LBW fraction of 40% within these trials. The modelling produced estimates of 48.5%, 73.5% and 86.3% efficacy in preventing malaria-attributable LBW for women receiving one, two or three doses of SP through IPTp, respectively. This analysis excluded South Sudan due to the lack of consistent IPTp data reporting through time. See methods for **Fig. 3.15**.

Fig. 3.17. Estimated number of low birthweights averted if levels of IPTp3 coverage were optimized to match levels of coverage of ANC1 in 2020, in moderate to high transmission countries in the WHO African Region

See methods for **Fig. 3.15** and **Fig. 3.16**.

Fig. 3.18. Estimated number of low birthweights averted if levels of IPTp3 were optimized to achieve 90% coverage in 2020, in moderate to high transmission countries in the WHO African Region

See methods for **Fig. 3.15** and **Fig. 3.16**.

Fig. 4.1. Number of countries that were malaria endemic in 2000 and had fewer than 10, 100, 1000 and 10 000 indigenous malaria cases between 2000 and 2020

Figure is based on the countries where malaria was endemic in 2000 and there were cases of malaria reported in 2000. The number of estimated cases was tabulated.

Table 4.1. Countries eliminating malaria since 2000

Countries are shown by the year in which they attained zero indigenous cases for 3 consecutive years, according to reports submitted by NMPs.

Table 4.2. Number of indigenous malaria cases in E-2020 and E-2025 countries, 2010–2020

Data were derived from NMP reports. Total indigenous malaria cases are based on confirmed malaria cases reported as indigenous by countries in all E-2020 and E-2025 countries between 2010 and 2020.

Fig. 4.2. Total indigenous malaria and *P. falciparum* indigenous cases in the GMS, 2000–2020

Data on the Greater Mekong subregion (GMS) were derived from the WHO database.

The data were assembled using the following methodology:

- Total indigenous malaria cases and indigenous *P. falciparum* cases are based on confirmed cases reported as indigenous by each country for all E-2020 countries and for GMS countries where 100% of malaria cases are investigated and classified.
- For GMS countries where not all cases are classified, total confirmed/total *P. falciparum* cases minus imported cases/imported *P. falciparum* is used to calculate indigenous malaria cases and indigenous *P. falciparum* cases.
- For GMS countries where cases are not classified, all confirmed cases are considered to be indigenous.

Depending on the data that countries submit annually, the methodology used can vary by year for the same country.

Fig. 4.3. Regional map of malaria incidence in the GMS, by area, 2012–2020

Data were derived from NMP reports to the GMS Malaria Elimination Database.

Fig. 5.1. HBHI: response pillars and objectives

This figure on the high burden high impact (HBHI) approach was adapted from a 2019 WHO publication (*38*).

Fig. 5.2. Estimated malaria a) cases and b) deaths in HBHI countries, 2000–2020

See methods notes for **Table 3.1**.

Table 6.1. Sources of funding for malaria control and elimination

The table describes the main sources of funding as reported by donors and countries. An additional amount for patient care (based on estimated number of malaria cases) is calculated for each country and added to domestic funding.

Fig. 6.1. Funding for malaria control and elimination, 2010–2020 (% of total funding), by source of funds (constant 2020 US$)

Total funding for malaria control and elimination over the period 2000–2020 was estimated using available data obtained from several sources. The methodology below describes the collection and analysis for all available public sector domestic funding and international funding for **Fig. 6.1** to **Fig. 6.6**.

Fig. 6.1 and **Fig. 6.2** reflect data for the years 2010–2020 because country-specific unit cost estimates were not available until 2010 and data from the Organisation for Economic Co-operation and Development (OECD) use of the multilateral system were not available until 2011 (whereby 2010 estimates were derived from 2011 data). **Fig. 6.5** reflects data for the years 2010–2020 because the trends in funding per person at risk before 2010 cannot be reliably interpreted owing to significant data gaps in international and domestic funding in each WHO region. **Fig. 6.3**, **Fig. 6.4** and **Fig. 6.6** reflect data for 2000–2020, where available. In the case of missing data for a specific funder, no imputation was conducted; hence, the trends presented in the main text should be interpreted carefully. Funding for malaria control and elimination is presented in constant 2020 US$ throughout the text and figures.

Contributions from governments of endemic countries were estimated as the sum of government contributions reported by NMPs for the world malaria report of the relevant year plus the estimated costs of patient care delivery services at public health facilities. NMP contributions in the form of domestic expenditures were used from 2000 through 2020. When domestic expenditures were unavailable, domestic budgets were used. In cases where neither domestic expenditure nor budgets were available, data reported from the previous 2 years (i.e. 2018 and 2019) were used to project current missing data. The number of reported malaria cases attending public health facilities was sourced from NMP reports, adjusted for diagnosis and reporting completeness. Between 1% and 3% of uncomplicated reported malaria cases were assumed to have moved to the severe stage of disease, and 50–80% of these severe cases were assumed to have been hospitalized. Costs of outpatient visits and inpatient bed-stays were estimated from the perspective of the public health care provider, using unit cost estimates from WHO-CHOosing Interventions that are Cost-Effective (WHO-CHOICE) (*39*). For each country, WHO-CHOICE 2010 unit cost estimates expressed in national currency were estimated for the period 2011–2020 using the gross domestic product (GDP) annual price deflator published by the World Bank (*40*) in July 2021 and converted in the base year 2010. Country-specific unit cost estimates were then converted from national currency to constant 2020 US$ for each year over the period 2010–2020. For each country, the number of adjusted reported malaria cases attending public health facilities was then multiplied by the estimated unit costs. In the absence of information on the level of care at which malaria patients attend public facilities, uncertainty around unit cost estimates was handled through probabilistic uncertainty analysis. The mean total cost of patient care service delivery was calculated from 1000 estimations.

International bilateral funding data were obtained from several sources. Data on planned funding from the government of the United States of America (USA) were sourced with the technical assistance of the Kaiser Family Foundation (*41*). Country-level funding data were available from the US Agency for International Development (USAID) for the period 2006–2020. Country-specific planned funding data from two agencies, the US Centers for Disease Control and Prevention (CDC) and the US Department of Defense, were not available; therefore, data on total annual planned funding from each of these two agencies were used for the period 2001–2020. Total annual planned funding from USAID was used for 2001–2005, until the introduction of country-specific funding from 2006 through 2020.

For the government of the United Kingdom of Great Britain and Northern Ireland (United Kingdom), data on funding towards malaria control since 2017 has been sourced from the *Statistics on international development: final UK aid spend* (*42*). For this past year, data from the *final UK aid spend 2020* were used, with the technical assistance of the United Kingdom Department for International Development. The *final UK aid spend* data do not capture all spending from the United Kingdom that may affect malaria outcomes because the country supports malaria control and elimination through a broad range of interventions – for example, via support to overall health systems in malaria endemic countries, and through research and development (R&D) – that are not included in these data. For the period 2007–2016, United Kingdom spending data were sourced from the OECD creditor reporting system (CRS) database on aid activity (*43*).

For all other donors, disbursement data were also obtained from the OECD CRS database on aid activity for the period 2002–2019. Disbursement data for 2020 were estimated using 2019 reported figures. All data were converted to constant 2020 US$. For years with no data available for a particular funder, no imputation was conducted; hence, trends presented in the figures in the main text should be interpreted carefully.

Malaria-related annual funding from donors through multilateral agencies was estimated from data on (i) donors' contributions published by the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) (*44*) from 2010 to 2020, and annual disbursements by the Global Fund to malaria endemic countries, as reported by the Global Fund; and (ii) donors' disbursements to malaria endemic countries published in the OECD CRS and in the OECD Development Assistance Committee (DAC) members' total use of the multilateral system from 2011 through 2019 (*43*). All funding flows were converted to constant 2020 US$.

For (i), the amount of funding contributed by each donor was estimated as the proportion of funding paid by each donor out of the total amount received by the Global Fund in a given year, multiplied by the total amount disbursed by the Global Fund in that same year.

For (ii), contributions from donors to multilateral channels were estimated by calculating the proportion of the core contributions received by a multilateral agency each year by each donor, then multiplying that amount by the multilateral agency's estimated investment in malaria control in that same year. Contributions from malaria endemic countries to multilateral agencies were allocated to governments of endemic countries under the "funding source" category.

Contributions from non-DAC countries and other sources to multilateral agencies were not available and were therefore not included. Annual estimated investments were summed to estimate the total amount each funder contributed to malaria control and elimination over the period 2010–2020, and the relative percentage of the total spending contributed by each funder was calculated for the period 2010–2020.

Fig. 6.1 excludes household spending on malaria prevention and treatment in malaria endemic countries.

Fig. 6.2. Funding for malaria control and elimination, 2010–2020, by source of funds (constant 2020 US$)

See methods notes for **Fig. 6.1** for sources of information on total funding for malaria control and elimination from governments of malaria endemic countries and on international funding flows. **Fig. 6.2** excludes household spending on malaria prevention and treatment in malaria endemic countries.

Fig. 6.3. Funding for malaria control and elimination, 2000–2020, by channel (constant 2020 US$)

See methods notes for **Fig. 6.1** for sources of information on total funding for malaria control and elimination from governments of malaria endemic countries and on international funding flows. For years where no data were available for a particular funder, no imputation was conducted; hence, trends presented in the main text figures should be interpreted carefully. **Fig. 6.3** excludes household spending on malaria prevention and treatment in malaria endemic countries.

Fig. 6.4. Funding for malaria control and elimination, 2000–2020, by World Bank 2020 income group and source of funding (constant 2020 US$)

See methods notes for **Fig. 6.1** for sources of information on total funding for malaria control and elimination from governments of malaria endemic countries and on international funding flows. Data on income group classification for 2020 were sourced from the World Bank (*45*). For years where no data were available for a particular funder, no imputation was conducted; hence, trends presented in the main text figures should be interpreted carefully. **Fig. 6.4** excludes household spending on malaria prevention and treatment in malaria endemic countries.

Fig. 6.5. Funding for malaria control and elimination per person at risk, 2010–2020, by WHO region (constant 2020 US$)

See methods notes for **Fig. 6.1** for sources of information on total funding for malaria control and elimination from governments of malaria endemic countries and on international funding flows. **Fig. 6.5** excludes household spending on malaria prevention and treatment in malaria endemic countries.

Fig. 6.6. Funding for malaria control and elimination, 2000–2020, by WHO region (constant 2020 US$)

See methods notes for **Fig. 6.1** for sources of information on total funding for malaria control and elimination from governments of malaria endemic countries and on international funding flows. The "Unspecified" category in **Fig. 6.6** includes all funding data for which there was no geographical information on the recipient. For years where no data were available for a particular funder, no imputation was conducted; hence, trends presented in the main text figures should be interpreted carefully.

Fig. 6.7. Real GDP annual growth percentage change, 2020, by World Bank income classification (constant 2020 US$)

Data on real GDP annual growth percentage change for 2020 were sourced directly from the International Monetary Fund data mapper (*46*). Data on income group classification for 2020 were sourced from the World Bank (*45*).

Fig. 6.8. Funding for malaria-related R&D, 2011–2020, by product type (constant 2020 US$)

Data on funding for malaria-related R&D for 2011–2020 were sourced directly from Policy Cures Research through the G-FINDER data portal (*47*).

Fig. 6.9. Funding for malaria-related R&D, 2011–2020, by sector (constant 2020 US$)

See methods for **Fig. 6.8**.

Fig. 7.1. Number of ITNs delivered by manufacturers and distributed by NMPs, 2010–2020

Data on the number of ITNs delivered by manufacturers to countries were provided to WHO by Milliner Global Associates. Data from NMP reports from countries that were endemic for malaria in 2020 were used for the number of ITNs distributed within countries, which includes ITNs distributed through antenatal clinics, the Expanded Programme on Immunization (EPI), mass campaigns and other distribution channels.

Fig. 7.2. a) Indicators of population-level access to ITNs, sub-Saharan Africa, 2000–2020 and b) indicators of population-level use of ITNs, sub-Saharan Africa, 2000–2020

Estimates of ITN coverage were derived from a model developed by MAP (*17*), using a two-stage process. First, a mechanism was designed for estimating net crop (i.e. the total number of ITNs in households in a country at a given time), taking into account inputs to the system (e.g. deliveries of ITNs to a country) and outputs (e.g. loss of ITNs from households). Second, empirical modelling was used to translate estimated net crops (i.e. total number of ITNs in a country) into resulting levels of coverage (e.g. access within households, use in all ages and use among children aged under 5 years).

The model incorporates data from three sources:

- the number of ITNs delivered by manufacturers to countries, as provided to WHO by Milliner Global Associates;
- the number of ITNs distributed within countries, as reported to WHO by NMPs; and
- data from nationally representative household surveys from 39 countries in sub-Saharan Africa, from 2001 to 2018.

Countries for analysis

The main analysis covered 40 of the 47 malaria endemic countries or areas of sub-Saharan Africa. The islands of Mayotte (for which no ITN delivery or distribution data were available) and Cabo Verde (which does not distribute ITNs) were excluded, as were the low transmission countries of Eswatini, Namibia, Sao Tome and Principe, and South Africa, for which ITNs comprise a small proportion of vector control. Analyses were limited to populations categorized by NMPs as being at risk.

Estimating national net crops through time

As described by Flaxman et al. (*48*), national ITN systems were represented using a discrete-time stock-and-flow model. Nets delivered to a country by manufacturers were modelled as first entering a "country stock" compartment (i.e. stored in-country but not yet distributed to households). Nets were then available from this stock for distribution to households by the NMP or through other distribution channels. To accommodate uncertainty in net distribution, the number of nets distributed in a given year was specified as a range, with all available country stock (i.e. the maximum number of nets that could be delivered) as the upper end of the range and the NMP-reported value (i.e. the assumed minimum distribution) as the lower end. The total household net crop comprised new nets reaching households plus older nets remaining from earlier times, with the duration of net retention by households governed by a loss function. However, rather than the loss function being fitted to a small external dataset – as per Flaxman et al. (*48*) – the loss function was fitted directly to the distribution and net crop data within the stock-and-flow model itself. Loss functions were fitted on a country-by-country basis, were allowed to vary through time, and were defined separately for conventional ITNs (cITNs) and LLINs. The fitted loss functions were compared with existing assumptions about rates of net loss from households. The stock-and-flow model was fitted using Bayesian inference and Markov chain Monte Carlo methods, which provided time-series estimates of national household net crop for cITNs and LLINs in each country, and an evaluation of underdistribution, all with posterior credible intervals.

Estimating indicators of national ITN access and use from the net crop

Rates of ITN access within households depend not only on the total number of ITNs in a country (i.e. the net crop), but also on how those nets are distributed among households. One factor that is known to strongly influence the relationship between net crop and net distribution patterns among households is the size of households, which varies among countries, particularly across sub-Saharan Africa. Many recent national surveys report the number of ITNs observed in each household surveyed. Hence, it is possible not only to estimate net crop, but also to generate a histogram that summarizes the household net ownership pattern (i.e. the proportion of households with 0, 1 or 2 nets and so on). In this way, the size of the net crop can be linked to distribution patterns among households while accounting for household size, making it possible to generate ownership distributions for each stratum of household size. The bivariate histogram of net crop to distribution of nets among households by household size made it possible to calculate the proportion of households with at least one ITN. Also, because the numbers of both ITNs and people in each household were available, it was possible to directly calculate two additional indicators: the proportion of households with at least one ITN for every two people, and the proportion of the population with access to an ITN within their household. For the final ITN indicator – the proportion of the population who slept under an ITN the previous night – the relationship between ITN use and access was defined using 62 surveys in which both these indicators were available (ITN $use_{\text{all ages}}$ = 0.8133 × ITN $access_{\text{all ages}}$ + 0.0026, R2 = 0.773). This relationship was applied to MAP's country–year estimates of household access, to obtain ITN use among all ages. The same method was used to obtain the country–year estimates of ITN use in children aged under 5 years (ITN $use_{\text{children under 5}}$ = 0.9327 x ITN $access_{\text{children under 5}}$ + 0.0282, R2 = 0.754).

Fig. 7.3. Percentage of the population at risk protected by IRS, by WHO region, 2010–2020

The number of people protected by IRS was reported to WHO by NMPs. Countries that were malaria endemic in 2020 were included. The total population of each country was taken from the 2019 revision of the *World population prospects* (*33*); the population at risk of malaria was calculated using the methods described for **Table 3.1**. For Cabo Verde, where the number of people protected by IRS exceeded the population at risk, the targeted population for IRS was used.

Table 7.1. Number of children treated with at least one dose of SMC, by year, in countries implementing SMC, 2012–2020

Data on seasonal malaria chemoprevention (SMC) were provided by the London School of Hygiene & Tropical Medicine (LSHTM) and the Medicines for Malaria Venture (MMV).

Table 7.2. Number of children targeted and treated, and total treatment doses targeted and delivered, in countries implementing SMC in 2020

Data were provided by LSHTM and MMV.

Fig. 7.4. Subnational areas where SMC was delivered in implementing countries in sub-Saharan Africa, 2020

Data were assembled through the SMC Alliance and provided by MMV.

Fig. 7.5. Percentage of pregnant women attending an ANC clinic at least once and receiving IPTp, by number of SP doses, sub-Saharan Africa, 2010–2020

The total number of pregnant women eligible for IPTp was calculated by adding total live births calculated from UN population data and spontaneous pregnancy loss (specifically, miscarriages and stillbirths) after the first trimester (*36*). Spontaneous pregnancy loss has previously been calculated by Dellicour et al. (*37*). Country-specific estimates of IPTp coverage were calculated as the ratio of pregnant women receiving IPTp at antenatal clinics to the estimated number of pregnant women eligible for IPTp in a given year. Antenatal clinic attendance rates were derived in the same way, using the number of initial ANC clinic visits reported through routine information systems. Local linear interpolation of information for national representative surveys was used to compute missing values. The same dose-specific IPTp and antenatal clinic coverage estimates reported in 2019 were assumed to be observed in 2020 for the following countries that had incomplete information for 2020: the Comoros, Guinea-Bissau, Equatorial Guinea, Liberia, the Niger, Togo and Zimbabwe. Annual aggregate estimates exclude countries for which a report or interpolation was not available for the specific year. Dose coverage between 2010 and 2020 was calculated for 33 of the 35 countries with an IPTp policy (the Comoros, and Sao Tome and Principe were excluded due to their low malaria burden).

The coverages of at least one ANC clinic visit were corrected in 2020 based on the country-specific disruptions to antenatal clinic services reported per country and obtained from the national pulse surveys on continuity of essential health services during the COVID-19 pandemic conducted by WHO (first round in May–July 2020 and second in January–March 2021) (*19*, *20*). Disruptions were quantified by using the middle value of the disruption ranges reported by countries. A 5% reduction in ANC attendance was assumed in all countries that did not provide information on antenatal service disruptions in the pulse surveys (*49-52*). The corrected number of women that attended at least one antenatal visit, after adjusting for disruptions, multiplied by the operational coverage of the first IPTp dose reported in 2020 (calculated as the number of women who received the first IPTp dose divided by the corrected number of women who attended the first ANC visit) allowed re-estimation of the expected number of pregnant women who took the first IPTp dose. This made it possible to re-estimate the population coverage of the first IPTp dose. The ratio observed among the first, second and third IPTp doses was used to calculate the corrected coverage for the second and third IPTp doses, assuming no disruptions in IPTp dose follow-up.

Diagnostic testing and treatment

The analysis is based on the latest nationally representative household surveys (DHS and MIS) conducted between 2015 and 2019, and surveys (the latest from 2000–2005) that were considered as baseline surveys from sub-Saharan African countries where data on malaria case management were available. Data are only available for children aged under 5 years because DHS and MIS focus on the most vulnerable population groups. Interviewers ask caregivers whether the child has had fever in the 2 weeks preceding the interview and, if so, where care was sought; whether the child received a finger or heel prick as part of the care; what treatment was received for the fever and when; and, in particular, whether the child received an artemisinin-based combination therapy (ACT) or other antimalarial medicine. In addition to self-reported data, DHS and MIS also include biomarker testing for malaria, using rapid diagnostic tests (RDTs) that detect *P. falciparum* histidine-rich protein 2 (HRP2). Percentages and 95% CIs were calculated for each country each year, taking into account the survey design. Median values and interquartile ranges were calculated using country percentages for the latest and baseline surveys. The following indicators are presented in **Table 7.3**:

Indicator	Numerator	Denominator
Median prevalence of fever in the past 2 weeks	Children aged under 5 years with a history of fever in the past 2 weeks	Children aged under 5 years
Median prevalence of fever in the past 2 weeks for whom treatment was sought	Children aged under 5 years with a history of fever in the past 2 weeks for whom treatment was sought	Children aged under 5 years with fever in the past 2 weeks
Median prevalence of treatment seeking by source of treatment for fever (public health facility, private health facility or community health worker)	Children aged under 5 years with a history of fever in the past 2 weeks for whom treatment was sought in the public sector or private sector or from a community health worker	Children aged under 5 years with fever in the past 2 weeks for whom treatment was sought
Median prevalence of receiving finger or heel prick	Children aged under 5 years with a history of fever in the past 2 weeks for whom treatment was sought and who received a finger or heel prick	Children aged under 5 years with fever in the past 2 weeks for whom treatment was sought
Median prevalence of treatment with ACTs	Children aged under 5 years with a history of fever in the past 2 weeks for whom treatment was sought and who were treated with ACTs	Children aged under 5 years with fever in the past 2 weeks for whom treatment was sought in public, private or community health services
Median prevalence of treatment with ACTs among those who received a finger or heel prick	Received ACT treatment	Children aged under 5 years with fever in the past 2 weeks for whom treatment was sought and who received a finger or heel prick

The use of household survey data has several limitations. One issue is that, because of difficulty recalling past events, respondents may not provide reliable information, especially on episodes of fever and the identity of prescribed medicines, resulting in a misclassification of drugs. Also, because respondents can choose more than one source of care for one episode of fever, and because the question on diagnostic test and treatment is asked broadly and hence is not linked to any specific source of care, it has been assumed that the diagnostic test and treatment were received in all the selected sources of care. However, only a low percentage (<5%) of febrile children were brought for care in more than one source of care. Data may also be biased by the seasonality of survey data collection, because DHS are carried out at various times during the year and MIS are usually timed to correspond with the high malaria transmission season. Another limitation, when undertaking trend analysis, is that DHS and MIS are done intermittently or not at all in some countries, resulting in a relatively small number of countries in sub-Saharan Africa or for any particular 4-year period. Also, countries are not the same across each 4-year period. In addition, depending on the sample size of the survey, the denominator for some indicators can be small – countries where the number of children in the denominator was less than 30 were excluded from the calculation.

Fig. 7.6. Number of RDTs sold by manufacturers and distributed by NMPs for use in testing suspected malaria cases, 2010–2020

The numbers of RDTs distributed by WHO region are the annual totals reported as having been distributed by NMPs. Numbers of RDT sales between 2010 and 2020 reflect sales by companies eligible for procurement. From 2010 to 2017, WHO received reports from up to 44 (cumulative number: number of eligible manufacturers and responders differed from year to year) manufacturers that participated in the RDT Product Testing Programme by WHO, the Foundation for Innovative New Diagnostics (FIND), the CDC, and the Special Programme for Research and Training in Tropical Diseases. WHO prequalification is now a selection requirement for procurement; hence, sales data from 2018 onwards have been provided by only a limited number of eligible manufacturers (for the 2020 figures, seven of nine eligible companies reported back to WHO).

Fig. 7.7. Number of ACT treatment courses delivered by manufacturers and distributed by NMPs to patients, 2010–2020

Data on ACT sales were provided by 10 manufacturers eligible for procurement by WHO and the United Nations Children's Fund (UNICEF). ACT sales were categorized as being to either the public sector or the private sector, taking into account the Global Fund copayment mechanism and the Affordable Medicines Facility–malaria (AMFm) initiative. Data on ACTs distributed within countries through the public sector were taken from NMP reports. For 2019 and 2020, missing data from NMP reports for ACT distributions were calculated based on the rate of ACT distributions to the number of patients treated with ACTs from the previous year, times the number of patients treated with ACTs in the current year. If these data were not available, the number of patients treated with ACTs was used as a proxy for ACT distributions.

Table 7.3. Summary of coverage of treatment seeking for fever, diagnosis and use of ACTs for children aged under 5 years, from household surveys in sub-Saharan Africa, at baseline (2005–2011) and most recently (2015–2019)

See the information provided in the section titled *Diagnostic testing and treatment* (under **Fig. 7.5**).

Table 7.4. Summary of coverage of treatment seeking for fever, diagnosis and use of ACTs for children aged under 5 years from the most recent household survey for countries in sub-Saharan Africa

See the information provided in the section titled *Diagnostic testing and treatment* (under **Fig. 7.5**).

Fig. 8.1. Comparison of global progress in malaria a) case incidence and b) mortality rate, considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green)

The GTS target is a 90% reduction of malaria incidence and mortality rate by 2030, with milestones of 40% and 75% reductions in both indicators for the years 2020 and 2025, respectively (*53*). A curve based on a quadratic fit is used for the malaria incidence milestones. For projection of malaria incidence under current estimated trends, the same year-on-year trend observed in the previous 10 years (2011–2020) is forecast up to 2030. The distance between the target and the observed or projected incidence or mortality estimates are calculated using the following formula: 1 – (GTS expected value for a given year / observed or projected value for the same year).

Fig. 8.2. Map of malaria endemic countries (including the territory of French Guiana) showing progress towards the GTS 2020 malaria case incidence milestone of at least 40% reduction from a 2015 baseline

See methods notes for **Fig. 8.1**.

Fig. 8.3. Map of malaria endemic countries (including the territory of French Guiana) showing progress towards the GTS 2020 malaria mortality rate milestone of at least 40% reduction from a 2015 baseline

See methods notes for **Fig. 8.1**.

Fig. 8.4. Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO African Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green)

See methods notes for **Fig. 8.1**.

Fig. 8.5. Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO Region of the Americas considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green)

See methods notes for **Fig. 8.1**.

Fig. 8.6. Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO Eastern Mediterranean Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green)

See methods notes for **Fig. 8.1**.

Fig. 8.7. Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO South-East Asia Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green)

See methods notes for **Fig. 8.1**.

Fig. 8.8. Comparison of progress in malaria a) case incidence and b) mortality rate in the WHO Western Pacific Region considering two scenarios: current trajectory maintained (blue) and GTS targets achieved (green)

See methods notes for **Fig. 8.1**.

Fig. 9.1. Treatment failure rates among patients infected with *P. falciparum* and treated with DHA-PPQ in Cambodia, the Lao People's Democratic Republic and Viet Nam (2015–2020), among studies with at least 20 patients

The bubble plots demonstrate the percentage of patients with treatment failure for each country, from 2015 to 2020. Only studies with at least 20 patients were included.

Fig. 9.2. Trends in molecular markers associated with drug resistance, Cambodia 2015–2020, among studies with at least 20 samples

The bubble plots demonstrate the percentage of samples with a) C580Y *PfKelch13* mutation, b) *Pfplasmepsin* multiple copy numbers, c) *Pfmdr1* multiple copy numbers and d) *PfKelch13* wild type. The studies were conducted in Cambodia from 2015 to 2020, and only those with at least 20 samples were included. The data were obtained from the WHO Global database on antimalarial drug efficacy and resistance (*54*).

Fig. 9.3. Reported insecticide resistance status as a proportion of sites for which monitoring was conducted, by WHO region, 2010–2020, for pyrethroids, organochlorines, carbamates and organophosphates

The status of resistance at each mosquito collection site for each insecticide class was assessed based on the lowest mosquito mortality reported across all standard WHO tube tests or CDC bottle bioassays conducted at the site during 2010–2020, with validated discriminating concentrations of the insecticides in the class. If multiple insecticides and mosquito species were tested between 2010 and 2020 at the collection site, the lowest mosquito mortality was considered. If the lowest mosquito mortality was below 90%, resistance was considered to be confirmed at the site; if the lowest mosquito mortality was at least 90% but less than 98%, resistance was considered to be possible at the site; if the lowest mortality was 98% or more, vectors at the site were considered to be susceptible to the insecticide class. The figure was developed based on data in the WHO global database for insecticide resistance in malaria vectors. These data were reported to WHO by NMPs, national public health institutes, universities and research centres, the African Network for Vector Resistance, MAP, VectorBase and PMI, or extracted from scientific publications.

Fig. 9.4. Number of classes to which resistance was confirmed in at least one malaria vector in at least one monitoring site, 2010–2020

Resistance to an insecticide class was considered to be confirmed in a country if at least one vector species exhibited resistance to one insecticide in the class in at least one collection site in the country, as measured by standard WHO tube tests or CDC bottle bioassays conducted with validated discriminating concentrations in 2010–2020. The map was developed based on data contained in the WHO global database for insecticide resistance in malaria vectors. These data were reported to WHO by NMPs, national public health institutes, universities and research centres, the African Network for Vector Resistance, MAP (*54*), VectorBase and the PMI, or extracted from scientific publications.

Fig. 9.5. Detections of *An. stephensi* in the Horn of Africa reported to WHO since 2012

Map of the invasion of *Anopheles stephensi* was produced from data submitted to the WHO global database on invasive species (*54*) on the Malaria Threats Map (*55*).

References for Annex 1

1. Global technical strategy for malaria 2016–2030, 2021 update. Geneva: World Health Organization; 2021 (https://www.who.int/publications/i/item/9789240031357).
2. RBM Partnership Strategic Plan 2021–25. Geneva: RBM Partnership to End Malaria Strategy; 2020 (https://endmalaria.org/sites/default/files/RBM%20Partnership%20to%20End%20Malaria%20Strategic%20plan%20for%202021-2025_web_0.pdf).
3. Global Fund Strategy 2023–2028 [website]. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2021 (https://www.theglobalfund.org/en/strategy/).
4. End malaria faster. Washington, DC: United States President's Malaria Initiative; 2021 (https://d1u4sg1s9ptc4z.cloudfront.net/uploads/2021/10/10.04Final_USAID_PMI_Report_50851.pdf).
5. WHO guidelines for malaria. Geneva: World Health Organization; 2021 (https://app.magicapp.org/#/guideline/5700).
6. The RTS,S malaria vaccine. Geneva: World Health Organization; 2021 (https://www.who.int/multi-media/details/the-rts-s-malaria-vaccinev2).
7. Country health cluster / sector dashboard, December 2020. Geneva: World Health Organization; 2020 (https://www.who.int/health-cluster/countries/GHC-dashboard-Q4-2020-final.pdf).
8. Rentschler J, Salhab M. People in harm's way. Flood exposure and poverty in 189 countries. Policy Research Working Paper 9447. Washington, DC: World Bank; 2020 (https://documents1.worldbank.org/curated/en/669141603288540994/pdf/People-in-Harms-Way-Flood-Exposure-and-Poverty-in-189-Countries.pdf).
9. Coronavirus disease (COVID-19) dashboard [website]. Geneva: World Health Organization; 2021 (https://covid19.who.int/).
10. Statistics and research: coronavirus (COVID-19) vaccinations [website]. Oxford: Our World in Data; 2021 (https://ourworldindata.org/covid-vaccinations).
11. End-use verification survey. Washington, DC: USAID Global Health Supply Chain Program; 2021 (https://www.ghsupplychain.org/euvsurvey).
12. World malaria report 2008. Geneva: World Health Organization; 2008 (https://apps.who.int/iris/handle/10665/43939).
13. Cibulskis RE, Aregawi M, Williams R, Otten M, Dye C. Worldwide incidence of malaria in 2009: estimates, time trends, and a critique of methods. PLoS Med. 2011;8(12):e1001142.
14. The R Core Team. R: A language and environment for statistical computing: reference index. Vienna: R Foundation for Statistical Computing.
15. Weiss DJ, Mappin B, Dalrymple U, Bhatt S, Cameron E, Hay SI et al. Re-examining environmental correlates of *Plasmodium falciparum* malaria endemicity: a data-intensive variable selection approach. Malar J. 2015;14(1):68.
16. Cameron E, Battle KE, Bhatt S, Weiss DJ, Bisanzio D, Mappin B et al. Defining the relationship between infection prevalence and clinical incidence of *Plasmodium falciparum* malaria. Nat Commun. 2015;6:8170.
17. Malaria Atlas Project [website]. (https://malariaatlas.org)
18. World malaria report 2020. Geneva: World Health Organization; 2020 (https://www.who.int/publications-detail-redirect/9789240015791).
19. Pulse survey on continuity of essential health services during the COVID-19 pandemic: interim report, 27 August 2020. Geneva: World Health Organization; 2020 (https://www.who.int/publications/i/item/WHO-2019-nCoV-EHS_continuity-survey-2020.1).
20. Second round of the national pulse survey on continuity of essential health services during the COVID-19 pandemic. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/bitstream/handle/10665/340937/WHO-2019-nCoV-EHS-continuity-survey-2021.1-eng.pdf?sequence=1&isAllowed=y).
21. Alles HK, Mendis KN, Carter R. Malaria mortality rates in South Asia and in Africa: implications for malaria control. Parasitol Today. 1998;14(9):369–75.
22. Luxemburger C, Ricci F, Nosten F, Raimond D, Bathet S, White NJ. The epidemiology of severe malaria in an area of low transmission in Thailand. Trans R Soc Trop Med Hyg. 1997;91(3):256–62.
23. Meek SR. Epidemiology of malaria in displaced Khmers on the Thai-Kampuchean border. Southeast Asian J Trop Med Public Health. 1988;19(2):243–52.
24. Douglas NM, Pontororing GJ, Lampah DA, Yeo TW, Kenangalem E, Poespoprodjo JR et al. Mortality attributable to *Plasmodium vivax* malaria: a clinical audit from Papua, Indonesia. BMC Med. 2014;12(1):217.
25. Perin J, Mulick A, Yeung D, Villavicencio F, Lopez G, Strong K L et al. Global, regional, and national causes of under-5 mortality in 2000–19: an updated systematic analysis with implications for the Sustainable Development Goals. Lancet. 2021; S2352-4642(21)00311-4.
26. Liu L, Oza S, Hogan D, Perin J, Rudan I, Lawn JE et al. Global, regional, and national causes of child mortality in 2000–13, with projections to inform post-2015 priorities: an updated systematic analysis. Lancet. 2015;385(9966):430–40.
27. Ross A, Maire N, Molineaux L, Smith T. An epidemiologic model of severe morbidity and mortality caused by *Plasmodium falciparum*. Am J Trop Med Hyg. 2006;75(2 Suppl):63–73.
28. Griffin JT, Ferguson NM, Ghani AC. Estimates of the changing age-burden of *Plasmodium falciparum* malaria disease in sub-Saharan Africa. Nat Commun. 2014;5(1):1–10.

29. Walker PG, Griffin JT, Cairns M, Rogerson SJ, Van Eijk AM, ter Kuile F et al. A model of parity-dependent immunity to placental malaria. Nat Commun. 2013;4(1):1–11 (https://www.nature.com/articles/ncomms2605).

30. Walker PG, ter Kuile FO, Garske T, Menendez C, Ghani AC. Estimated risk of placental infection and low birthweight attributable to *Plasmodium falciparum* malaria in Africa in 2010: a modelling study. Lancet Glob Health. 2014;2(8):e460–e7 (https://pubmed.ncbi.nlm.nih.gov/25103519).

31. Bhatt S, Weiss DJ, Cameron E, Bisanzio D, Mappin B, Dalrymple U et al. The effect of malaria control on *Plasmodium falciparum* in Africa between 2000 and 2015. Nature. 2015;526(7572):207–11 (https://pubmed.ncbi.nlm.nih.gov/26375008).

32. The DHS program: demographic and health surveys [website]. Washington, DC: United States Agency for International Development; 2021 (https://dhsprogram.com/).

33. World population prospects [website]. New York City: United Nations; 2020 (https://population.un.org/wpp/).

34. WorldPop [website]. 2021 (https://www.worldpop.org/).

35. Cairns M, Roca-Feltrer A, Garske T, Wilson AL, Diallo D, Milligan PJ et al. Estimating the potential public health impact of seasonal malaria chemoprevention in African children. Nat Commun. 2012;3:881.

36. Adekanbi AO, Olayemi OO, Fawole AO, Afolabi KA. Scourge of intra-partum foetal death in Sub-Saharan Africa. World J Clin Cases. 2015;3(7):635–39. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4517338/).

37. Dellicour S, Tatem AJ, Guerra CA, Snow RW, ter Kuile FO. Quantifying the number of pregnancies at risk of malaria in 2007: a demographic study. PLoS Med. 2010;7(1):e1000221.

38. High burden to high impact: a targeted malaria response. Geneva: World Health Organization; 2019 (https://www.who.int/publications/i/item/WHO-CDS-GMP-2018.25).

39. Choosing Interventions that are Cost-Effective (WHO-CHOICE) [website]. Geneva: World Health Organization; 2021 (https://www.who.int/teams/health-systems-governance-and-financing/economic-analysis).

40. GDP deflator [website]. Washington DC: World Bank; 2021 (https://data.worldbank.org/indicator/NY.GDP.DEFL.ZS).

41. Foreign assistance [website]. Washington, DC: Government of the United States of America; 2021 (https://foreignassistance.gov/).

42. Statistics on international development: final UK aid spend 2020. United Kingdom: Foreign, Commonwealth & Development Office; 2020 (https://www.gov.uk/government/statistics/statistics-on-international-development-provisional-uk-aid-spend-2020).

43. Creditor reporting system (CRS) [website]. Organisation for Economic Co-operation and Development; 2021 (https://stats.oecd.org/Index.aspx?DataSetCode=CRS1).

44. Government and public donors [website]. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2021 (https://www.theglobalfund.org/en/government/).

45. World Bank country and lending groups [website]. Washington DC: World Bank; 2021 (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups).

46. Real GDP growth: annual percent change [website]. Washington, DC: International Monetary Fund; 2021 (https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD).

47. Policy Cures Research: G-FINDER data portal [website]. Sydney, Australia: Policy Cures Research; 2021 (https://gfinderdata.policycuresresearch.org).

48. Flaxman AD, Fullman N, Otten MW, Menon M, Cibulskis RE, Ng M et al. Rapid scaling up of insecticide-treated bed net coverage in Africa and its relationship with development assistance for health: a systematic synthesis of supply, distribution, and household survey data. PLoS Med. 2010;7(8):e1000328.

49. Burt JF, Ouma J, Amone A, Aol L, Sekikubo M, Nakimuli A et al. Indirect effects of COVID-19 on maternal, neonatal, child, sexual and reproductive health services in Kampala, Uganda. BMJ Glob Health. 2021;6:e006102 (https://gh.bmj.com/content/6/8/e006102).

50. Balogun M, Banke-Thomas A, Sekoni A, Boateng GO, Yesufu V, Wright O et al. Challenges in access and satisfaction with reproductive, maternal, newborn and child health services in Nigeria during the COVID-19 pandemic: A cross-sectional survey. PLoS One. 2021;16(5):e0251382 (https://doi.org/10.1371/journal.pone.0251382).

51. das Neves Martins Pires PH, Macaringue C, Abdirazak A, Mucufo JR, Mupueleque MA, Zakus D et al. COVID-19 pandemic impact on maternal and child health services access in Nampula, Mozambique: a mixed methods research. BMC Health Serv Res. 2021;21:860.

52. Ahmed T, Rahman AE, Amole TG, Galadanci H, Matjila M, Soma-Pillay P et al. The effect of COVID-19 on maternal newborn and child health (MNCH) services in Bangladesh, Nigeria and South Africa: call for a contextualised pandemic response in LMICs. Int J Equity Health. 2021;20(1):1–6 (https://doi.org/10.1186/s12939-021-01414-5).

53. Global technical strategy for malaria 2016–2030. Geneva: World Health Organization; 2015 (http://apps.who.int/iris/bitstream/handle/10665/176712/9789241564991_eng.pdf;jsessionid=02F0657EB47EB043AD211FC20B1E2F1F?sequence=1).

54. Global database on antimalarial drug efficacy and resistance. Geneva: World Health Organization; 2020 (https://www.who.int/teams/global-malaria-programme/case-management/drug-efficacy-and-resistance/antimalarial-drug-efficacy-database).

55. Malaria threats map [website]. Geneva: World Health Organization; 2021 (https://apps.who.int/malaria/maps/threats/).

ANNEX 2 – NUMBER OF ITNs DISTRIBUTED THROUGH CAMPAIGNS IN MALARIA ENDEMIC COUNTRIES, 2020–2021

Data on number of insecticide-treated mosquito nets were collected from reports from national malaria programmes and other sources by the Alliance for Malaria Prevention and RBM Partnership to End Malaria.

Country	ITNs planned for distribution in 2020	ITNs considered distributed for the WMR 2020	ITNs remaining for distribution in 2021	Percentage of planned ITNs distributed in 2020
Afghanistan	2 012 283	2 012 283	0	100
Bangladesh	2 014 200	1 200 000	814 200	60
Benin	12 703 091	12 703 091	0	100
Cambodia	0	0	0	NA
Cameroon	2 112 900	2 112 900	0	100
Central African Republic	1 134 049	1 134 049	0	100
Chad	8 779 988	6 441 908	2 338 080	73
Comoros	444 750	444 750	0	100
Côte d'Ivoire	0	0	0	NA
Democratic Republic of the Congo	26 426 155	13 927 893	12 498 262	53
Eritrea	1 900 000	0	1 900 000	0
Ethiopia	5 601 538	5 601 538	0	100
Ghana	0	0	0	NA
Guatemala	0	0	0	NA
Guinea-Bissau	1 341 059	1 341 059	0	100
Haiti	1 100 000	990 000	110 000	90
India	22 400 000	11 200 000	11 200 000	50
Indonesia	3 351 572	1 361 184	1 990 388	41
Kenya	15 707 752	200 000	15 507 752	1
Liberia	0	0	0	NA
Madagascar	0	0	0	NA
Malawi	0	0	0	NA
Mali	7 800 000	7 800 000	0	100
Mauritania	1 645 733	1 645 733	0	100
Mozambique	10 792 450	10 792 450	0	100
Niger	8 000 000	8 000 000	0	100
Nigeria	14 493 444	14 493 444	0	100
Pakistan	1 442 617	1 442 617	0	100
Rwanda	4 800 000	4 800 000	0	100
Sierra Leone	4 601 419	4 601 419	0	100
Solomon Islands	0	0	0	NA
Somalia	1 400 000	1 400 000	0	100
South Sudan	7 109 587	2 605 604	4 503 983	37
Sudan	4 626 940	4 626 940	0	100
Togo	5 965 000	5 965 000	0	100
Uganda	28 242 547	22 232 825	6 009 722	79
United Republic of Tanzania	7 892 562	7 714 722	177 840	98
Zanzibar	0	0	0	NA
Venezuela (Bolivarian Republic of)	0	0	0	NA
Yemen	1 565 000	855 298	709 702	55
Zambia	7 036 457	1 758 078	5 278 379	25
Zimbabwe	0	0	0	NA
Total	**222 430 810**	**159 392 502**	**63 038 308**	**72**

ITN: insecticide-treated mosquito net; NA: not applicable; WMR: world malaria report.

ITNs distributed in 2021 from 2020 campaigns	Percentage of remaining ITNs from 2020 distributed in 2021	Planned ITNs 2021 (excluding carryover from 2020)	ITNs distributed in 2021	ITNs remaining for distribution in 2021	Percentage of ITNs planned for distribution in 2021 distributed in 2021
NA	NA	0	0	0	NA
814 200	100	620 696	620 696	0	100
NA	NA	0	0	0	NA
NA	NA	1 274 428	0	1 274 428	0
NA	NA	0	0	0	NA
NA	NA	1 193 522	0	1 193 522	0
2 338 080	100	1 000 000	0	1 000 000	0
NA	NA	0	0	0	NA
NA	NA	19 313 573	19 313 573	0	100
12 498 262	100	39 630 973	1 496 539	38 134 434	4
1 900 000	100	0	0	0	NA
NA	NA	7 800 000	7 000 000	800 000	90
NA	NA	16 225 716	12 342 387	3 883 329	76
NA	NA	0	0	0	NA
NA	NA	0	0	0	NA
110 000	100	0	0	0	NA
11 200 000	100	11 345 000	0	11 345 000	0
1 990 388	100	421 980	421 980	0	100
9 488 866	61	0	0	0	NA
NA	NA	2 783 264	2 783 264	0	100
NA	NA	14 674 150	14 674 150	0	100
NA	NA	9 258 645	0	9 258 645	0
NA	NA	0	0	0	NA
NA	NA	0	0	0	NA
NA	NA	0	0	0	NA
NA	NA	4 202 152	4 202 152	0	100
NA	NA	35 845 001	16 950 443	18 894 558	47
NA	NA	3 672 938	0	3 672 938	0
NA	NA	0	0	0	NA
NA	NA	0	0	0	NA
NA	NA	605 384	0	605 384	0
NA	NA	0	0	0	NA
1 637 617	36	0	0	0	NA
NA	NA	0	0	0	NA
NA	NA	0	0	0	NA
6 009 722	100	0	0	0	NA
177 840	100	1 018 383	1 018 383	0	100
NA	NA	746 420	746 420	0	100
NA	NA	800 000	0	800 000	0
709 702	100	0	0	0	NA
5 278 379	100	0	0	0	NA
NA	NA	928 629	928 629	0	100
54 153 056	**86**	**171 685 805**	**80 823 567**	**90 862 238**	**47**

This annex summarizes countries' progress against the response pillars of the high burden high impact (HBHI) initiative.

BURKINA FASO

Response pillar I.	■ Owing to the coronavirus disease (COVID-19) pandemic, World Malaria Day activities were not implemented in 2020. ■ A proposal for a national malaria champion has been made, and the application is undergoing administrative approval. ■ The President of the Association of Mayors of Burkina Faso has been called on to support and advocate for the malaria response in urban areas in the country. ■ Universal health insurance coverage implementation started in December 2019, initially targeted at pilot health regions. More than 60 000 people on a lower income in the administrative regions of Boucle du Mouhoun, Centre, Hauts-Bassins and North are currently benefiting from health insurance in the pilot phase.
Response pillar II.	■ The subnational tailoring of interventions has been carried out and validated by the National Malaria Programme, in collaboration with the World Health Organization (WHO) and other partners, and is being used for the development of the 2021–2025 National Strategic Plan (NSP). ■ The process of digitalizing the data from the long-lasting insecticidal net (LLIN) and seasonal malaria chemoprevention (SMC) campaigns is underway. ■ Surveillance systems assessment has been implemented with support from partners, using the pilot version of the WHO malaria surveillance assessment toolkit. ■ The District Health Information Software 2 (DHIS2) health management information system (HMIS) platform has been updated and it is now possible to capture supply chain data (distributions, consumption and stockouts). The system allows for offline data entry. ■ Data entry at health facility level is being tried in all six health districts in the Boucle du Mouhoun, and in the health districts of Yako and Ziniaré in the Central Plateau and North regions. ■ Discussions are ongoing with WHO and partners to establish an integrated national malaria data repository that is hosted by the HMIS.
Response pillar III.	■ Studies evaluating new nets are ongoing in selected regions, and coordination with implementation partners is effective. ■ A workshop for national stakeholders to share research results, best practices and experiences in malaria control was held in December 2020. ■ The 2017 malaria treatment guidelines have been updated based on the latest evidence and recommendations. The main updates are the introduction of Pyramax in the new guidelines (which recommend dihydroartemisinin-piperaquine, or artesunate-pyronaridine or artemether-lumefantrine), the formulation of recommendations and the development of a checklist for optimal management of malaria cases at all levels. This is to be done through the integrated supervision carried out at all levels of the health system and the visits organized at the level of the health centres, to monitor compliance with the guidelines and the malaria control policy. Supervision undertaken in 2020 was used to verify compliance with the guidelines. ■ The supply chain strengthening plan is being implemented; the plan resulted from the assessment of the supply chain in Burkina Faso conducted with support from the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). ■ Environmental management and sanitation activities were integrated into the NSP 2021–2025, with the participation of the municipalities and other ministerial departments.
Response pillar IV.	■ A revision of the decree to update the national steering committee is underway; it takes into account all the actors in the national steering committee. While awaiting the updating of the decree, meetings of the national steering committee and specialized commissions were held involving resource persons and certain stakeholders (some of the specialized commissions could not be held because of the COVID-19 pandemic). ■ Pooled procurement of inputs was integrated into the procurement process in the 2021–2025 NSP.

CAMEROON

Response pillar I.	■ A task force for implementation of the HBHI response pillar 1 was set up and steps are being taken to put malaria on the agenda of the interministerial committee. ■ There was widespread use of social media to promote malaria control actions at all levels (i.e. via social networks).
Response pillar II.	■ Subnational tailoring of malaria interventions was finalized and was used to update the NSP. ■ Surveillance data at all levels was reviewed and validated at biannual meetings involving all sectors; also, the United States President's Malaria Initiative (PMI) supported the equipping of health facilities with data collection and analysis tools (e.g. digital tablets and internet connection) in the two health regions. ■ Annual operational plans at all levels were updated. ■ Work is ongoing to establish an integrated national malaria data repository with support from partners.
Response pillar III.	■ Guidelines for malaria treatment, integrated vector management, insecticide resistance and chemoprevention were updated. ■ Meetings were held of the thematic technical committee for the revision and monitoring of the implementation of the guidelines. ■ Health personnel were trained in the new malaria treatment guidelines. ■ The stock management and supply policy was updated.
Response pillar IV.	■ Technical committee meetings were organized at the national, regional and district levels to discuss operational issues and ways of improving the malaria response. ■ A malaria advocacy plan is under development.

DEMOCRATIC REPUBLIC OF THE CONGO

Response pillar I.	■ The Presidency of the Democratic Republic of the Congo created the Multisectoral Council for Malaria Control and Elimination, to make the fight against malaria a priority. ■ The parliamentary network for malaria control was revitalized and institutionalized. ■ Strong advocacy for the reduction of taxes and tariffs on malaria inputs is ongoing. ■ At the decentralized level, support for advocacy and planning activities at the provincial level for the introduction of the HBHI initiative in the province's 2021 plans of action was carried out with the support of WHO in four of the six provinces targeted for 2020 (Ituri, Katanga, Kongo Central and Thiopo). South Kivu and North Kivu will benefit from the same support by the end of 2021, before the validation phase of the 2021 operational plans.
Response pillar II.	■ The subnational tailoring of interventions has been completed and was used to update the NSP 2020–2023 and provincial operation plans. ■ Antimalarial therapeutic efficacy studies were implemented by the National Malaria Control Programme (NMCP), with support from the University of Kinshasa and funding from the WHO country office. Twenty-five NMCP and partner members were trained as part of these studies. ■ The Kinshasa School of Public Health is involved in the assessments and formulation of strategic plans, and in the implementation of the CARAMAL (community access to rectal artesunate for malaria) research project, which is looking at the effectiveness of rectal artesunate. ■ The health zones identified as having epidemic potential benefited from support from the epidemiological surveillance division at the central level and from WHO, for retrospective data analysis and the development of monitoring plans.
Response pillar III.	■ Updating of the guidelines involved revision of the management guidelines, which include a malaria and COVID-19 component. ■ The guidelines were disseminated at the national and subnational levels, including COVID-19-related interim guidance. ■ There was follow-up supervision to monitor the effective implementation of the national guidelines.
Response pillar IV.	■ Within the framework of institutional strengthening, a working group has been set up – it comprises the NMCP management, WHO, the Global Fund and PMI. Its mission is to make proposals to the Secretary General of Health for the restructuring of the NMCP divisions, so that these divisions respond to the assigned terms of reference. ■ In total, there were 76 agents at the level of the National Directorate of the NMCP, which led to a proposal for the support of partners for the restructuring of the NMCP's coordination divisions and the development of a performance framework with monitoring indicators. The partners are committed to supporting the NMCP in building the capacity of its staff at both the central and provincial levels, as evidenced by the malaria management course being conducted in the provinces for the benefit of provincial and health zone management teams. ■ Working sessions with the NMCP and partners were organized to evaluate the impact of COVID-19 on malaria control activities. ■ The country has actively participated in cross-border collaboration activities organized by the East African Community and the Southern African Development Community.

GHANA

Response pillar I.

- Among the partnerships and high-level advocacy activities carried out, the country facilitated a meeting with the government's One Village One Dam Initiative from the Ministry of Special Development Initiatives (MSDI). This initiative supports development of the agricultural sector through the building of dams in certain communities to enhance irrigation. Correspondence about a partnership on larval source management was sent to the MSDI, and inputs were made into the manual being developed for this initiative, regarding the impact of larval source management on malaria control. These advocacy activities are being followed up by the HBHI officer, who was recruited to support implementation of the HBHI approach – an integral part of holistic malaria control in Ghana.
- Under discussion are a draft concept note and terms of reference that have been developed for the Ghana Malaria Foundation and the proposed End Malaria Council. A draft proposal on the allocation of the 0.5% of the District Assembly Common Fund allocated for malaria was also developed. Some of these activities were slowed by the COVID-19 pandemic and the subsequent restrictions.
- Discussions have begun about collaboration between the country's NMCP and the Accra Metropolitan Assembly on how the two can work together to strengthen malaria control.

Response pillar II.

- Ghana is pursuing the strategic use of data by using risk stratification to inform the intervention mix for maximum impact. WHO headquarters and the WHO Regional Office for Africa (AFRO) supported the country to carry out a malaria risk stratification with sublevel data, to inform which interventions to use and where to deploy them for efficiency and impact.
- The country has again been supported to develop a malaria data repository database, to bring all malaria datasets into one hub. WHO headquarters and AFRO are supporting the integration of this system with the national DHIS2.
- The three levels of WHO supported a review of the National Malaria Strategic Plan (NMSP) 2014–2020 and the subsequent development of a new NMSP 2021–2025.
- The strategic information team of the NMCP has been actively producing quarterly data bulletins, which are essential for informed decision-making and intervention planning.

Response pillar III.

- Ghana seeks to adopt global policies and strategies that will help to deliver the optimal mix of interventions within the country's settings and in the context of COVID-19. There were capacity-building efforts for the various guidelines and manuals that had been revised in 2019. Implementation of case management interventions was sustained; although there were delays in procurement of some commodities, there were no severe stockouts.

  Case management (in the context of COVID-19)

  - Case management, including diagnosis and treatment at health facilities, continued to be integrated in the health care service.
  - An onsite outreach training and supportive supervision was carried out for health workers in the context of COVID-19; this activity was mainly supported by a PMI implementing partner.
  - The quarterly technical working group meetings (e.g. malaria in pregnancy and vector oversight) were organized as online meetings and were carried out according to schedule.
  - SMC was carried out successfully in the five eligible regions – 1 078 635 children aged 6 months to 5 years were covered with four rounds of dosing, representing 94% of children fully dosed or treated.

  Prevention

  - LLINs:
    - Routine distribution of LLINs at facilities took place uninterrupted; however, school distribution was delayed until November, when a new strategy was devised that involved making telephone calls to individual eligible school pupils.
    - For mass distribution of LLINs, planning and preparations were undertaken for 2021.
    - There were no LLIN stockouts and no stockouts are expected.
  - Indoor residual spraying (IRS)
    - IRS was successfully completed for the year under strict COVID-19 protocols. One achievement was the spraying of all the 49 prisons in the country, in addition to the original districts.
    - The annual entomological monitoring took place as scheduled.

Response pillar IV.

- Processes requiring coordination included collaborative activities with malaria stakeholders in the nongovernmental and private sectors. A working group oversaw the collaboration with the private sector regarding access to artemisinin-based combination therapies (ACTs).
- The malaria programme review identified cross-border collaboration as a gap; efforts to address this gap have been affected by COVID-19, which makes cross-border meetings and activities a challenge.
- The new Malaria Interagency Coordinating Committee has not yet been convened.
- In terms of coordination structures, several technical working groups meet quarterly, and these meetings took place as scheduled, but online rather than in person.

INDIA

Response pillar I.

- India is a signatory to the *Ministerial Declaration on Accelerating and Sustaining Malaria Elimination in the South-East Asia Region*, which was signed in New Delhi by health ministers of countries of the WHO South-East Asia Region.
- The National Framework for Malaria Elimination (NFME) 2016–2030 was launched in February 2016 by India's Minister for Health.
- The NFME 2016–2030 was disseminated to all states, with instructions to initiate key actions.
- A National Task Force on Malaria Elimination was formed under the Union Health Secretary, to promote intersectoral cooperation and engagement of all stakeholders, including the community (who are members).
- A Parliamentary and Legislative Forum on Malaria Elimination was formed.

Response pillar II.

- Malaria has been made notifiable in 31 states; progress was monitored through a review by the Secretary and the Health and Family Welfare Ministry by videoconference with the states.
- Existing malaria data were used for stratification of high burden areas at all levels (state, district, primary health care catchments and villages).
- A web-based health reporting system (that includes malaria) was scaled up for the whole country on the Integrated Health Information Platform. A pilot study on malaria elimination forms for web-based, real-time malaria reporting is ongoing in two states. The system can link malaria data to other aspects such as hospital admissions and deaths (all causes), climatic conditions and diagnosis of fever (other than malaria). Reporting from the private sector is also included.
- High malarious areas were mapped using geographic information system maps and hotspots for identification and follow-up.
- Tracking of cases and follow-up included an understanding that acceptance and usage of LLINs and IRS would lead to better decision-making and make it easier to change direction mid-course.

Response pillar III.

- National treatment and prevention guidelines are up to date.

Response pillar IV.

- A technical working group was formed under the Directorate General of Health Services to oversee all malaria elimination activities in the country.
- State and district malaria elimination committees were formed.
- Subnational malaria elimination strategies were launched at the central and state levels by the minister responsible.
- Districts and states were incentivized to maintain "zero indigenous cases" for 1 year and subsequently for 3 years, with awards to be given by the state and central ministers and the announcement of states that achieved zero malaria cases in 2020.
- Enhanced microscopy with crosschecking was used to check the quality of diagnosis.
- Almost 50 million LLINs were distributed or are being distributed in high endemic villages (these LLINs were centrally procured using funding from the Global Fund and the domestic budget).
- There was decentralization of procurement items to the states; for example, rapid diagnostic tests, synthetic pyrethroids for IRS, larvicides and drugs.

MALI

Response pillar I.	■ The Directorate of the country's NMCP was directly attached to the Secretary General of the Ministry of Health with its coordination bodies: the orientation committee, the technical coordination groups, the framework for consultation between the NMCP and the partners involved in the fight against malaria. ■ A United States Agency for International Development (USAID)/PMI grant was received through the malaria operational plan, totalling about US$ 25 million per year. ■ A New Funding Model 3 grant was received from the Global Fund (€ 70 685 959). ■ Technical and financial support was received from WHO and the United Nations Children's Fund (UNICEF).
Response pillar II.	■ Malaria data have been stored in DHIS2 since 2016, with retrospective data entry for the 2018–2020 SMC campaigns and the 2019 and 2020 LLIN campaigns. ■ Implementation of the malaria indicator survey is ongoing, as is the national malaria surveillance assessment survey and periodic audit of data quality at the district level. ■ The SMC campaign was digitalized in 64 health districts, with systematic data entry into DHIS2 in each district. ■ Data stratification by district was completed in December 2020, and was used for the updated NSP and funding request to partners. ■ Monthly production began of malaria information bulletins produced at the national level and in two regions (Kayes and Sikasso). ■ Malaria control activities were integrated into regional and district operational plans and the quarterly review of malaria control data at the district level.
Response pillar III.	■ Current national treatment guidelines are up to date. ■ National guidelines on vector controls and other prevention interventions are also up to date. Discussions are ongoing on potential expansion of SMC to children aged under 10 years in some areas.
Response pillar IV.	■ There was cascade supervision of malaria control activities; also, workshops to share lessons learned during formative supervision were organized in the regions of Bamako and Kayes. ■ A review was implemented of the organizational decree and the operating mode of the NMCP in the new government organigram. ■ Biannual policy committee meetings restarted, and quarterly meetings were held for the technical groups on monitoring and evaluation, SMC and communication. ■ Meetings were held for the technical committee for monitoring the management of health products for the programmes.

MOZAMBIQUE

Response pillar I.	▪ The country's NMCP began to formulate policy to address an ongoing decentralization process. ▪ The Ministry of Health organigram was updated, including at provincial level. ▪ Malaria is part of the Presidential agenda – a National Malaria Fund was announced and was published on Malaria Day. ▪ The country's quarterly score cards for the first and second quarters were disseminated and published, and the 2020 annual malaria report was completed. ▪ There was continuous engagement with the country's executive and parliament to actualize the push for a malaria agenda. ▪ The 2021–2023 Global Fund grant for malaria and PMI malaria operational plan funding support was approved and disbursement has started. ▪ The social and behaviour change communication strategy was updated and disseminated, civil society and media were engaged to address malaria issues during the peak season, and national and local radio were routinely used to disseminate malaria messages.
Response pillar II.	▪ An integrated malaria information storage system (repository) was operationalized at national and subnational level, and staff training was completed in all provinces using interactive dashboards. The system has a tool for monitoring data quality and producing standardized bulletins, and is accessible to all partners. ▪ A mid-term review was completed in 2020, and the 2020 malaria annual report is being finalized. A malaria programme review was planned in 2021, and developments include a 2-year business plan and establishment of a quarterly review at subnational levels. ▪ The new strategic plan includes granular data analysis; also, intervention mixes and impact projection modelling were used to inform the newly approved Global Fund grant. ▪ In terms of surveillance, monitoring and evaluation, an operational research thematic working group is now functional. ▪ Surveillance operational guidelines are being updated to reflect emerging issues including risk stratification and cross-border surveillance. ▪ SMC is being conducted in Nampula using artesunate and amodiaquine. ▪ Mass drug administration using dihydroartemisinin-piperaquine is being undertaken in Cabo-Delgado because of the complex humanitarian emergency (in Metuge District and Ibo Island).
Response pillar III.	▪ The integrated vector management strategy was updated and was planned for dissemination in October 2021. ▪ Mechanisms for communications and coordination of activities were established at all levels, with partner engagement to ensure accountability. ▪ Guidelines for private sector engagement are needed and a malaria indicator survey is planned for 2022.
Response pillar IV.	▪ There is ongoing harmonization of partners' support, including support from nontraditional donors. ▪ Coordination mechanisms are being strengthened at subnational levels, ensuring alignment with national programme priorities. ▪ There is continuous engagement and collaboration with partners for effective implementation.

NIGER

Response pillar I.	■ The First Lady Hadjia Hadiza Bazoum became President of the Noor Foundation. ■ New parliamentary members were introduced into the network of the fight against malaria, AIDS and tuberculosis. ■ Traditional and religious authorities were involved in malaria response activities. ■ Several coordination meetings with partners were held under the leadership of the country's NMCP; meetings included a discussion panel comprising multisectoral and advocacy partners. ■ Work was undertaken with the Prime Minister's office to ensure that malaria is represented in preparations for "Government day". ■ A funding application was submitted to the Global Fund and processes were finalized for the Global Fund Technical Review Panel and grant-making discussions; also, discussions about the COVID-19 response were undertaken with the Global Fund. ■ An SMC campaign was launched with the participation of parliamentarians and religious and civil society leaders, using messaging via radio, the community and social media.
Response pillar II.	■ Digitalization of SMC campaigns was implemented in three pilot districts. ■ A progress report for the first half of 2021 was developed using DHIS2 data, including analysis and quality control of monthly malaria data from the HMIS. ■ Weekly malaria data from the districts were analysed using the epidemic threshold monitoring tool, and the surveillance, monitoring and operational research group produced a biannual malaria epidemiological bulletin. ■ The malaria indicator survey and the PMI-supported end-use verification survey are in progress. ■ Vector resistance to insecticides (piperonyl butoxide and Interceptor® G2) was monitored. ■ An audit of the quality of the malaria data is in progress.
Response pillar III.	■ A meeting was held to review and update documents for the distribution of LLINs in the context of COVID-19. ■ A guide for the implementation of the SMC campaign was updated for the COVID-19 context. ■ A technical group on malaria in pregnancy was established. ■ A malaria epidemic management plan was developed and validated. ■ The malaria epidemiological surveillance guide was validated.
Response pillar IV.	■ A quarterly NMCP coordination meeting was held with PMI. ■ Bi-monthly coordination meetings were held between the NMCP and the Global Fund principal recipient. ■ A workshop was held with all partners to update data and quantify malaria control inputs, and another to review and validate the annual action plan. ■ Review meetings were held with partners in the following areas: maintaining of essential health services and elaboration of the COVID-19/malaria plan. ■ Annual operational plans were developed for each region and district, taking into account malaria control activities at the decentralized level. ■ The semi-annual evaluation was undertaken of the activities of the first semester of 2021 of the annual action plan of the NMCP.

NIGERIA

Response pillar I.

- Structured advocacy meetings with state governors and key policy-makers at the state level resulted in more state support for interventions (LLIN and SMC).
- An advocacy meeting was held with the Chair of the Senate Committee on Health, and a meeting with the governor's forum is planned.
- The National End Malaria Council is being set up, with support from partners.
- An annual review meeting for programme managers provided an opportunity to review progress, identify opportunities and make plans for next year. New activities (e.g. institutional capacity strengthening) were introduced at the National Malaria Elimination Programme (NMEP).
- State policy-makers attended regional review meetings for state programmes. Meetings were held on lessons learned and national level planning for LLIN mass campaigns and SMC.
- The West African Health Organization pledged to provide some financial support to the NMEP to fill some of the gaps in programme implementation.
- The Global Fund provided additional support for the implementation of the 2021 malaria indicator survey.
- There are plans for increased funding for providing malaria training for state domestic resource mobilization officers.
- Advocacy visits and sensitization meetings were held with stakeholders who are gatekeepers and key influencers at different levels, and who support the "Zero Malaria Starts With Me" social movement.
- Support for states continued, particularly for states implementing insecticide-treated mosquito net (ITN) mass campaigns (e.g. provision of warehouses and payment for additional staff to support the planning and distribution process).

Response pillar II.

- A subnational tailoring process concluded and was used to develop the NSP and funding requests to partners.
- More than 900 staff from 17 states and local government areas were trained on the use of the national malaria data repository. A meeting of the repository steering committee was held to discuss progress made so far and additional efforts required to improve the repository, including ways to obtain more nonroutine data.
- An annual malaria programme review was held. Secondary analysis on the drivers of parasitaemia was conducted using data from malaria indicator surveys and demographic and health surveys.
- The NMEP is supporting the development of annual operational plans at state level through the provision of technical support.
- Plans are ongoing to engage one or more consultants to support the development of a national training manual and curriculum rollout for surveillance, monitoring and evaluation.
- The malaria indicator survey for 2021 is ongoing, as are LLIN and SMC evaluation studies that are intended to better guide operationalization of these interventions.

Response pillar III.	■ Development of a national social behavioural change communications strategy is in progress. ■ Various thematic guidance documents have been updated and are already in use. ■ A study is ongoing in two states to inform deployment of next-generation ITNs. ■ Insecticide resistance management is ongoing, to guide ITN deployment in different states.
Response pillar IV.	■ Training of NMEP staff in institutional capacity strengthening is ongoing; the first set of trainees have graduated and the second set of participants have started their training. ■ There are functional multisectoral committees (e.g. Malaria Technical Working Group and thematic subcommittees with wide stakeholder membership); decision-making processes will be through the NMEP thematic branches to the subcommittees. There are coordination structures across the thematic areas, and meetings are held. The NMEP acts as the secretariat and the partners act as committee chairs. ■ Coordination between the NMEP and state malaria elimination programmes is ongoing for coordinating programme implementation at the state level and providing direction. ■ A partners forum and technical working group provides opportunities to plan and fill gaps where required.

UGANDA

Response pillar I.	■ Political structures are established: in 2018, the President of Uganda launched the Mass Action Against Malaria (MAAM) initiative (for HBHI) and the Uganda Parliamentary Forum for Malaria, and committed the government to a malaria free Uganda by 2030. To decentralize and engage all levels, the country developed and disseminated the *MAAM handbook for leaders*. The malaria agenda is part of the manifesto for the country's 2021 election. The Uganda Parliamentary Forum for Malaria (UPFM) was established and developed its strategy and action plan, the implementation of which is being supported. In addition, MAAM district task forces, headed by regional district coordinators, were established and are supporting malaria operational interventions such as the LLIN universal coverage campaign (which has the slogan *USE NET*), IRS and *Music Dance Drama* (an annual nationwide, school-based sensitization and empowerment campaign on the malaria response) at subnational levels. ■ Accountability measures are in place: in 2018 the President declared "A malaria free Uganda is my responsibility"; he urged all community leaders to follow suit, and he continues to commit his government to this aim. The malaria agenda has been incorporated into the 2021–2025 National Development Plan III, Health Sector Development Plan III. The UPFM scorecard for periodic rating of performance at constituency level was established, and data management was initiated by the Division of Health Information in the Ministry of Health. ■ In terms of increasing malaria profile, social awareness and empowerment at all levels, one of the strategic objectives of the Uganda Malaria Reduction and Elimination Strategic Plan (UMRESP) is advocacy and social and behaviour change communication; thus, relevant operational tools were developed and incorporated into the COVID-19 response. Champions are being identified at all levels, including in the private and related sectors. There are partnerships and collaborations with mass media. ■ The following have helped to increase domestic financing for malaria through institutions: ● a budget call circular from the Ministry of Finance, Planning and Economic Development asking all sectors to prioritize the malaria agenda; ● establishment of the *Malaria Free Uganda* initiative, a private mechanism to drive the malaria agenda and a Rotary Malaria Partnership; and ● ongoing costing of the UMRESP; approval was received from key external development partners (e.g. the Global Fund) to increase malaria response resources, while WHO and partners from the RBM Partnership to End Malaria continued to provide assistance (e.g. to maintain technical quality).
Response pillar II.	■ The malaria portal was linked to the nationwide DHIS2, and the HMIS DHIS2 server is currently being upgraded, as is the malaria data repository as part of an integrated data management system. ■ A malaria programme review (MPR) was completed in 2020; an aide-memoire was endorsed and a follow-up plan for the MPR strategic recommendations is currently being implemented. The UMRESP 2021–2025 was finalized and was approved by the Health Policy Advisory Committee. Malaria is high on the agenda of the Ministry of Health quarterly review meetings. ■ Malaria risk stratification and impact modelling was conducted, and the results informed the prioritization of new UMRESP interventions in high, moderate and low transmission regions. The Ministry of Health and partners (including WHO) continued to support the decentralization process, including regional malaria strategies. ■ In terms of subnational operational plans, the Karamoja Malaria Strategy was developed, although decentralized planning for other regions was suspended owing to COVID-19. The publication *Guidance for mainstreaming malaria into national and district plans* was developed and disseminated. ■ A thematic working group titled *Surveillance, Monitoring and Evaluation – Operational Research* is functional and a plan for monitoring and evaluation is being finalized. Weekly malaria surveillance data – as a component of integrated disease surveillance and response (mTrac) – were shared, with recommendations followed up and progress reported. At national level, there was a monthly surveillance bulletin and data dissemination and use. Surveillance operational guidelines are being updated to reflect emerging issues such as risk stratification and cross-border surveillance.

Response pillar III.	■ Uganda developed and disseminated several evidence-based guidelines including tools related to Continuation of Essential Health Services (CEHS). Some of these guidelines are being finalized. Training needs assessment is ongoing, and the result will inform a plan for a tailored training programme. ■ Uganda continued to adapt and translate global policies – for example, the *Global technical strategy for malaria 2016–2030* (GTS), HBHI, MPR, treatment guidelines, therapeutic efficacy studies (TESs), the global vector control plan, the insecticide resistance management plan, SMC, information notes and COVID-19-related interim guidance – to the national and subnational context. ■ Several tools and reports were developed and deployed during the COVID-19 period; they include an MPR progress report, a malaria indicator survey report, the Uganda Malaria Reduction and Elimination Strategy, mainstreaming malaria into national and district plans, the *MAAM handbook for leaders*, a TES report and policy briefs. The national malaria prevention and control policy has been finalized but awaits approval from the Ministry of Health, owing to COVID-19 disruptions. Yet to be finalized are the strategies for the UPFM, the private sector and a malaria free Uganda. ■ There is collaboration with the Ministry of Health's departments of Planning and Quality Assurance to improve the tool tracking system, which incorporates availability, use and compliance or adherence.
Response pillar IV.	■ Processes requiring coordination included those within the malaria stakeholders, with other Ministry of Health programmes, with other health-related sectors and with the private sector, at national and subnational levels. Also, there was cross-border and international collaboration through participation in the East Asia Summit and WHO Regional Office for Africa, and in networks for HBHI and the WHO Global Malaria Programme. ■ Coordination structures included weekly structures (within the National Malaria Control Division, malaria partners and stakeholders, and the COVID-19 CEHS pillar), monthly structures (within the Ministry of Health National Disease Control and related health programmes – health information; epidemiology surveillance division; maternal, newborn, child and adolescent health; Expanded Programme on Immunization; planning, quality assurance, community and partnership), quarterly structures (RBM Partnership to End Malaria) and annual structures (MPR and progress report); the process of working with districts to decentralize is being improved. ■ A resource inventory was conducted, as was partner mapping; both are being progressively updated. The UMRESP 2021–2025 has aligned its goals, objectives, strategies and targets with those of Health Sector Development Plan III and the National Development Plan III, the GTS and the Vision 2040 Agenda.

UNITED REPUBLIC OF TANZANIA

Response pillar I.	▪ The country's NMCP works with the African Leaders Malaria Alliance (ALMA) to advocate for political support for malaria control in the country (e.g. in early 2021, the NMCP and ALMA jointly conducted a sensitization session on malaria control to members of parliament). ▪ To increase the use of the malaria scorecard at subnational level, the NMCP and its partners conducted a malaria scorecard training in five high burden regions (Geita, Kagera, Kigoma, Lindi and Mtwara). Political leaders from the five regions participated. ▪ The NMCP is in the process of establishing the End Malaria Council (EMC), which will be used to foster multisectoral collaboration in malaria control and fund mobilization. ▪ To increase awareness on malaria intervention, malaria messages were communicated through different media channels (radio, print materials, social media and interpersonal communication). Messages concerned malaria prevention, specifically, LLIN use, treatment seeking, testing before treatment, prevention of malaria during pregnancy and the "Zero Malaria Starts With Me" campaign. Further communications activities were implemented during World Malaria Day on 25 April through different channels.
Response pillar II.	▪ The NMCP works with subnational malaria focal persons to ensure continued collection of routine malaria data from health facilities. ▪ A malaria data repository system is in place but cannot be launched until sufficient server space is available to accommodate the new data. A functional malaria dashboard was available. ▪ An MPR for 2020 was conducted to understand progress and challenges, and an annual malaria report was produced. ▪ Data analysis and stratification of malaria transmission risk (at macro and micro levels) was conducted in 2018 and 2020; the outputs of this stratification were used in developing the NSP 2021–2025. ▪ Subnational operational plans were linked to health plans, as per health planning guidelines. ▪ The NMCP collaborates with partners to conduct monthly data review meetings to understand the data, and to detect and rectify any data quality issues. ▪ Two surveys are ongoing: the school malaria parasitological survey and the malaria indicator survey.
Response pillar III.	▪ The NSP 2021–2025 is in place and has already been disseminated to 13 regions (50%). ▪ A national guideline for malaria diagnosis, treatment and preventive therapies was published and disseminated to 13 regions (50%). ▪ Review of the vector control guidelines is ongoing.
Response pillar IV.	▪ An analysis of multisectoral stakeholders was conducted in July 2021, in preparation for the establishment of the EMC, which will include all relevant stakeholders. ▪ The NSP 2021–2025 includes an implementation framework and implementation arrangements, and clarifies the roles of all implementing entities, from national to council level as well as public and private. ▪ All public health facilities (dispensary to national hospital) provide malaria services in line with the Ministry of Health and NMCP.

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 404 million
Parasites: *P. falciparum* (almost 100%) and other (<1%)
Vectors: *An. arabiensis, An. coluzzii, An. funestus s.l., An. gambiae s.l., An. hispaniola, An. labranchiae, An. melas, An. moucheti, An. multicolor, An. nili s.l., An. pharoensis* and *An. sergentii s.l.*

FUNDING (US$), 2010–2020

563.8 million (2010), 575.5 million (2015), 870.8 million (2020); increase 2010–2020: 54%
Proportion of domestic source[a] in 2020: 19%
[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

INTERVENTIONS, 2010–2020

Countries with ≥80% coverage with either LLINs or IRS in 2020: Mali, the Niger and Togo
Countries with ≥50% coverage with either LLINs or IRS in 2020: Benin, Burkina Faso, Ghana, Guinea, Mali, the Niger, Senegal, Sierra Leone and Togo

Countries that implemented IPTp in 2020: Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Mali, Mauritania, Nigeria, Senegal and Sierra Leone
Countries with >30% IPTp3+ in 2020: Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Mali, Senegal and Sierra Leone
Note: No data for Guinea-Bissau, Liberia, the Niger and Togo.

Percentage of suspected cases tested (reported):[a] 54% (2010), 73% (2015), 90% (2020)
Number of ACT courses distributed: 32.2 million (2010), 47.4 million (2015), 59.7 million (2020)
Number of any antimalarial treatment courses (incl. ACT) distributed: 32.2 million (2010), 49.4 million (2015), 60.8 million (2020)
[a] No data for Guinea-Bissau, Liberia and Togo in 2020.

REPORTED CASES AND DEATHS IN THE PUBLIC SECTOR, 2010–2020

Total (presumed and confirmed) cases:[a] 30.6 million (2010), 56.8 million (2015), 58.3 million (2020)
Confirmed cases: 6.8 million (2010), 36.4 million (2015), 52.2 million (2020)
Percentage of total cases confirmed: 22.1% (2010), 64.1% (2015), 89.5% (2020)
Deaths: 39 000 (2010), 30 900 (2015), 20 500 (2020)
[a] No data for Guinea-Bissau, Liberia and Togo in 2020.

Children aged under 5 years, presumed and confirmed cases:[a] 11.9 million (2010), 21.0 million (2015), 22.7 million (2020)
Children aged under 5 years, percentage of total cases: 38.9% (2010), 37.0% (2015), 38.9% (2020)
Children aged under 5 years, deaths:[a] 22 900 (2010), 22 100 (2015), 14 000 (2020)
Children aged under 5 years, percentage of total deaths:[b] 59% (2020), 72% (2015), 68% (2020)
[a] No data for Guinea-Bissau, Liberia, Mauritania and Togo in 2020.
[b] Nigeria only reports deaths in children aged under 5 years.

ESTIMATED CASES AND DEATHS, 2010–2020

Cases: 115.6 million (2010), 106.3 million (2015), 117.1 million (2020); increase 2010–2020: 1%
Deaths: 366 100 (2010), 296 000 (2015), 329 000 (2020); decrease 2010–2020: 10%

ACCELERATION TO ELIMINATION

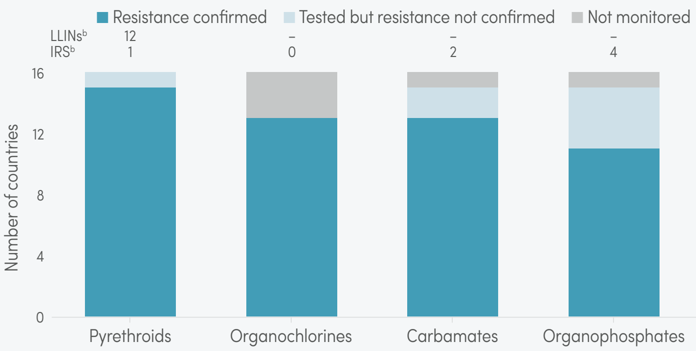
Countries with subnational/territorial elimination programme: Gambia, Mauritania, the Niger and Senegal
Countries with nationwide elimination programme: Cabo Verde
Zero indigenous cases for 2 consecutive years (2019 and 2020): Cabo Verde
Certified as malaria free since 2010: Algeria (2019)

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2015–2019	54	0.0	1.1	42.6	0.0	3.6
AS-AQ	2015–2019	46	0.0	0.0	8.0	0.0	2.2
DHA-PPQ	2016–2019	8	0.0	2.4	18.7	0.0	8.1

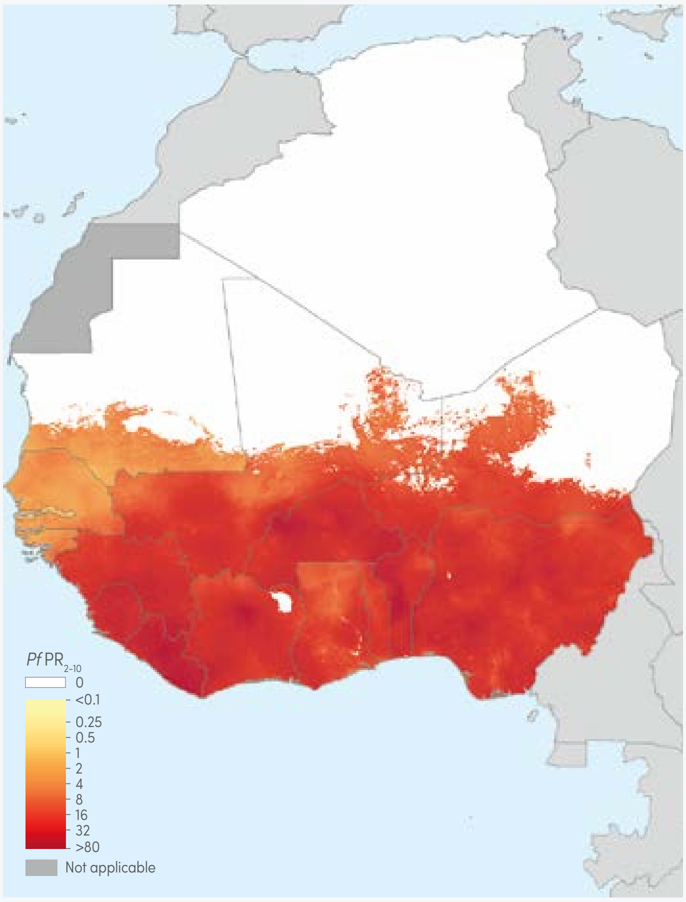
AL: artemether-lumefantrine; AS-AQ: artesunate-amodiaquine; DHA-PPQ: dihydroartemisinin-piperaquine.

STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)

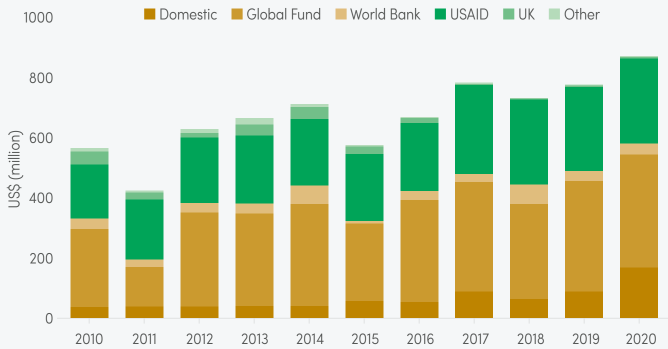


[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.
[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. *P. falciparum* parasite rate (*Pf*PR), 2020

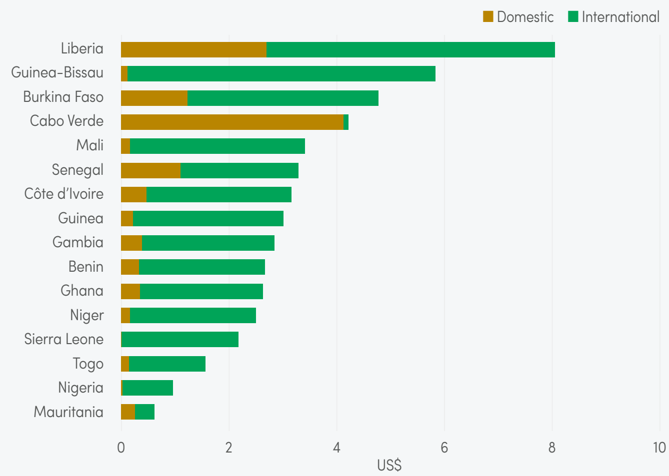


B. Malaria funding[a] by source, 2010–2020



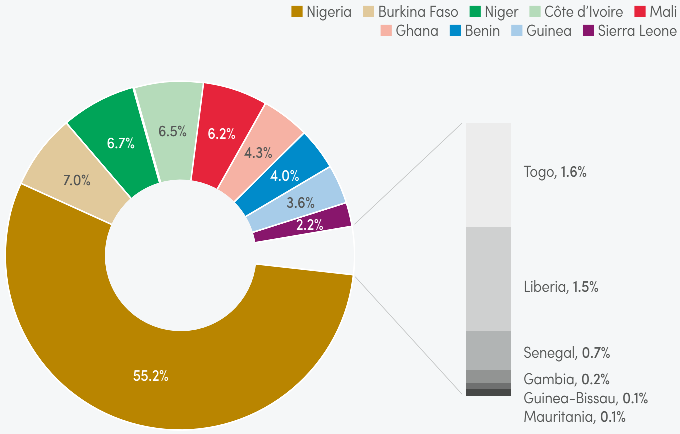
Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; UK: United Kingdom of Great Britain and Northern Ireland; USAID: United States Agency for International Development.
[a] Excludes patient service delivery costs and out-of-pocket expenditure.

C. Malaria funding[a] per person at risk, average 2018–2020

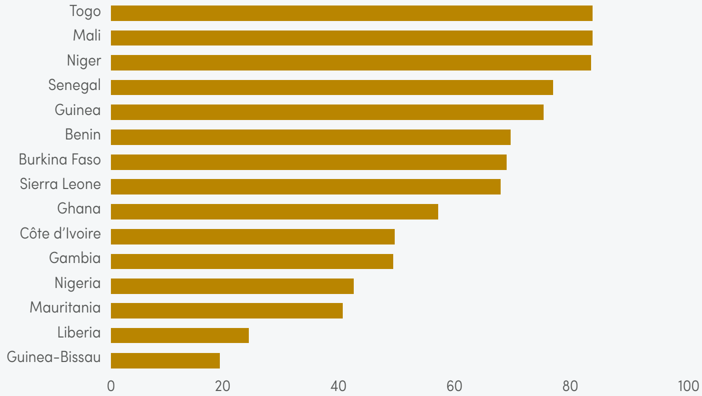


[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.

D. Share of estimated malaria cases, 2020

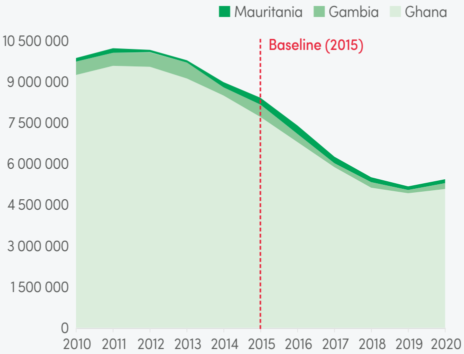


E. Percentage of population with access to either LLINs or IRS, 2020
Source: ITN coverage model from MAP



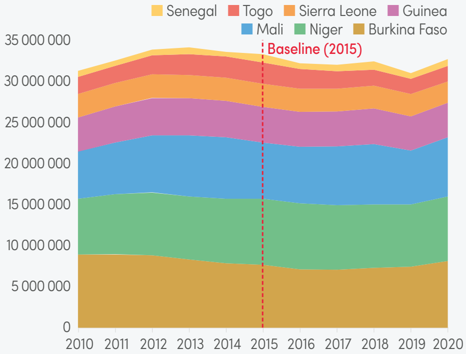
IRS: indoor residual spraying; ITN: insecticide-treated mosquito net; LLIN: long-lasting insecticidal net; MAP: Malaria Atlas Project.
Note: Algeria was certified malaria free in 2019 and Cabo Verde is an E-2025 country where vector control is targeted to foci.

F. Estimated number of cases in countries that reduced case incidence by ≥40% in 2020 compared with 2015

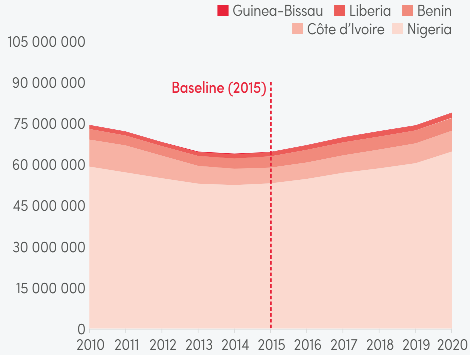


Note: Algeria was certified malaria free in 2019 and Cabo Verde met the 2020 GTS milestone with zero malaria cases.

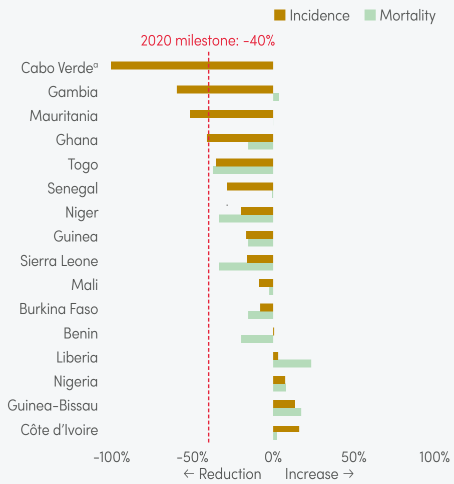
G. Estimated number of cases in countries that reduced case incidence by <40% in 2020 compared with 2015



H. Estimated number of cases in countries with an increase or no change in case incidence, 2015–2020

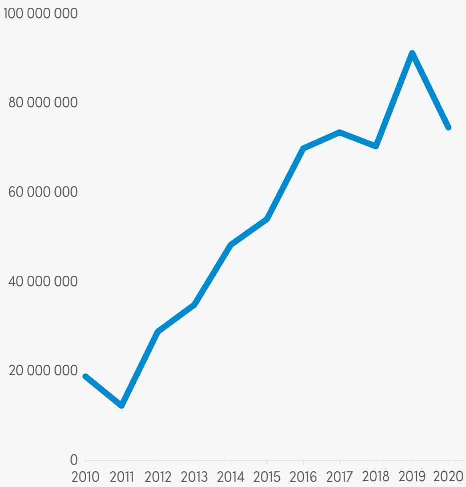


I. Change in estimated malaria incidence and mortality rates, 2015–2020

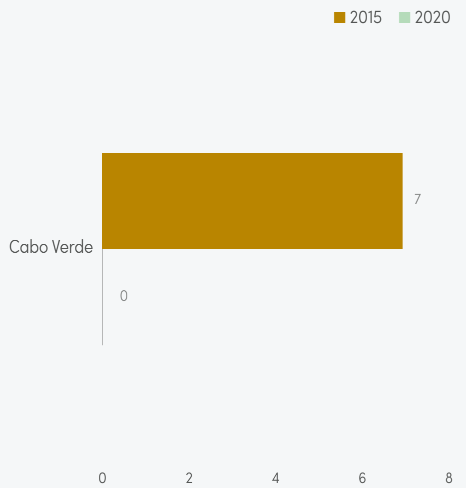


[a] This country achieved the 40% reduction in mortality rate in 2015; since then, there has been no change.

J. Total number of suspected malaria cases tested, 2010–2020



K. Reported indigenous cases in countries with national elimination activities, 2015 versus 2020



KEY MESSAGES

- In 2020, there were 16 malaria endemic countries in west Africa. Algeria was certified malaria free in May 2019, following 3 consecutive years with zero indigenous cases. Cabo Verde has had 2 consecutive years (2019 and 2020) of zero indigenous cases, and has started to prepare for the certification process. The HBHI initiative was initiated in Burkina Faso, Ghana, the Niger and Nigeria in 2019, and in Mali in 2020, leading to evidence-based national strategic plans and funding requests. In countries of this subregion (except for Algeria and Cabo Verde) malaria transmission is year-round and almost exclusively due to *P. falciparum*, with strong seasonality in the Sahelian countries.
- The subregion had about 117 million estimated cases and about 329 000 estimated deaths – a 1% increase and a 10% decrease compared with 2010, respectively. Five countries accounted for more than 80% of the estimated cases: Nigeria (55.2%), Burkina Faso (7.0%), the Niger (6.7%), Côte d'Ivoire (6.5%) and Mali (6.2%). About 58 million cases were reported in the public and private sectors and in the community, among which 38.9% were in children aged under 5 years and 52 million (89.5%) were confirmed. The proportion of total cases that were confirmed has improved substantially over time, from only 22.1% in 2010. Most deaths were in children aged under 5 years (68%).
- In nine of the 16 countries in this subregion, where routine distribution of LLINs or use of IRS is still applicable, 50% or more of the population had access to these interventions. Eleven countries implemented IPTp in 2020.
- Five countries met the GTS target by reducing case incidence by at least 40% or reaching zero malaria cases by 2020 compared with 2015: Algeria (which is already certified malaria free), Cabo Verde (zero cases), the Gambia, Ghana and Mauritania. In seven countries, although there is progress towards meeting the target, reductions were less than 40%: Burkina Faso, Guinea, Mali, the Niger, Senegal, Sierra Leone and Togo. In Benin, Côte d'Ivoire, Guinea-Bissau and Liberia, incidence increased in 2020 compared with 2015. After a large increase in indigenous cases in Cabo Verde between 2016 and 2017, the country has been reporting zero indigenous cases since February 2018.
- Vector resistance to pyrethroids was confirmed in 91% of sites, to organochlorines in 96%, to carbamates in 43% and to organophosphates in 26%. The intensity of pyrethroid resistance in this region is high overall. Eleven countries have developed their insecticide resistance monitoring and management plans.
- The Nouakchott Declaration was adopted in 2013 and the new Sahel Malaria Elimination Initiative (SaME) was launched in 2018 by ministers of the eight Sahelian countries (Burkina Faso, Cabo Verde, Chad, the Gambia, Mali, Mauritania, the Niger and Senegal), to accelerate implementation of high-impact strategies towards eliminating malaria by 2030. In line with these initiatives, an action plan was adopted in 2019. In addition to Cabo Verde as an eliminating country, the Gambia, Mauritania, the Niger and Senegal have reoriented their programmes towards malaria subnational elimination.
- Challenges include inadequate political commitment and leadership, weak malaria programme management, insufficient prioritization and sustainability of interventions, inappropriate application of larviciding, inadequate domestic financing and weak surveillance systems, including a lack of well-functioning vital registration systems. The COVID-19 pandemic disrupted diagnostic services, as indicated by the 18% decrease in diagnostic tests in 2020 compared with 2019; also, numbers of diagnostic tests decreased in all countries except the Niger and Senegal.

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 191 million

Parasites: *P. falciparum* (100%)

Vectors: *An. arabiensis, An. funestus s.l., An. gambiae s.l., An. melas, An. moucheti, An. nili s.l.* and *An. pharoensis.*

FUNDING (US$), 2010–2020

253.5 million (2010), 381.0 million (2015), 408.0 million (2020); increase 2010–2020: 61%

Proportion of domestic source[a] in 2020: 17%

[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

INTERVENTIONS, 2010–2020

Countries with ≥80% coverage with either LLINs or IRS in 2020: the Congo

Countries with ≥50% coverage with either LLINs or IRS in 2020: Burundi, Cameroon, the Central African Republic, the Congo and the Democratic Republic of the Congo

Countries that implemented IPTp in 2020: Angola, Burundi, Cameroon, the Central African Republic, Chad, the Congo, the Democratic Republic of the Congo, Gabon and Sao Tome and Principe

Countries with >30% IPTp3+ in 2020: Angola, Burundi, Cameroon, the Central African Republic, Chad, the Congo, the Democratic Republic of the Congo, Gabon and Sao Tome and Principe

Percentage of suspected cases tested (reported):[a] 46% (2010), 92% (2015), 92% (2020)

Number of ACT courses distributed:[a] 18.2 million (2010), 22.4 million (2015), 33.7 million (2020)

Number of any antimalarial treatment courses (incl. ACT) distributed: 19.1 million (2010), 22.4 million (2015), 34.5 million (2020)

[a] No data for Equatorial Guinea in 2020.

REPORTED CASES AND DEATHS IN THE PUBLIC SECTOR, 2010–2020

Total (presumed and confirmed) cases:[a] 20.4 million (2010), 26.6 million (2015), 43.9 million (2020)

Confirmed cases: 6.1 million (2010), 23.4 million (2015), 40.2 million (2020)

Percentage of total cases confirmed: 30.1% (2010), 87.9% (2015), 91.6% (2020)

Deaths: 40 400 (2010), 58 200 (2015), 41 800 (2020)

Children aged under 5 years, presumed and confirmed cases:[a] 9.1 million (2010), 11.3 million (2015), 16.9 million (2020)

Children aged under 5 years, percentage of total cases: 44.9% (2010), 42.6% (2015), 38.4% (2020)

Children aged under 5 years, deaths: 26 000 (2010), 37 100 (2015), 25 000 (2020)

Children aged under 5 years, percentage of total deaths: 64% (2010), 64% (2015), 60% (2020)

[a] No data for Equatorial Guinea in 2020.

ESTIMATED CASES AND DEATHS, 2010–2020

Cases: 42.5 million (2010), 41.5 million (2015), 54.7 million (2020); increase 2010–2020: 29%

Deaths: 144 900 (2010), 108 600 (2015), 140 100 (2020); decrease 2010–2020: 3%

ACCELERATION TO ELIMINATION

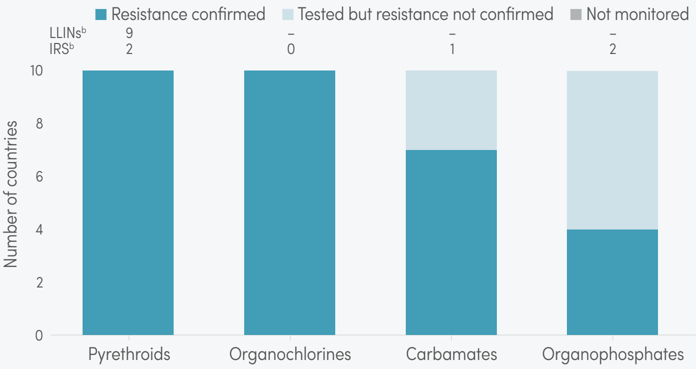
Countries with subnational/territorial elimination programme: Sao Tome and Principe

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2015–2020	23	0.0	1.6	13.6	0.0	4.5
AS-AQ	2015–2020	26	0.0	0.0	7.7	0.0	4.9
DHA-PPQ	2015–2017	9	0.0	0.0	2.0	0.0	0.7

AL: artemether-lumefantrine; AS-AQ: artesunate-amodiaquine; DHA-PPQ: dihydroartemisinin-piperaquine.

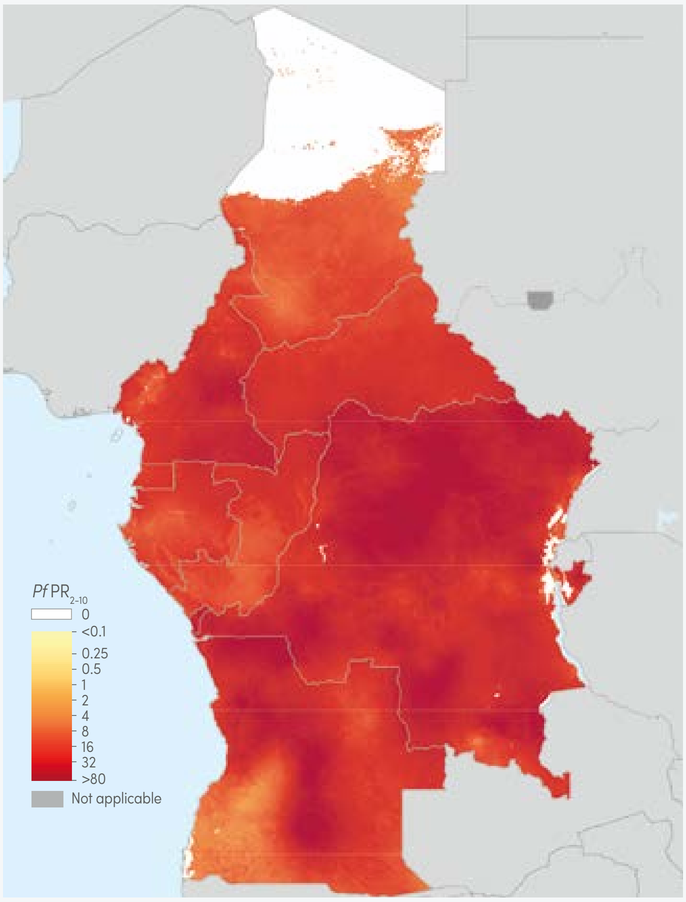
STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)



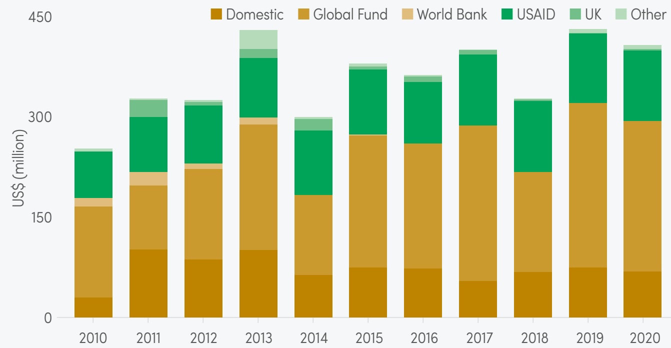
[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.

[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. *P. falciparum* parasite rate (*Pf*PR), 2020

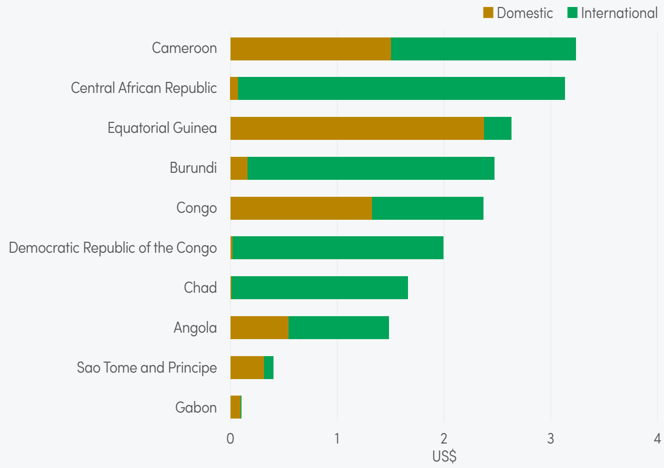


B. Malaria funding[a] by source, 2010–2020



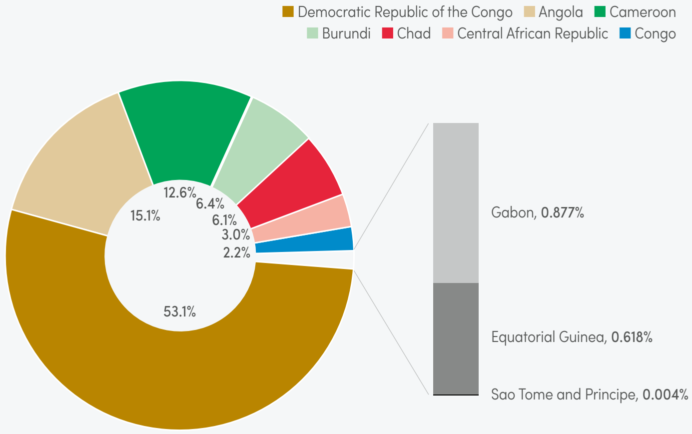
Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; UK: United Kingdom of Great Britain and Northern Ireland; USAID: United States Agency for International Development.
[a] Excludes patient service delivery costs and out-of-pocket expenditure.

C. Malaria funding[a] per person at risk, average 2018–2020

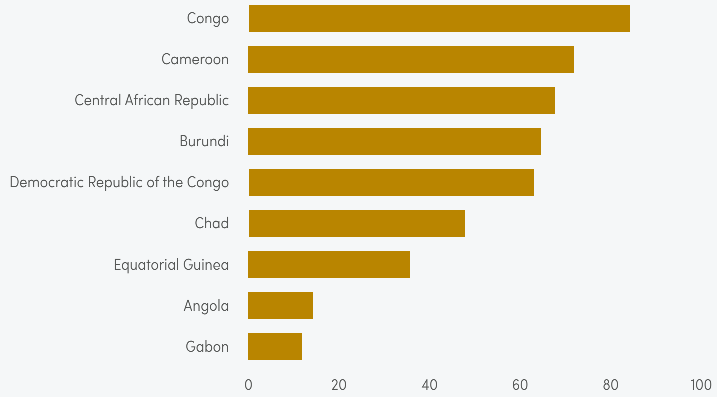


[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.

D. Share of estimated malaria cases, 2020

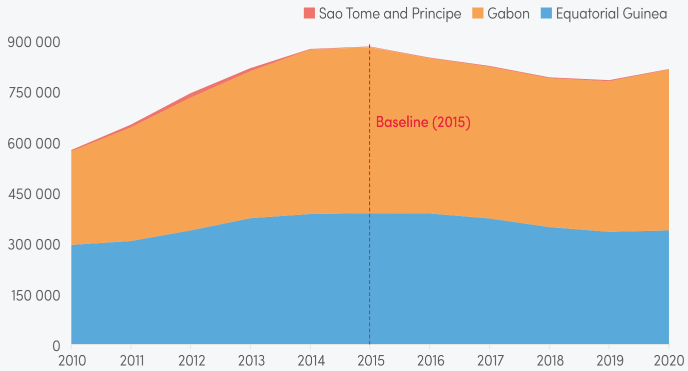


E. Percentage of population with access to either LLINs or IRS, 2020
Source: ITN coverage model from MAP

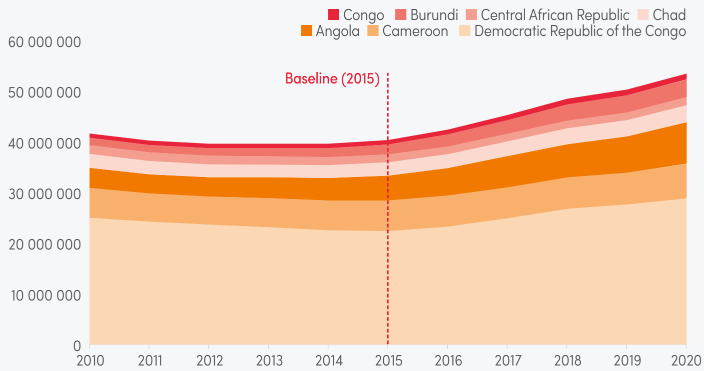


IRS: indoor residual spraying; ITN: insecticide-treated mosquito net; LLIN: long-lasting insecticidal net; MAP: Malaria Atlas Project.
Note: Sao Tome and Principe is an E-2025 country where vector control is targeted to foci.

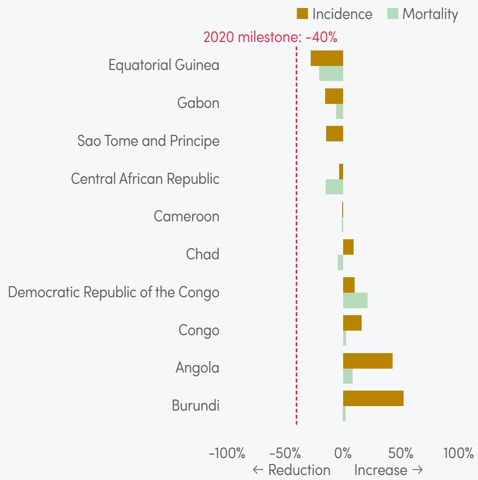
F. Estimated number of cases in countries that reduced case incidence by <40% in 2020 compared with 2015



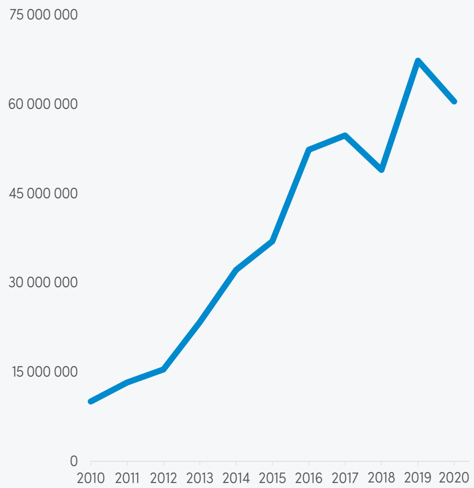
G. Estimated number of cases in countries with an increase or no change in case incidence, 2015–2020



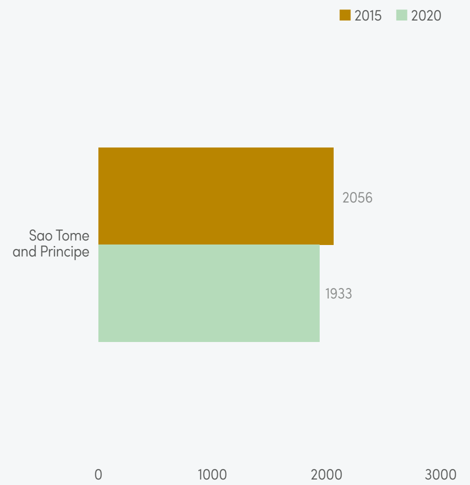
H. Change in estimated malaria incidence and mortality rates, 2015–2020



I. Total number of suspected malaria cases tested, 2010–2020



J. Reported indigenous cases in countries with national elimination activities, 2015 versus 2020



KEY MESSAGES

- About 191 million people living in the 10 countries of central Africa are at high risk of malaria. Malaria transmission, almost exclusively due to *P. falciparum*, occurs throughout the year except in the north of Cameroon, northern Chad and the southern part of the Democratic Republic of the Congo. The HBHI initiative has been initiated in Cameroon and the Democratic Republic of the Congo.
- In 2020, the subregion had more than 54 million estimated cases and almost 140 100 estimated deaths – a 29% increase and a 3% decrease compared with 2010, respectively. Three countries in the region accounted for more than 80% of the estimated cases: the Democratic Republic of the Congo accounted for 53.1% of estimated cases, followed by Angola (15.1%) and Cameroon (12.6%). A similar distribution was seen for estimated malaria deaths, which were also mainly observed in the Democratic Republic of the Congo (59%), Angola (11%) and Cameroon (11%). More than 43 million cases were reported in the public and private sectors and in the community; of these, 38.4% were in children aged under 5 years and 40.2 million (91.6 %) were confirmed. The proportion of total cases that were confirmed has improved substantially over time, from only 30.1% in 2010.
- None of the countries in the subregion met the GTS target of a 40% reduction in incidence by 2020 compared with 2015. In three countries, some progress has been made towards achieving the target, with reductions in Equatorial Guinea, Gabon and Sao Tome and Principe, but of less than 40%. Five countries saw an increase in estimated malaria incidence between 2015 and 2020; Burundi had the largest increase (51.8%), followed by Angola (42.4%), the Congo (15.8%), the Democratic Republic of the Congo (9.6%) and Chad (8.8%). In Cameroon and the Central African Republic there was no change in case incidence between 2015 and 2020. Sao Tome and Principe has reported zero deaths since 2018.
- Coverage of preventive vector control measures remains low in the region, except for the Congo, with more than 80% coverage. In 2020, Cameroon, the Central African Republic, Chad and the Democratic Republic of the Congo conducted LLIN mass campaigns. Additionally, Cameroon and Chad are implementing SMC in targeted areas of the country.
- Vector resistance to pyrethroids was confirmed in 86% of sites, to organochlorines in 90%, to carbamates in 21% and to organophosphates in 6%. Vector resistance to pyrethroids and to organochlorines was confirmed in all countries. Six countries have developed their insecticide resistance monitoring and management plans.
- The performance of the surveillance system varies across countries in the region, as can be seen through the completeness of public sector data reported for 2020, with all countries except Sao Tome and Principe reporting a rate of less than 100%. Additional challenges include insufficient domestic and international funding, and frequent malaria outbreaks. The COVID-19 pandemic disrupted diagnostic services, as indicated by the 10% decrease in diagnostic tests in 2020 compared with 2019; numbers of diagnostic tests decreased in all countries except the Democratic Republic of the Congo and Gabon.

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 370 million
Parasites: *P. falciparum* (almost 100%), *P. vivax* (<1%) and other (<1%)
Vectors: *An. arabiensis, An. funestus s.l., An. gambiae s.l., An. gambiae s.s., An. leesoni, An. nili, An. pharoensis, An. rivulorum, An. stephensi s.l.*[a] and *An. vaneedeni.*

[a] A potential vector identified.

FUNDING (US$), 2010–2020

767.8 million (2010), 742.6 million (2015), 894.3 million (2020); increase 2010–2020: 16%
Proportion of domestic source[a] in 2020: 12%

[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

INTERVENTIONS, 2010–2020

Countries with ≥80% coverage with either LLINs or IRS in 2020: none
Countries with ≥50% coverage with either LLINs or IRS in 2020: Mozambique, Rwanda, Uganda and the United Republic of Tanzania

Countries that implemented IPTp in 2020: Kenya, Madagascar, Malawi, Mozambique, South Sudan, Uganda, the United Republic of Tanzania (mainland) and Zambia
Countries with >30% IPTp3+ in 2020: Kenya, Madagascar, Malawi, Mozambique, South Sudan, Uganda, the United Republic of Tanzania (mainland) and Zambia

Percentage of suspected cases tested (reported): 38% (2010), 80% (2015), 90% (2020)
Number of ACT courses distributed: 67.9 million (2010), 108.2 million (2015), 89.2 million (2020)
Number of any antimalarial treatment courses (incl. ACT) distributed: 68.0 million (2010), 109.9 million (2015), 99.8 million (2020)

REPORTED CASES AND DEATHS IN THE PUBLIC SECTOR, 2010–2020

Total (presumed and confirmed) cases: 53.3 million (2010), 59.0 million (2015), 63.5 million (2020)
Confirmed cases: 8.5 million (2010), 36.2 million (2015), 57.3 million (2020)
Percentage of total cases confirmed: 16.0% (2010), 61.5% (2015), 90.1% (2020)
Deaths: 70 700 (2010), 38 400 (2015), 14 300 (2020)

Children aged under 5 years, presumed and confirmed cases: 21.6 million (2010), 17.6 million (2015), 20.4 million (2020)
Children aged under 5 years, percentage of total cases: 40.5% (2010), 29.9% (2015), 32.2% (2020)
Children aged under 5 years, deaths:[a] 25 300 (2010), 10 400 (2015), 7200 (2020)
Children aged under 5 years, percentage of total deaths: 36% (2010), 27% (2015), 50% (2020)

[a] No data for Mozambique and South Sudan in 2020.

ESTIMATED CASES AND DEATHS, 2010–2020

Cases:[a] 53.7 million (2010), 56.2 million (2015), 56.0 million (2020); increase 2010–2020: 4%
Deaths: 134 500 (2010), 122 200 (2015), 132 500 (2020); decrease 2010–2020: 2%

[a] Estimated cases are derived from the *Pf*PR-to-incidence model, which means that estimated cases are lower than reported by the country.

ACCELERATION TO ELIMINATION

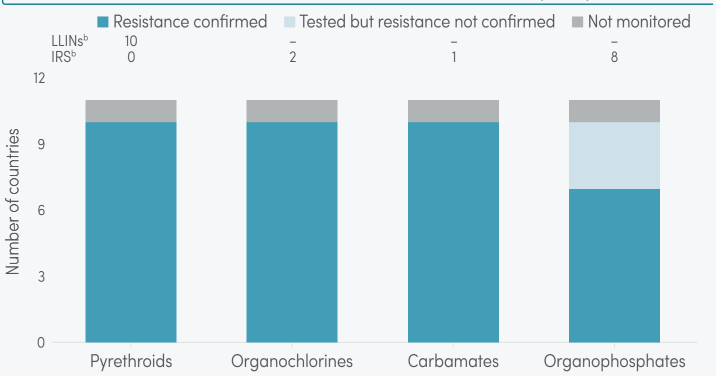
Countries with subnational/territorial elimination programme: the United Republic of Tanzania (Zanzibar)

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2015–2019	49	0.0	1.4	13.9	0.0	3.4
AS-AQ	2016–2018	14	0.0	0.0	2.0	0.0	0.8
DHA-PPQ	2015–2019	13	0.0	0.0	6.0	0.0	1.4

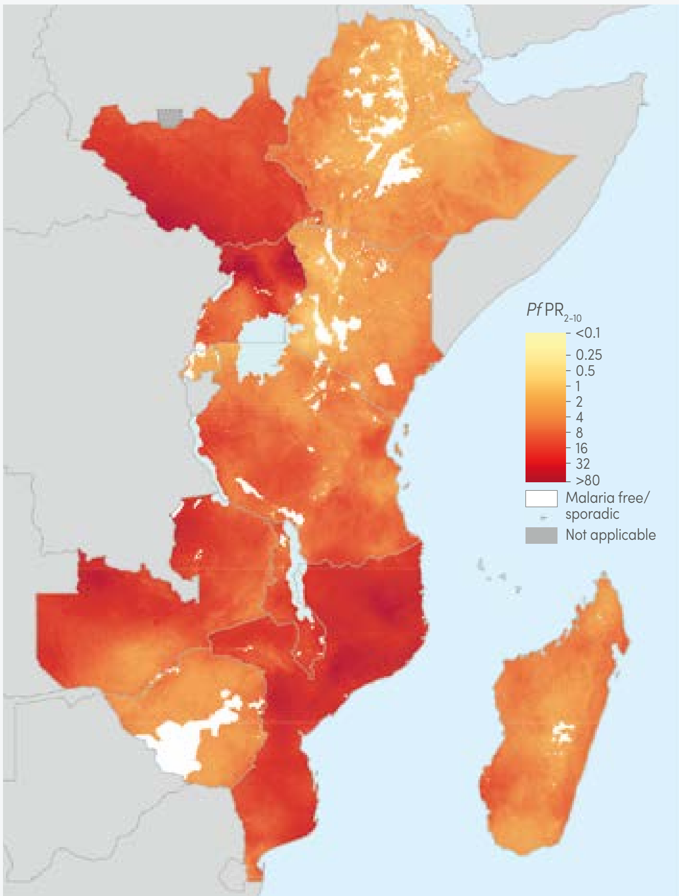
AL: artemether-lumefantrine; AS-AQ: artesunate-amodiaquine; DHA-PPQ: dihydroartemisinin-piperaquine.

STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)

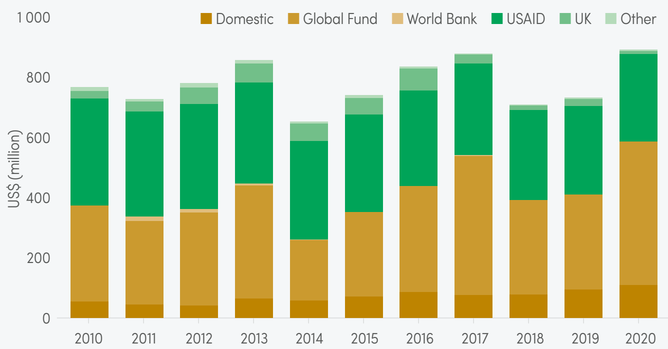


[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.
[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. *P. falciparum* parasite rate (*Pf*PR), 2020

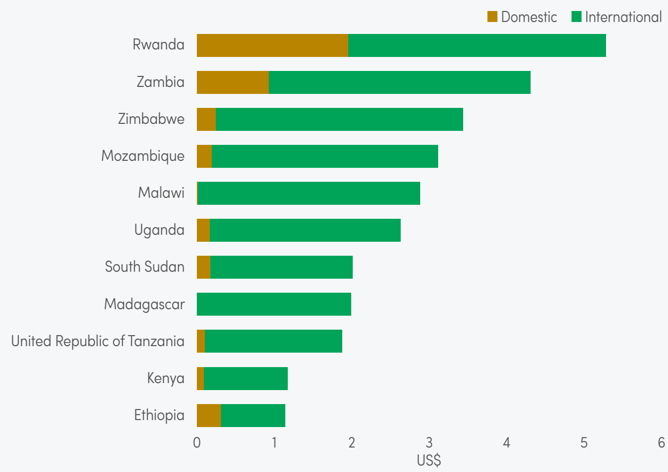


B. Malaria funding[a] by source, 2010–2020



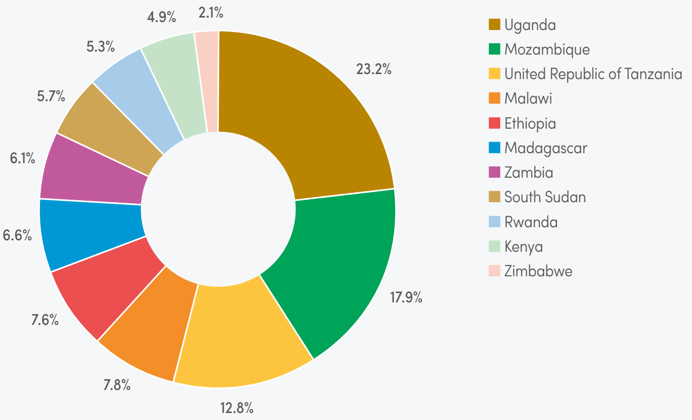
Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; UK: United Kingdom of Great Britain and Northern Ireland; USAID: United States Agency for International Development.
[a] Excludes patient service delivery costs and out-of-pocket expenditure.

C. Malaria funding[a] per person at risk, average 2018–2020

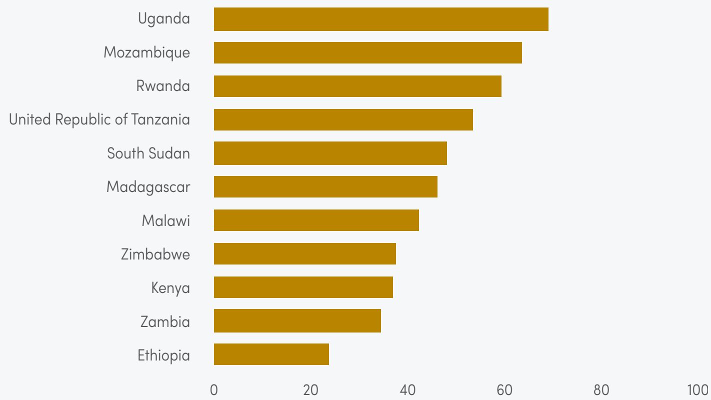


[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.

D. Share of estimated malaria cases, 2020

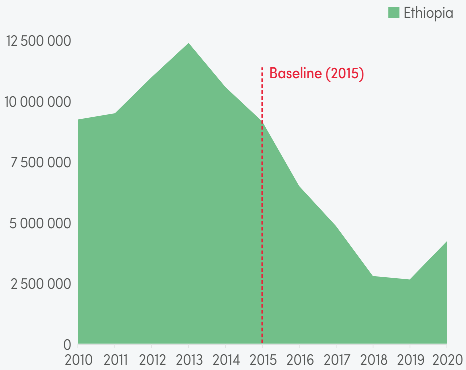


E. Percentage of population with access to either LLINs or IRS, 2020
Source: ITN coverage model from MAP

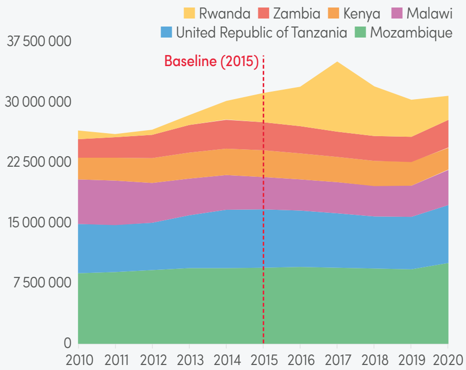


IRS: indoor residual spraying; ITN: insecticide-treated mosquito net; LLIN: long-lasting insecticidal net; MAP: Malaria Atlas Project.

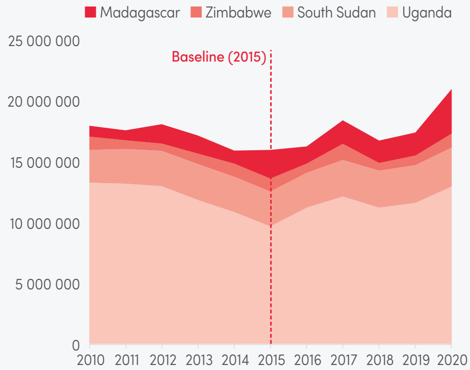
F. Estimated number of cases in countries that reduced case incidence by ≥40% in 2020 compared with 2015



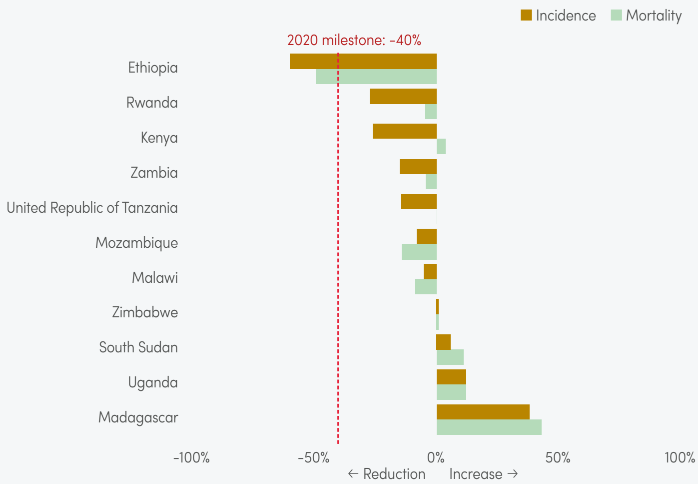
G. Estimated number of cases in countries that reduced case incidence by <40% in 2020 compared with 2015



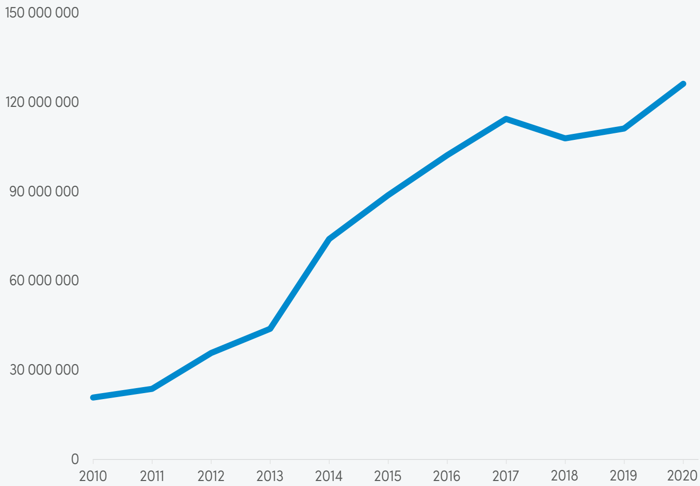
H. Estimated number of cases in countries with an increase or no change in case incidence, 2015–2020



I. Change in estimated malaria incidence and mortality rates, 2015–2020



J. Total number of suspected malaria cases tested, 2010–2020



KEY MESSAGES

- About 370 million people in the 11 countries with high transmission in east and southern Africa are at high risk of malaria. Malaria transmission is almost exclusively due to *P. falciparum* (except in Ethiopia), and is highly seasonal in Ethiopia, Madagascar and Zimbabwe, and in coastal and highland areas of Kenya. Malaria transmission is stable in most of Malawi, Mozambique, South Sudan, Uganda, the United Republic of Tanzania and Zambia. The HBHI initiative has been initiated in Mozambique and Uganda.
- The subregion had almost 56 million estimated cases and about 132 500 estimated deaths, representing a 2% decrease and a 4% increase compared with 2010, respectively. Three countries accounted for more than 50% of the estimated cases: Uganda (23.2%), Mozambique (17.9%) and the United Republic of Tanzania (12.8%). In the public and private sectors and the community, 63.5 million cases were reported, of which 32.2% were in children aged under 5 years and 57 million (90.1%) were confirmed. The proportion of total cases that were confirmed has improved substantially over time, from only 16% in 2010. A significantly lower number of deaths were reported in 2020 (7200) compared with 2010 (70 700) and 2015 (38 400).
- Ethiopia achieved the GTS target of a 40% reduction in incidence by 2020 compared with the GTS baseline in 2015. Although the GTS target was not met in the other countries in the subregion, Kenya, Malawi, Mozambique, Rwanda, the United Republic of Tanzania and Zambia reduced incidence but by less than 40% in 2020 compared with 2015. Increases in incidence were seen in Madagascar, South Sudan and Uganda. Zimbabwe saw no reductions in incidence between 2015 and 2020.
- In only four countries did 50% or more of the population have access to LLINs or IRS in 2020; however, eight countries implemented IPTp, with more than 30% of pregnant women attending ANC receiving three or more doses.
- Compared with 2019, in 2020, South Sudan had a decrease of 55% in the number of reported malaria cases (from about 4 million to 1.8 million), whereas Malawi had an increase of 37% (from 5.2 million to 7.2 million). Reported cases also more than doubled in Zanzibar (United Republic of Tanzania), from about 7000 cases in 2019 to 14 100 cases in 2020. Between 2017 and 2020, the number of reported cases in Rwanda decreased from 5.9 million to 2 million – a total reduction of 65%. Despite the COVID-19 pandemic in 2020, there did not appear to be an effect on diagnostic services, with a 14% increase in diagnostic tests in 2020 compared with 2019; increases in testing were reported in all countries except Mozambique and Rwanda.
- Vector resistance to pyrethroids was confirmed in 74% of sites, to organochlorines in 40%, to carbamates in 27% and to organophosphates in 16%. Vector resistance to pyrethroids, organochlorines and carbamates was confirmed in all countries except South Sudan, which did not report resistance monitoring. Eleven countries have developed their insecticide resistance monitoring and management plans.
- Challenges include frequent epidemics, emergencies, inadequate response (South Sudan), inadequate funding, delays in critical commodities and weak surveillance systems in several countries.

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 14 million
Parasites: *P. falciparum* (91%), *P. vivax* (9%) and other (<1%)
Vectors: *An. arabiensis, An. funestus s.l., An. funestus s.s., An. gambiae s.l.* and *An. gambiae s.s.*

FUNDING (US$), 2010–2020

69.7 million (2010), 26.3 million (2015), 67.9 million (2020); decrease 2010–2020: 3%
Proportion of domestic source[a] in 2020: 86%
Regional funding mechanisms: Southern Africa Malaria Elimination Eight Initiative

[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

INTERVENTIONS, 2010–2020

Countries with ≥80% coverage of at-risk population with either LLINs or IRS in 2020: None
Countries with ≥50% coverage of high-risk population with either LLINs or IRS in 2020: the Comoros and Namibia

Countries with >30% IPTp3+ in 2020: none

Percentage of suspected cases tested (reported): 81% (2010), 99% (2015), 89% (2020)
Number of ACT courses distributed: 575 000 (2010), 366 000 (2015), 164 000 (2020)
Number of any antimalarial treatment courses (incl. ACT) distributed: 575 000 (2010), 366 000 (2015), 164 000 (2020)

REPORTED CASES AND DEATHS IN THE PUBLIC SECTOR, 2010–2020

Total (presumed and confirmed) cases: 205 300 (2010), 52 900 (2015), 103 300 (2020)
Confirmed cases: 82 500 (2010), 47 700 (2015), 101 600 (2020)
Percentage of total cases confirmed: 40.2% (2010), 90.2% (2015), 98.3% (2020)
Deaths: 242 (2010), 178 (2015), 105 (2020)

Children aged under 5 years, presumed and confirmed cases:[a] 56 400 (2010), 7300 (2015), 9800 (2020)
Children aged under 5 years, percentage of total cases: 27.5% (2010), 13.7% (2015), 9.5% (2020)
Children aged under 5 years, deaths: 37 (2010), 16 (2015), 7 (2020)
Children aged under 5 years, percentage of total deaths: 15% (2010), 9% (2015), 7% (2020)

[a] No data for the Comoros in 2020.

ESTIMATED CASES AND DEATHS, 2010–2020

Cases: 133 200 (2010), 86 100 (2015), 190 100 (2020); increase 2010–2020: 43%
Deaths: 347 (2010), 280 (2015), 476 (2020); increase 2010–2020: 37%

ACCELERATION TO ELIMINATION

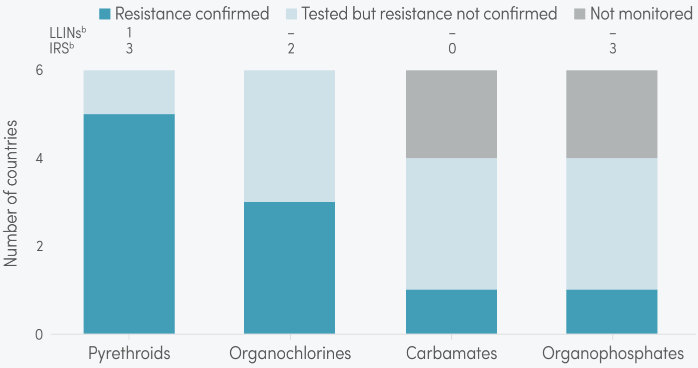
Countries with nationwide elimination programme: Botswana, the Comoros, Eswatini, Namibia and South Africa

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2017–2017	4	0.0	0.0	0.0	0.0	0.0
AS-AQ	2016–2019	8	0.0	3.2	4.7	1.1	4.4

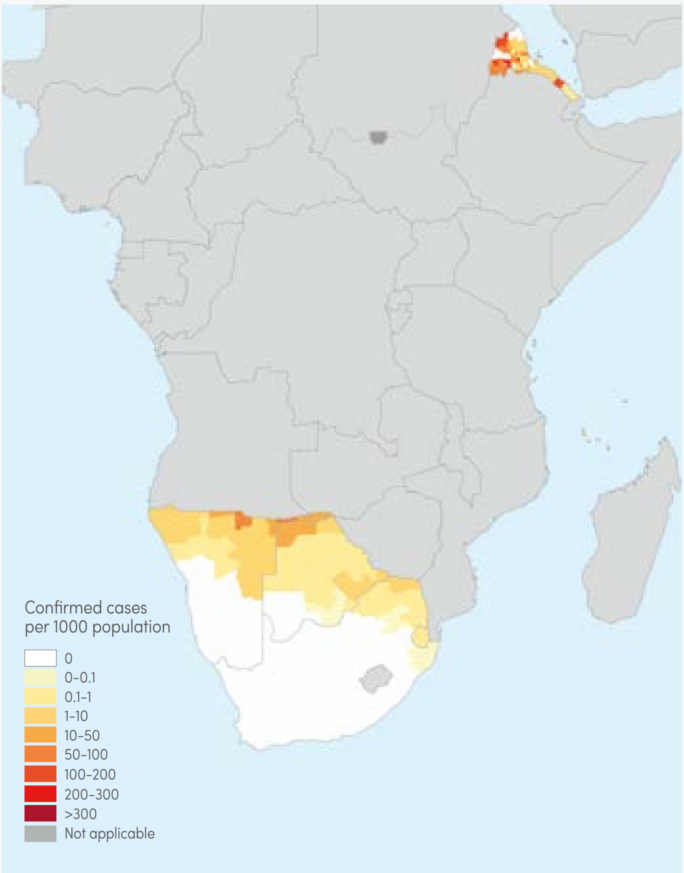
AL: artemether-lumefantrine; AS-AQ: artesunate-amodiaquine.

STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)

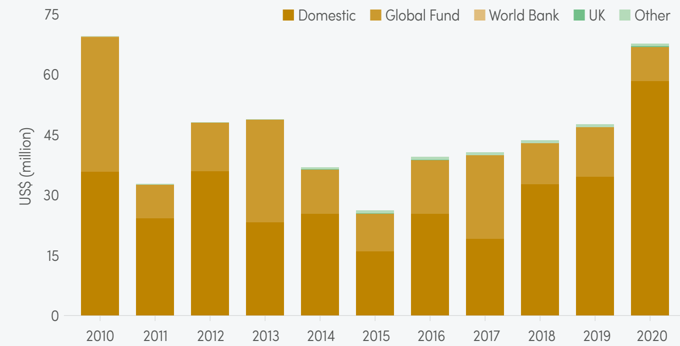


[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.
[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. Confirmed malaria cases per 1000 population, 2020

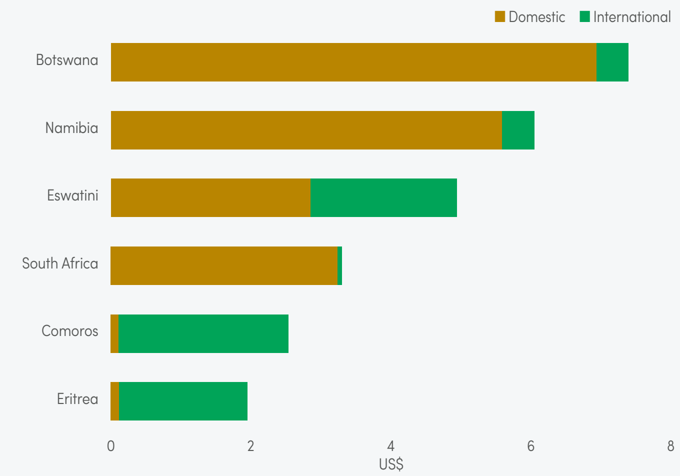


B. Malaria funding[a] by source, 2010–2020



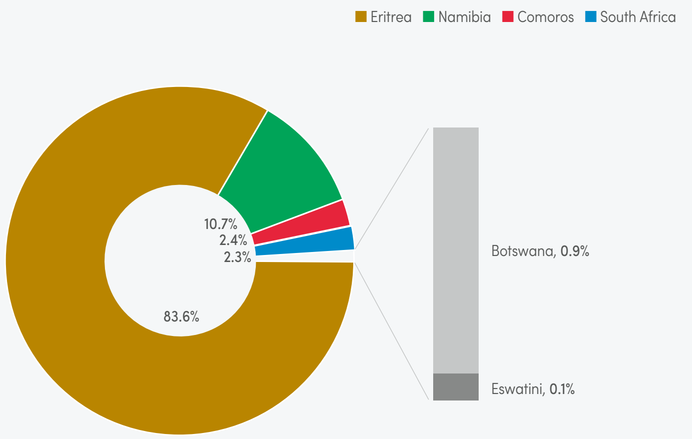
Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; UK: United Kingdom of Great Britain and Northern Ireland.
[a] Excludes patient service delivery costs and out-of-pocket expenditure.

C. Malaria funding[a] per person at risk, average 2018–2020

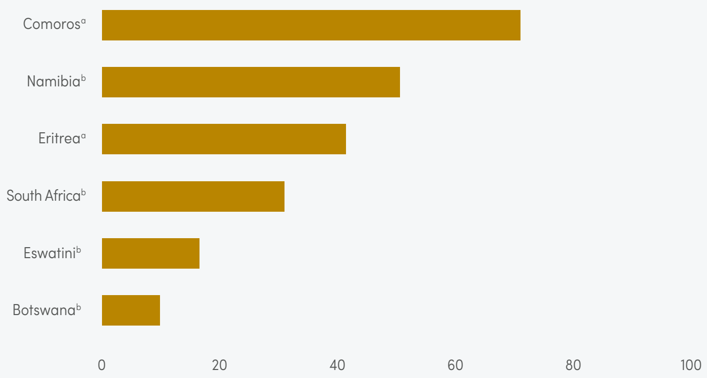


[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.

D. Share of estimated malaria cases, 2020

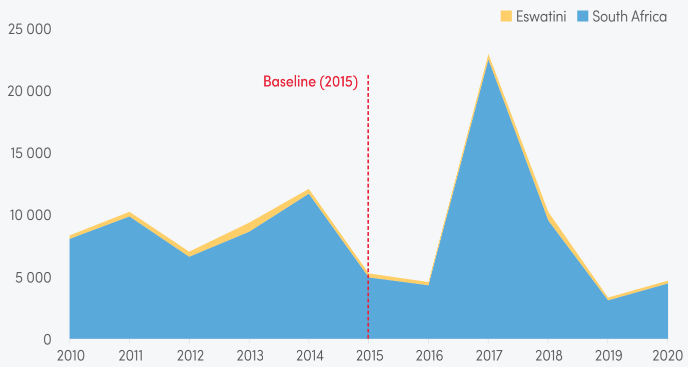


E. Percentage of population with access to either LLINs or IRS, 2020
Source: ITN coverage model from MAP

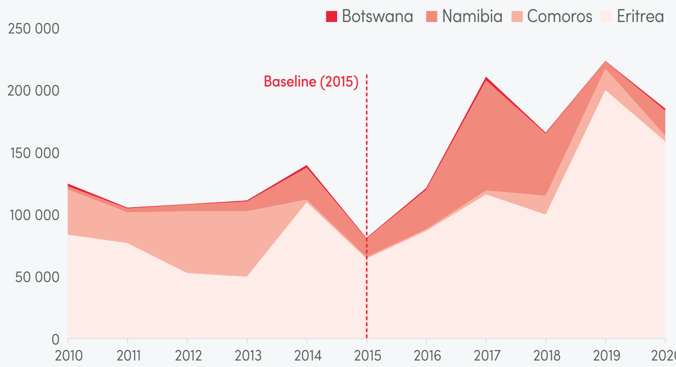


IRS: indoor residual spraying; ITN: insecticide-treated mosquito net; LLIN: longlasting insecticidal net; MAP: Malaria Atlas Project.
[a] ITN coverage estimated by a model from MAP.
[b] IRS coverage is shown.

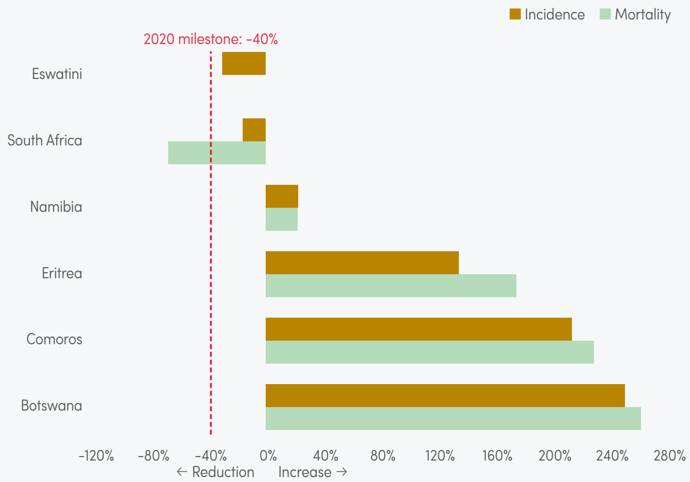
F. Estimated number of cases in countries that reduced case incidence by ≥40% in 2020 compared with 2015



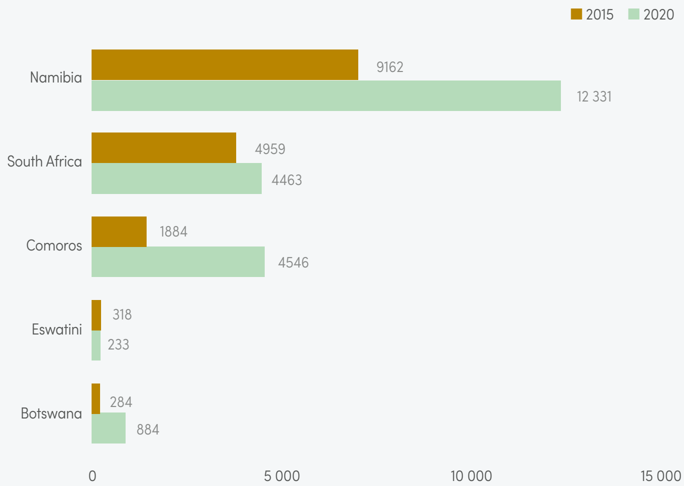
G. Estimated number of cases in countries with an increase in case incidence, 2015–2020



H. Change in estimated malaria incidence and mortality rates, 2015–2020



I. Reported indigenous cases in countries with national elimination activities, 2015 versus 2020



KEY MESSAGES

- About 14 million people in the six countries with low transmission in east and southern Africa are at risk of malaria. About 103 300 cases were reported, of which 9.5% were in children aged under 5 years and 98.3% were confirmed. The proportion of total cases that were confirmed has improved substantially over time, from only 40.2% in 2010. The proportion of all malaria deaths that were in children aged under 5 years has more than halved, from 15% in 2010 to 7% in 2020.
- In 2020, there were an estimated 190 100 cases and 476 deaths – increases of 43% and 37% compared with 2010, respectively. Eritrea accounted for 83.6% of all estimated cases in the subregion. Eswatini and South Africa met the GTS target of a 40% reduction in incidence by 2020 compared with the GTS baseline of 2015. The GTS target was not met in Botswana, the Comoros, Eritrea and Namibia, where incidence increased. Despite a large decrease in the number of estimated cases in Namibia in 2019 (5705) compared with 2018 (50 217), cases significantly increased again to 20 258 in 2020. Botswana also had a significant increase in estimated cases in 2020 (1759), which was seven times higher than estimated cases in 2019 (257). The Comoros, however, had a 74% decrease in estimated cases in 2020 (4546) compared with 2019 (17 599).
- Vector resistance to pyrethroids was confirmed in 55% of sites, to organochlorines in 33%, to carbamates in 7% and to organophosphates in 8%. Five countries have developed their insecticide resistance monitoring and management plans.
- Challenges include inadequate coverage of vector control, bottlenecks in procurement and supply management, importation of cases from neighbouring countries and resurgence during the past 3 years.

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 141 million
Parasites: *P. vivax* (75%), *P. falciparum* and mixed (25%) and other (<1%)
Vectors: *An. albimanus, An. albitarsis, An. aquasalis, An. argyritarsis, An. braziliensis, An. cruzii, An. darlingi, An. neivai, An. nuneztovari, An. pseudopunctipennis* and *An. punctimacula.*

FUNDING (US$), 2010–2020

222.8 million (2010), 199.4 million (2015), 119.0 million (2020); decrease 2010–2020: 47%
Proportion of domestic source[a] in 2020: 89%
Regional funding mechanisms: Regional Malaria Elimination Initiative
[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

INTERVENTIONS, 2010–2020

Number of people protected by IRS:[a] 7.04 million (2010), 3.97 million (2015), 719 000 (2020)
Total LLINs distributed:[b] 978 000 (2010), 1.14 million (2015), 890 000 (2020)
Number of RDTs distributed:[c] 83 700 (2010), 533 900 (2015), 350 200 (2020)
Number of ACT courses distributed:[d] 148 400 (2010), 209 400 (2015), 178 700 (2020)
Number of any first-line antimalarial treatment courses (incl. ACT) distributed:[e] 1.25 million (2010), 669 000 (2015), 659 000 (2020)
[a] No data for the Bolivarian Republic of Venezuela, Colombia, French Guiana, Guyana, Haiti, Peru and Suriname in 2020.
[b] No data for Costa Rica, French Guiana, Guatemala, Haiti and Panama in 2020; includes piperonyl butoxide (PBO) nets, G2 nets and Royal Guard nets in 2020.
[c] No data for Colombia, the Dominican Republic, Guatemala, Haiti, Nicaragua, Peru and the Plurinational State of Bolivia in 2020.
[d] No data for Costa Rica, the Dominican Republic, French Guiana, Mexico and Panama in 2020.
[e] No data for French Guiana, Mexico and Panama in 2020.

REPORTED CASES AND DEATHS IN THE PUBLIC SECTOR, 2010–2020

Total (presumed and confirmed) cases: 677 500 (2010), 455 800 (2015), 602 500 (2020)
Confirmed cases: 677 500 (2010), 455 800 (2015), 596 200 (2020)
Percentage of total cases confirmed: 100% (2010), 100% (2015), 99% (2020)
Indigenous cases: 677 463 (2010), 443 424 (2015), 517 906 (2020)
Imported cases: 84 (2010), 14 904 (2015), 4004 (2020)
Introduced cases: 43 (2010), 0 (2015), 136 (2020)
Indigenous deaths: 190 (2010),169 (2015), 108 (2020)

ESTIMATED CASES AND DEATHS, 2010–2020

Cases: 818 000 (2010), 602 000 (2015), 653 000 (2020); decrease 2010–2020: 20%
Deaths: 502 (2010), 414 (2015), 402 (2020); decrease 2010–2020: 20%

ACCELERATION TO ELIMINATION

Countries part of the E-2025 initiative: Belize, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Panama and Suriname
Zero indigenous cases for 2 consecutive years (2019 and 2020): Belize
Certified as malaria free since 2010: Argentina (2019), El Salvador (2021) and Paraguay (2018)

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2015–2019	2	0	0	0	0	0

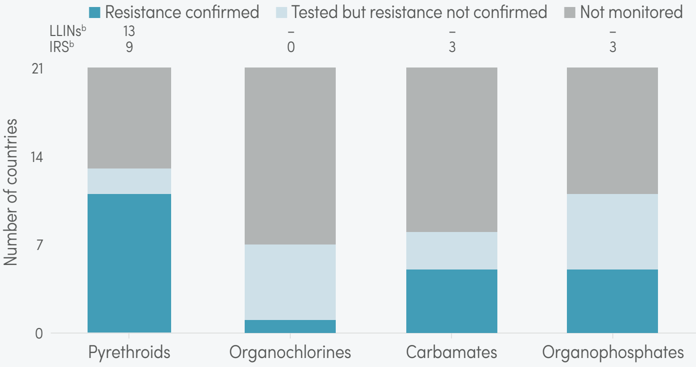
AL: artemether-lumefantrine.

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. VIVAX* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
CQ	2019–2020	1	0.0	0.0	0.0	0.0	0.0
CQ+PQ	2016–2020	3	0.0	0.0	1.2	0.0	1.2

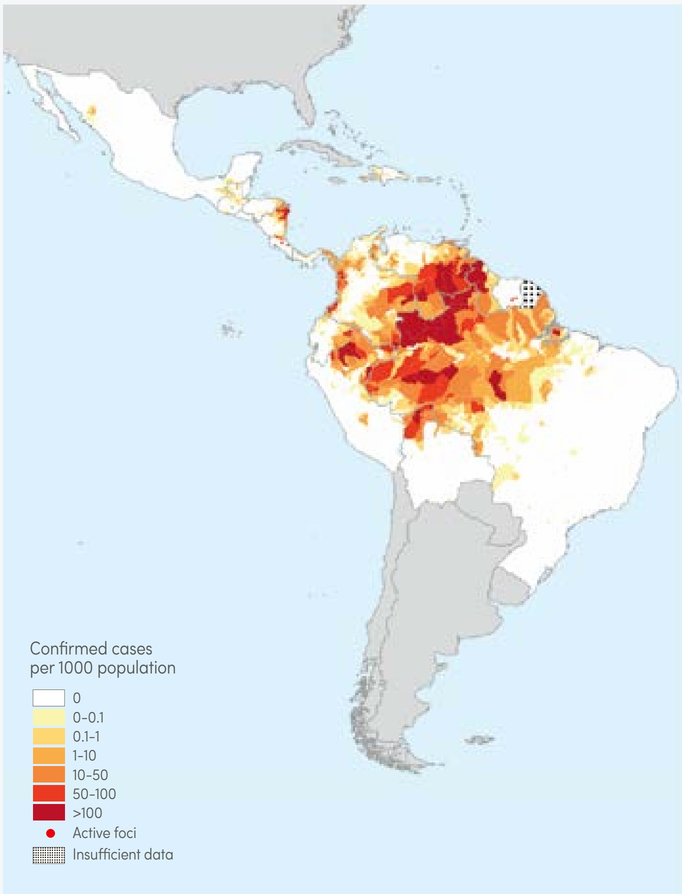
CQ: chloroquine; CQ+PQ: chloroquine+primaquine.

STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)

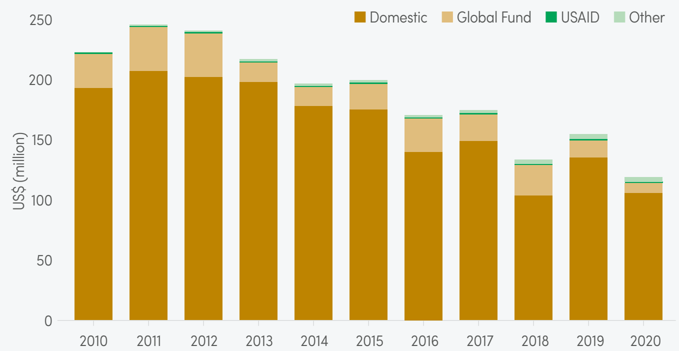


[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.
[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. Confirmed malaria cases per 1000 population, 2020

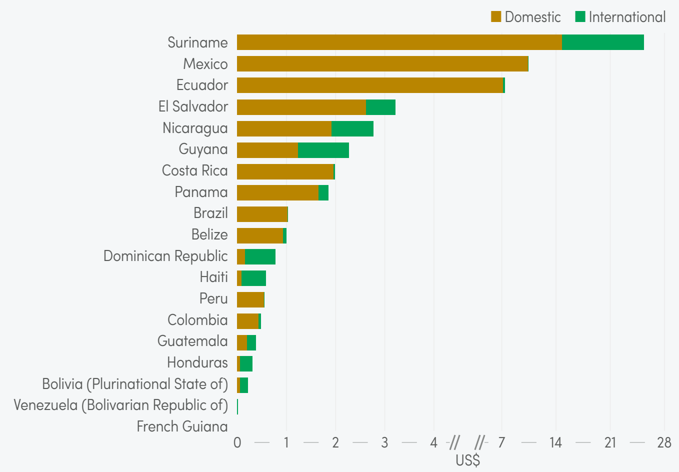


B. Malaria funding[a] by source, 2010–2020



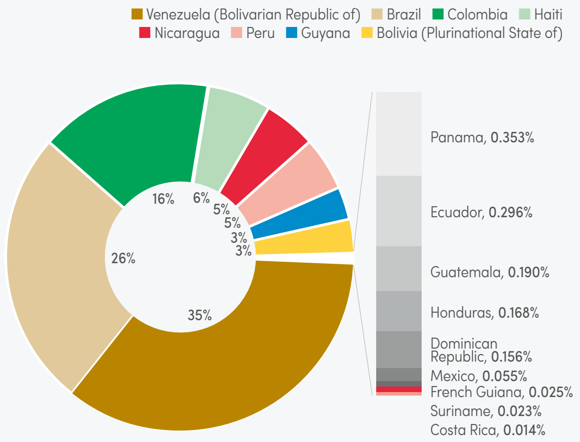
Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; USAID: United States Agency for International Development.
[a] Excludes patient service delivery costs and out-of-pocket expenditure.

C. Malaria funding[a] per person at risk, average 2018–2020

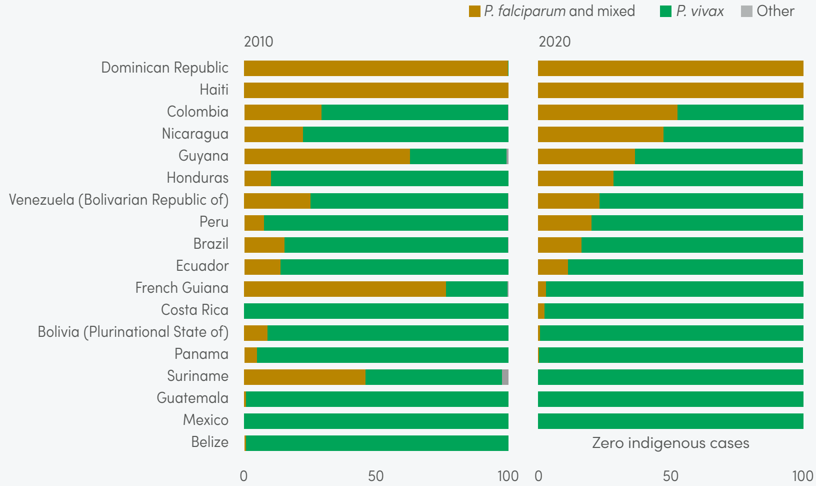


[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.

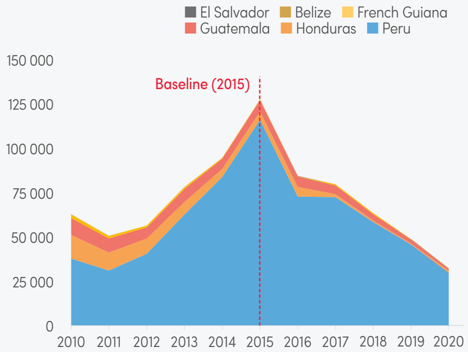
D. Share of estimated malaria cases, 2020



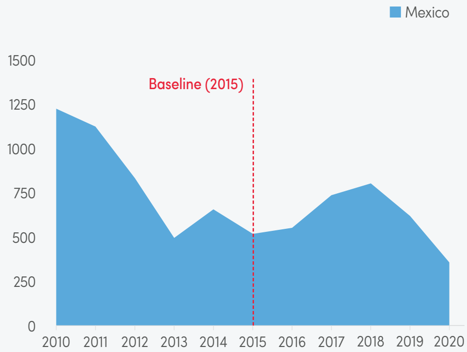
E. Percentage of *Plasmodium* species from indigenous cases, 2010 and 2020



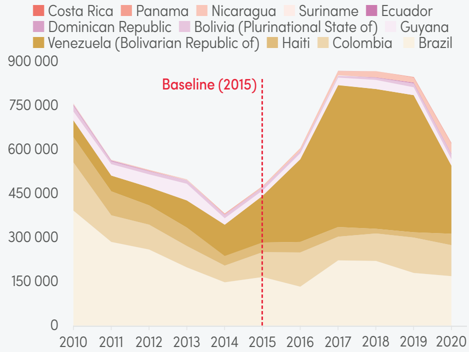
F. Estimated number of cases in countries and areas that reduced case incidence by ≥40% in 2020 compared with 2015



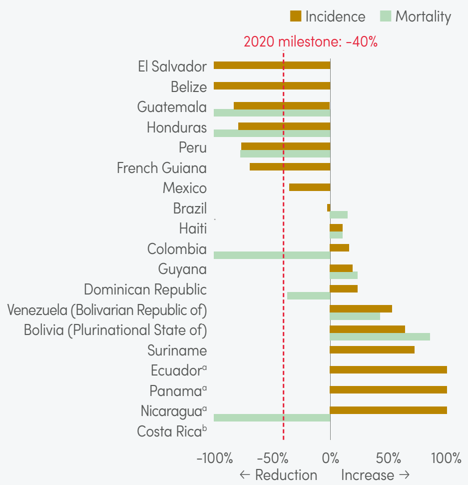
G. Estimated number of cases in countries that reduced case incidence by <40% in 2020 compared with 2015



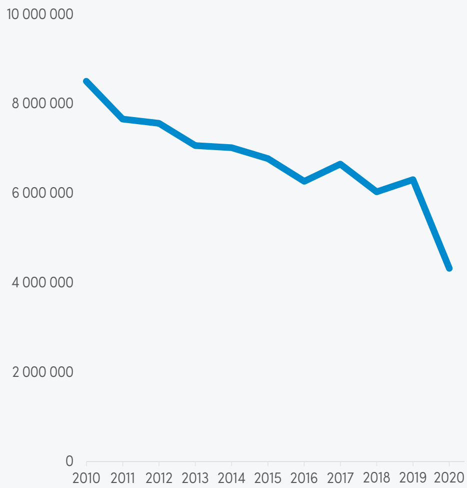
H. Estimated number of cases in countries with an increase or no change in case incidence, 2015–2020



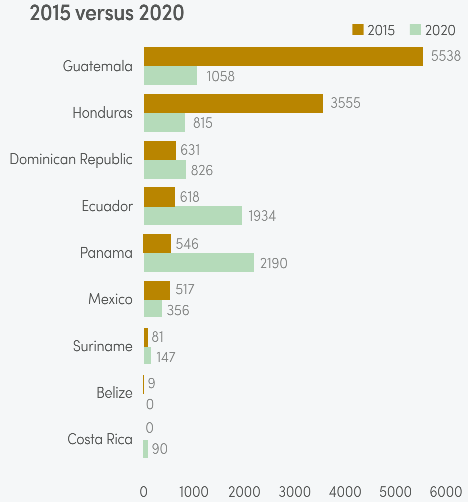
I. Change in estimated malaria incidence and mortality rates, 2015–2020



J. Total number of suspected malaria cases tested, 2010–2020



K. Number of reported indigenous cases in countries with national elimination activities, 2015 versus 2020



[a] In these countries, change in case incidence is more than 100%.
[b] There is no change in incidence or mortality in 2020.

KEY MESSAGES

- Eighteen countries in the WHO Region of the Americas are at risk of malaria. Three quarters of reported malaria cases in the region are caused by *P. vivax*. In 2020, the region reported 602 476 malaria cases and 108 indigenous deaths – decreases of 11% and 43% compared with 2010, respectively. Three countries accounted for more than 80% of all estimated cases: the Bolivarian Republic of Venezuela (35%), Brazil (26%) and Colombia (16%). Presumed cases were reported in the region for the first time since 2010; Nicaragua experienced shortages of RDTs during a malaria outbreak.
- Eight countries and areas experienced reductions in the number of reported cases between 2015 and 2020: Belize (100% reduction), El Salvador (100%), French Guiana (65%), Guatemala (81%), Honduras (74%), Mexico (33%), Peru (76%) and Suriname (35%). All other countries experienced varying levels of increases in reported cases. Nevertheless, transmission in countries was focal – in particular, in Choco in Colombia, Loreto in Peru and Bolivar in the Bolivarian Republic of Venezuela – with more than one third of all cases in the region in 2020 being from 14 municipalities. Increases in other countries in 2020 are attributed to improved surveillance and focal outbreaks.
- All of the indigenous cases reported by Guatemala, Mexico, Panama and Suriname were due to *P. vivax*. Additionally, between 53% and 99% of the indigenous cases were due to *P. vivax* in the Bolivarian Republic of Venezuela, Brazil, Costa Rica, Ecuador, French Guiana, Guyana, Honduras, Nicaragua, Peru and the Plurinational State of Bolivia. Conversely, all of the indigenous cases reported by the Dominican Republic and Haiti and 53% of the indigenous cases reported in Colombia in 2020 were due to *P. falciparum*.
- Six of the endemic countries and areas in the region met the GTS target of reduced case incidence by more than 40% by 2020: Belize, El Salvador, French Guiana, Guatemala, Honduras and Peru. Mexico reduced case incidence but by less than 40%. Twelve countries – the Bolivarian Republic of Venezuela, Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, Guyana, Haiti, Nicaragua, Panama, the Plurinational State of Bolivia and Suriname – saw increases in incidence in 2020 compared with 2015. Colombia and Peru experienced a reduction in the number of estimated deaths larger than 40%, while another nine countries reported zero malaria deaths.
- Nine countries in this region are part of the E-2025 initiative: Belize, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Panama and Suriname. Paraguay, Argentina and El Salvador were certified malaria free by WHO in 2018, 2019 and 2021, respectively. Belize reported zero indigenous malaria cases for the second consecutive year in 2020. An additional nine countries in Central America and Hispaniola are taking part in the subregional initiative to eliminate malaria by 2020. In 2020, imported cases accounted for 36% of the cases in Suriname (88/244), 24% of the cases in Costa Rica (34/141), 11% of the cases in Honduras (98/913), 9% of the cases in French Guiana (14/154), 3% of the cases in Ecuador (67/2001) and 3% of the cases in Mexico (10/369).
- Malaria prevention in most of the countries relies on IRS, or mass or routine distribution of bed nets. Peru and the Plurinational State of Bolivia introduced the distribution of PBO nets in 2019 and 2020, respectively. Vector resistance to pyrethroids was confirmed in 32% of the sites, to organochlorines in 5%, to carbamates in 18% and to organophosphates in 18%. There continue to be significant gaps in standard resistance monitoring for the insecticide classes commonly used for vector control. Fourteen countries have developed their insecticide resistance monitoring and management plans.
- The COVID-19 pandemic disrupted diagnostic services, as shown by the 32% decrease in suspected malaria cases tested in 2020 compared with 2019. In six countries (Brazil, Colombia, Costa Rica, Guyana, Mexico and Panama), although the test positivity rate increased in 2020 compared with 2019, the number of people tested decreased by at least 25%. In the Dominican Republic and Mexico, where testing data were available, testing declined in March of 2020 and beyond, clearly associated with COVID-19-related lockdowns; this has probably led to an increase in cases and deaths in the region.

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 507 million

Parasites: *P. falciparum* and mixed (74%), *P. vivax* (26%) and other (<1%)

Vectors: *An. annularis, An. arabiensis, An. culicifacies s.l., An. d'thali, An. fluviatilis s.l., An. funestus s.l., An. gambiae s.s., An. maculipennis s.l., An. merus, An. pulcherrimus, An. rhodesiensis, An. sacharovi, An. sergentii, An. stephensi* and *An. superpictus s.l.*

FUNDING (US$), 2010–2020

131.7 million (2010), 162.9 million (2015), 131.8 million (2020); increase 2010–2020: <1%

Proportion of domestic source[a,b] in 2020: 28%

Regional funding mechanisms: none

[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

[b] No domestic funding data reported for Afghanistan, the Sudan and Yemen in 2020.

INTERVENTIONS, 2010–2020

Number of people protected by IRS: 6.1 million (2010), 5.1 million (2015), 5.2 million (2020)

Total LLINs distributed:[a] 2.9 million (2010), 5.9 million (2015), 10.9 million (2020)

Number of RDTs distributed: 2.0 million (2010), 6.1 million (2015), 9.5 million (2020)

Number of ACT courses distributed:[b] 2.6 million (2010), 3.2 million (2015), 5.5 million (2020)

Number of any first-line antimalarial treatment courses (incl. ACT) distributed:[b] 2.6 million (2010), 4.0 million (2015), 5.8 million (2020)

[a] Includes PBO nets, G2 nets and Royal Guard nets in 2020.

[b] No data reported for Afghanistan, Djibouti and Pakistan in 2010; no data reported for Yemen in 2020.

REPORTED CASES AND DEATHS IN THE PUBLIC SECTOR, 2010–2020

Total (presumed and confirmed) cases: 6.4 million (2010), 5.4 million (2015), 4.2 million (2020)

Confirmed cases: 1.2 million (2010), 1.0 million (2015), 2.4 million (2020)

Percentage of total cases confirmed: 18.3% (2010), 18.8% (2015), 58.8% (2020)

Deaths:[a] 1143 (2010), 1016 (2015), 792 (2020)

[a] In 2020, there was no report on malaria deaths in Djibouti.

ESTIMATED CASES AND DEATHS, 2010–2020

Cases: 4.5 million (2010), 4.3 million (2015), 5.7 million (2020); increase 2010–2020: 26%

Deaths: 8770 (2010), 8280 (2015), 12 330 (2020); increase 2010–2020: 41%

ACCELERATION TO ELIMINATION

Countries with nationwide elimination programme: Islamic Republic of Iran and Saudi Arabia

Zero indigenous cases for 3 consecutive years (2018, 2019 and 2020): Islamic Republic of Iran

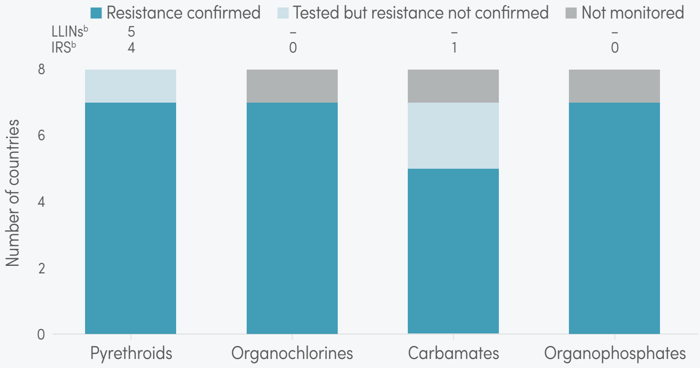
Certified as malaria free since 2010: Morocco (2010)

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2015–2020	18	0.0	0.0	7.9	0.0	2.4
AS+SP	2015–2017	7	0.0	0.0	16.4	0.0	12.3
DHA-PPQ	2015–2020	11	0.0	0.0	2.5	0.0	1.0

AL: artemether-lumefantrine; AS+SP: artesunate+sulfadoxine-pyrimethamine; DHA-PPQ: dihydroartemisinin-piperaquine.

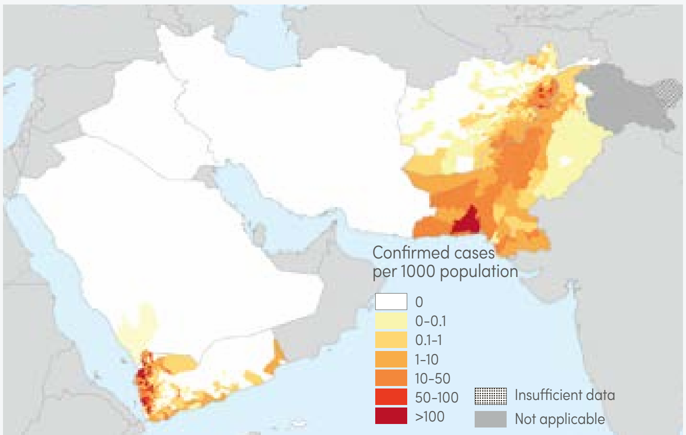
STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)



[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.

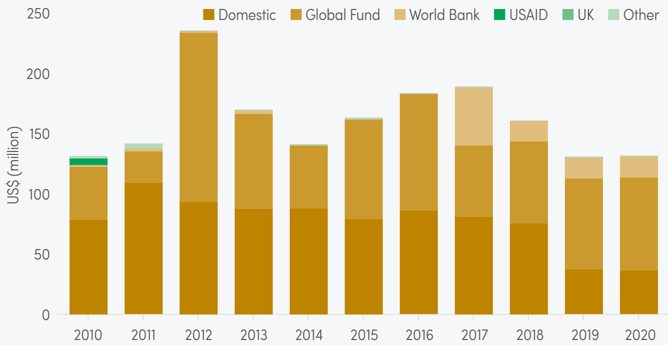
[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. Confirmed malaria cases per 1000 population, 2020



Note: Owing to unavailable or limited data for 2020, malaria incidence or prevalence is not shown here for other countries in the region.

B. Malaria funding[a,b] by source, 2010–2020

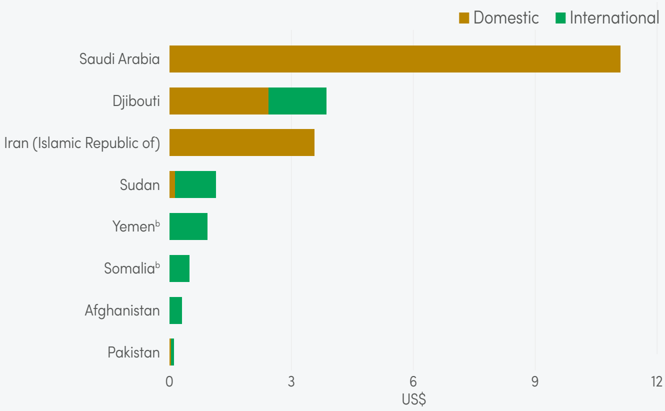


Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; UK: United Kingdom of Great Britain and Northern Ireland; USAID: United States Agency for International Development.

[a] Excludes patient service delivery costs and out-of-pocket expenditure.

[b] No domestic funding data reported for the Sudan and Yemen in 2020.

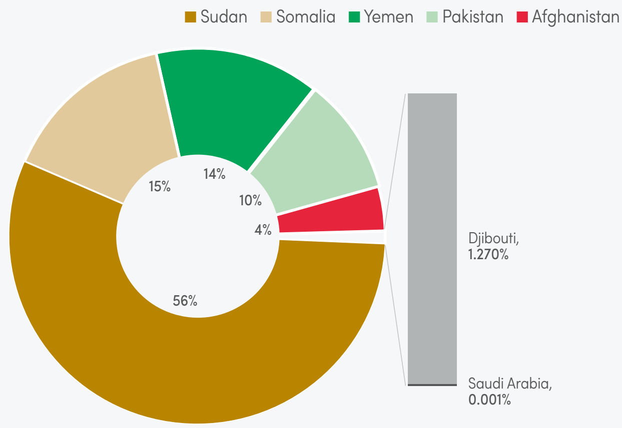
C. Malaria funding[a] per person at risk, average 2018–2020



[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.

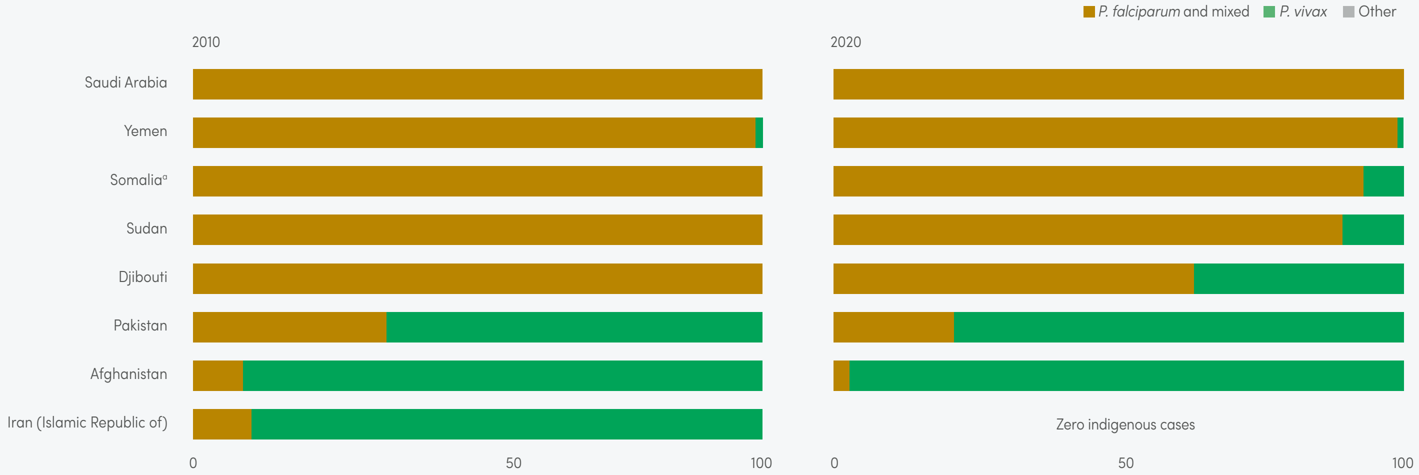
[b] No domestic funding data reported for Afghanistan, the Sudan and Yemen in 2020.

D. Share of estimated malaria cases, 2020



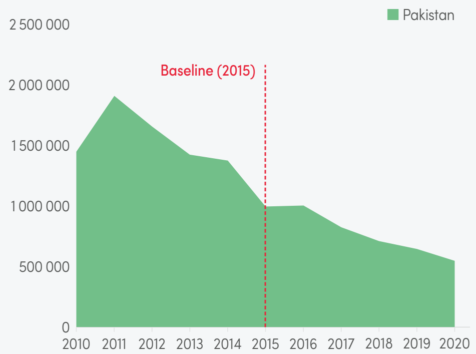
Note: Islamic Republic of Iran has zero indigenous cases.

E. Percentage of *Plasmodium* species from indigenous cases, 2010 and 2020

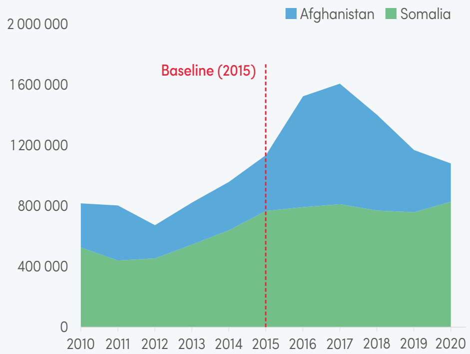


[a] Survey data were used since no data on species were reported since 2018.

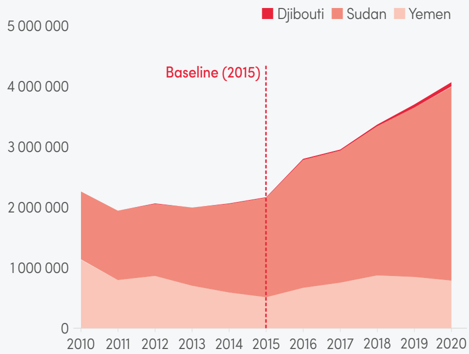
F. Estimated number of cases in countries that reduced case incidence by ≥40% in 2020 compared with 2015



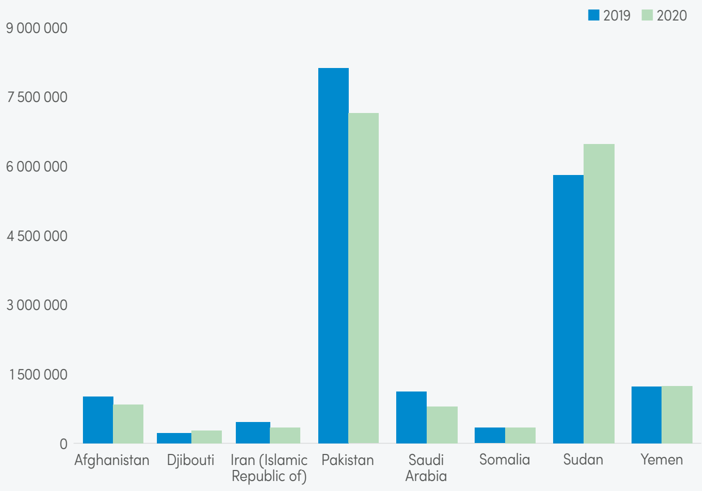
G. Estimated number of cases in countries that reduced case incidence by <40% in 2020 compared with 2015



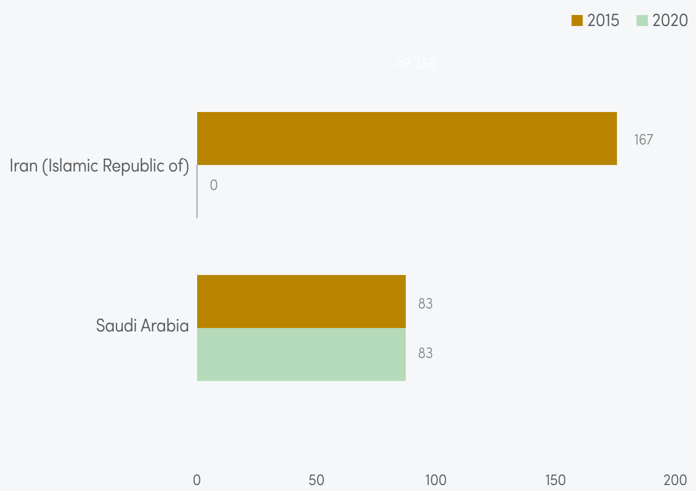
H. Estimated number of cases in countries with an increase or no change in case incidence, 2015–2020



I. Total number of suspected malaria cases tested, 2019 versus 2020



J. Reported indigenous cases in countries with national elimination activities, 2015 versus 2020



KEY MESSAGES

- Of the 14 countries in the WHO Eastern Mediterranean Region, seven are free of indigenous malaria and are at the stage of prevention of re-establishment; the other seven countries are malaria endemic, with *P. falciparum* responsible for 74% of all detected infections. Estimated malaria incidence in the region declined between 2010 and 2015, but increased significantly in 2016 and has remained stable for the past 5 years, translating into a 26% increase between 2010 and 2020. The number of estimated malaria deaths shows a similar trend – in this case, an increase of 14% between 2010 and 2020.
- The Sudan accounted for more than half of the cases estimated for the region. In 2020, the region reported that about 2.4 million of the 4.2 million cases reported were confirmed (58.8%), which represented a significant increase from the 18.3% and 18.8% confirmation rates reported in 2010 and in 2015, respectively. Part of this increase is due to incomplete reporting of presumed cases in Pakistan in 2019 and 2020. The reported number of deaths decreased from 1143 in 2010 to 792 in 2020.
- The Islamic Republic of Iran and Saudi Arabia aimed to eliminate malaria by 2020. The Islamic Republic of Iran reported zero indigenous cases for the third consecutive year. In Saudi Arabia, the number of indigenous malaria cases declined, from 272 in 2016 to 38 in 2019, then increased again to 83 in 2020. These countries undertake continued vigilance for malaria in the general health services; they also provide diagnosis and treatment free of charge to all imported cases.
- Among the malaria endemic countries, Pakistan met the 2020 GTS target by reducing estimated case incidence by 40% or more in 2020 compared with 2015. Afghanistan and Somalia also reduced estimated case incidence, but by less than 40%, so they did not meet the GTS 2020 case incidence milestones. Djibouti and the Sudan were off track, with malaria case incidence higher by 40% or more. Estimated case incidence also increased in Yemen but by less than 25%.
- From the latest data available, in all countries except for Saudi Arabia, vector resistance to pyrethroids, organochlorines and organophosphates was confirmed in 76%, 65% and 44% of the sites tested, respectively. In all countries except for Saudi Arabia, Somalia and Yemen, resistance to carbamates was confirmed in 25% of the sites tested. All seven endemic countries developed their insecticide resistance monitoring and management plans.
- Challenges include low coverage of essential interventions (below universal target) in most malaria endemic countries, inadequate funding and dependence on external resources, humanitarian emergencies, difficult operational environments and population displacements, a shortage of skilled technical staff (particularly at subnational level), and weak surveillance and health information systems. Frequent floods (particularly in Somalia, the Sudan and Yemen) and the increasing spread of *An. stephensi* in Djibouti, Somalia and the Sudan have increased the risk of malaria, particularly in urban and suburban areas. Another threat to the region is the confirmed presence of HRP2/3 gene deletions in Djibouti and Somalia and the high probability of the presence of this mutation in the Sudan, based on reports of *pfhrp2/3* deletions in travellers returning from these countries. These challenges may have led to an overall increase in cases during the period 2015–2019 in some countries of the region. The COVID-19 pandemic appeared to have disrupted diagnostic services, as shown by the reduction in diagnostic tests in Afghanistan and Pakistan in 2020 compared to 2019. The disruption of services mainly occurred in the first two quarters of 2020, which also affected the Sudan. However, poor data quality and reporting issues in some countries in the region, as well as the limited data available, means that it is challenging to accurately quantify the impact of the COVID-19 pandemic on diagnostic and treatment services.

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 1.65 billion
Parasites: *P. falciparum* and mixed (60%), *P. vivax* (39%) and other (<1%)
Vectors: *An. albimanus, An. annularis, An. balabacensis, An. barbirostris, An. culicifacies s.l., An. dirus s.l., An. farauti s.l., An. fluviatilis, An. leteri, An. maculatus s.l., An. minimus s.l., An. peditaeniatus, An. philippinensis, An. pseudowillmori, An. punctulatus s.l., An. sinensis s.l., An. stephensi s.l., An. subpictus s.l., An. sundaicus s.l., An. tessellatus, An. vagus, An. varuna* and *An. yatsushiroensis.*

FUNDING (US$), 2010–2020

254.0 million (2010), 204.3 million (2015), 218.1 million (2020); decrease 2010–2020: 14%
Proportion of domestic source[a] in 2020: 51%
Regional funding mechanisms: Mekong Malaria Elimination (MME) initiative in the Greater Mekong subregion: Myanmar and Thailand

[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

INTERVENTIONS, 2010–2020

Number of people protected by IRS: 57.0 million (2010), 44.0 million (2015), 24.9 million (2020)
Total LLINs distributed:[a] 8.1 million (2010), 14.5 million (2015), 31.0 million (2020)
Number of RDTs distributed: 11.4 million (2010), 23.5 million (2015), 25.2 million (2020)
Number of ACT courses distributed: 3.5 million (2010), 2.8 million (2015), 5.7 million (2020)
Number of any first-line antimalarial treatment courses (incl. ACT) distributed:[b] 2.9 million (2010), 2.9 million (2015), 5.7 million (2020)

[a] Includes PBO nets, G2 nets and Royal Guards nets in 2020.
[b] Data for Bhutan were not available for 2020.

REPORTED CASES AND DEATHS, 2010–2020

Total (presumed and confirmed) cases: 3.1 million (2010), 1.7 million (2015), 512 000 (2020)
Confirmed cases: 2.6 million (2010), 1.6 million (2015), 512 000 (2020)
Percentage of total cases confirmed: 85.6% (2010), 98.9% (2015), 99.9% (2020)
Indigenous cases: 2 641 582 (2010), 1 624 233 (2015), 510 366 (2020)
Imported cases: 52 (2010), 10 646 (2015), 1252 (2020)
Introduced cases: 0 (2010), 0 (2015), 27 (2020)
Deaths: 2421 (2010), 620 (2015), 147 (2020)

ESTIMATED CASES AND DEATHS, 2010–2020

Cases: 24.6 million (2010), 13.3 million (2015), 5.0 million (2020); decrease 2010–2020: 80%
Deaths: 39 300 (2010), 24 100 (2015), 8900 (2020); decrease 2010–2020: 77%

ACCELERATION TO ELIMINATION

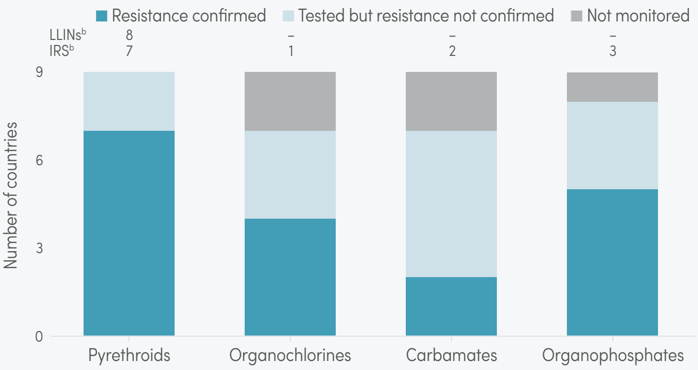
Countries with subnational/territorial elimination programme: Bangladesh, India, Indonesia and Myanmar
Countries with nationwide elimination programme: Bhutan, the Democratic People's Republic of Korea, Nepal, Thailand and Timor-Leste
Certified as malaria free since 2010: Maldives (2015) and Sri Lanka (2016)

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2015–2020	36	0.0	0.0	3.8	0.0	1.9
AS+SP	2015–2017	14	0.0	0.0	5.6	0.0	1.5
DHA-PPQ	2015–2020	12	0.0	0.0	3.9	0.0	2.0

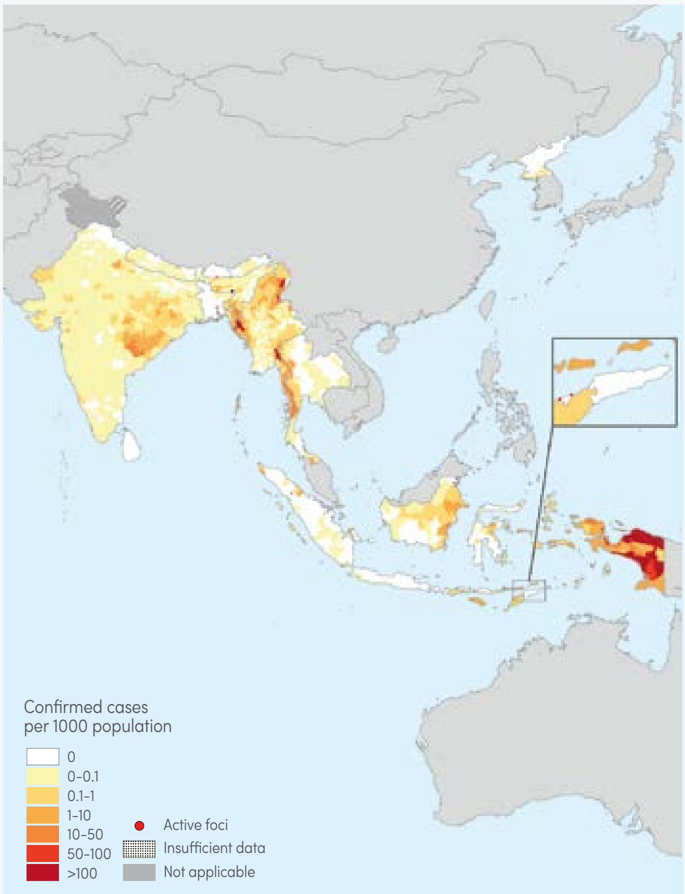
AL: artemether-lumefantrine; AS+SP: artesunate+sulfadoxine-pyrimethamine; DHA-PPQ: dihydroartemisinin-piperaquine.

STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)

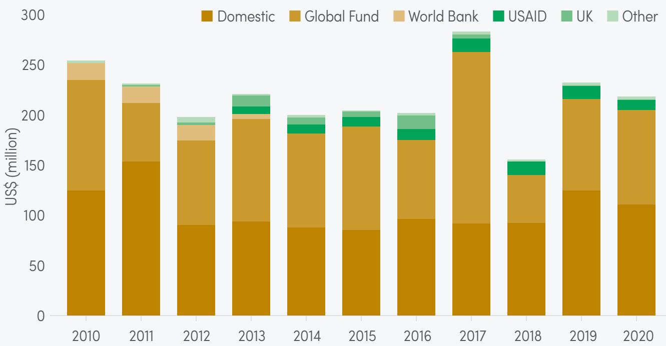


[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.
[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. Confirmed malaria cases per 1000 population, 2020

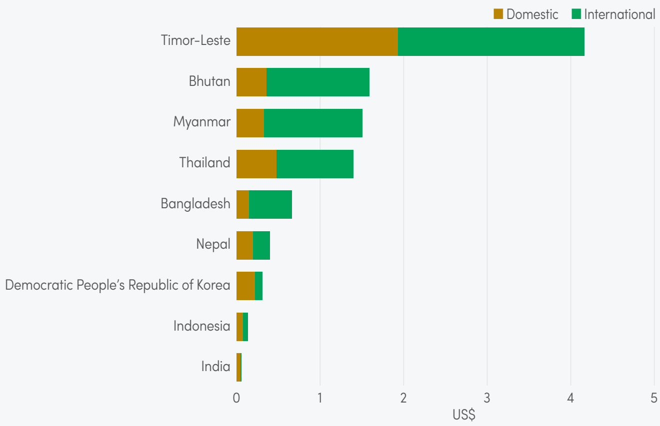


B. Malaria funding[a] by source, 2010–2020



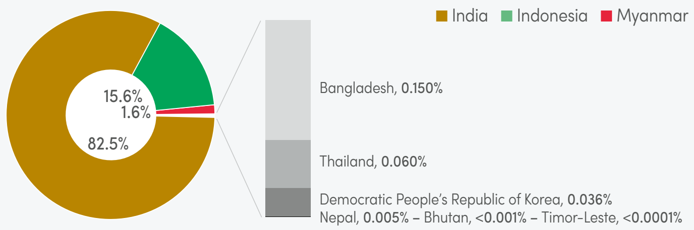
Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; UK: United Kingdom of Great Britain and Northern Ireland; USAID: United States Agency for International Development.
[a] Excludes patient service delivery costs and out-of-pocket expenditure.

C. Malaria funding[a] per person at risk, average 2018–2020

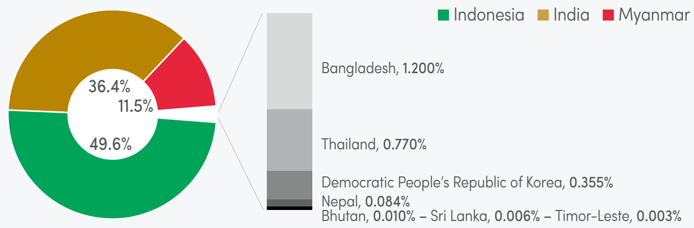


[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.

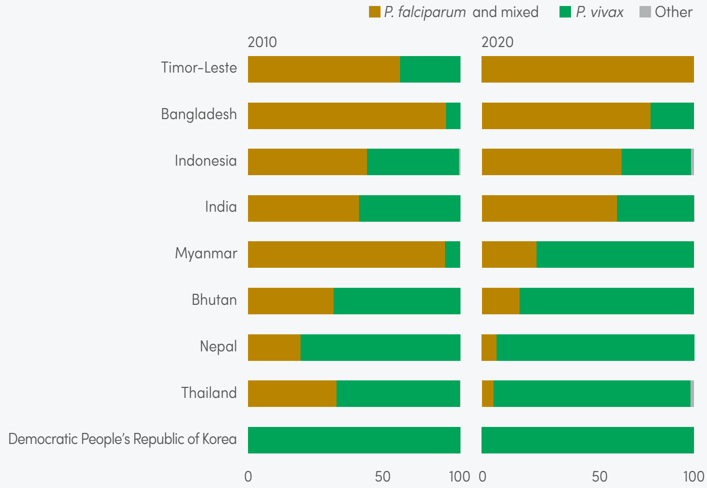
Da. Share of estimated malaria cases, 2020



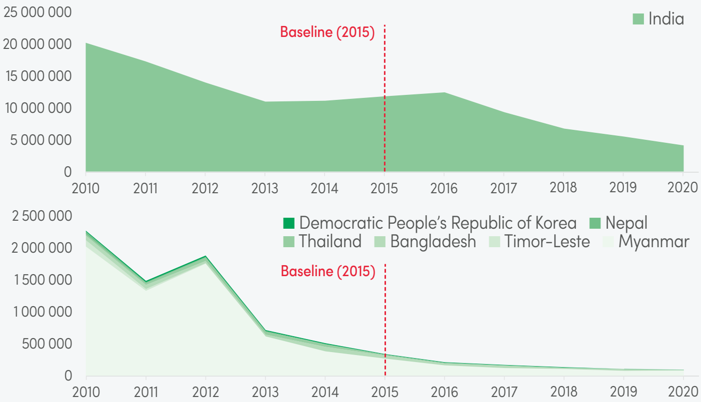
Db. Share of reported confirmed cases, 2020



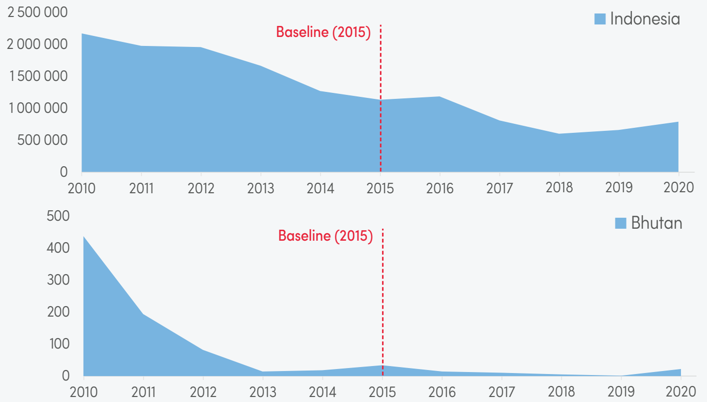
E. Percentage of *Plasmodium* species from indigenous cases, 2010 and 2020



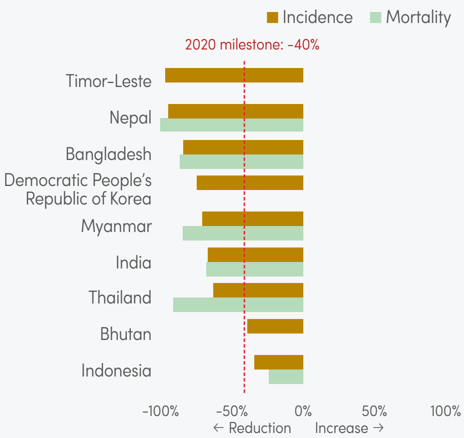
F. Estimated number of cases in countries that reduced case incidence by ≥40% in 2020 compared with 2015



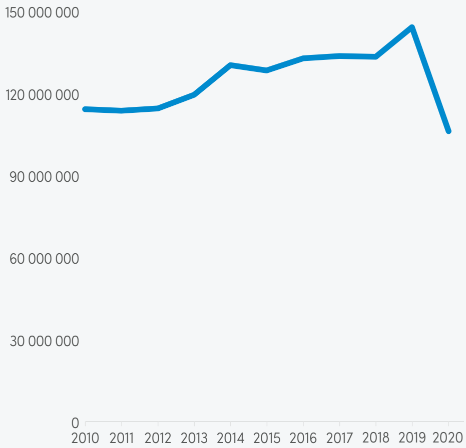
G. Estimated number of cases in countries that reduced case incidence by <40% in 2020 compared with 2015



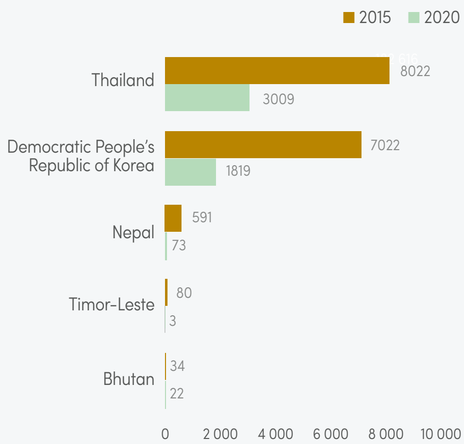
H. Change in estimated malaria incidence and mortality rates, 2015–2020



I. Total number of suspected malaria cases tested, 2010–2020



J. Reported indigenous cases in countries with national elimination activities, 2015 versus 2020



KEY MESSAGES

- Malaria is endemic in nine of the WHO South-East Asia Region's 11 countries, accounting for 38% of the estimated burden of malaria outside the WHO African Region. In 2020, the region had 5 million estimated cases and 8900 estimated deaths (reductions of 80% and 77%, respectively, compared with 2010), representing the largest decline in any of the WHO regions. All countries met the GTS 2020 target of more than 40% reduction in case incidence by 2020 compared with 2015, except Bhutan and Indonesia, where the case incidence reduced by 39% and 35%, respectively. All countries also met the GTS 2020 target for a reduction in mortality rate by at least 40% in 2020 compared with 2015, except Indonesia, where the mortality rate reduced by 24%. Bhutan, the Democratic People's Republic of Korea, Nepal and Timor-Leste all reported zero indigenous deaths. The Maldives and Sri Lanka were certified malaria free in 2015 and 2016, respectively, and continue to maintain their malaria free status.
- Three countries accounted for 99.7% of the estimated cases in the region, India being the largest contributor (82.5%), followed by Indonesia (15.6%) and Myanmar (1.6%). Compared with 2019, in 2020, Bangladesh and Nepal had substantial reductions in estimated cases of 64% and 48%, respectively. In 2020, about 512 000 cases were reported and 99.9% were confirmed. Indonesia accounted for the highest proportion of reported cases in the region (49.6%), followed by India (36.4%). The gap between reported cases and estimated cases in India in 2020 is due to adjustments made for care seeking and diagnostic testing rates, which were affected in some states by disruption of services due to the COVID-19 pandemic. About one third of reported cases in the region are due to *P. vivax*. In 2020, *P. vivax* was the dominant species (>50% of local cases) in Bhutan, the Democratic People's Republic of Korea (100%), Myanmar, Nepal and Thailand, whereas *P. falciparum* was the dominant species in Bangladesh, India, Indonesia and Timor-Leste (100%). In Myanmar, the proportion of local cases due to *P. falciparum* decreased from 96% in 2010 to 26% in 2020.
- Continuing the declining trend, reported malaria deaths in the region dropped to 147 in 2020 – a 94% reduction compared with 2010. India, Indonesia and Myanmar accounted for 63%, 22% and 7% of the total reported deaths in the region, respectively.
- Among the three countries (Bhutan, Nepal and Timor-Leste) identified as having the potential to eliminate malaria by 2020, Timor-Leste almost completed 3 consecutive years of malaria free status, reporting zero indigenous cases in 2018 and 2019, but experienced a small malaria outbreak in 2020. Bhutan reported six indigenous cases in 2018 followed by just two in 2019, but had an increase in cases to 22 in 2020. Nepal reported 73 indigenous cases in 2020. About half of the reported cases in Nepal and Timor-Leste were classified as imported.
- Vector resistance to pyrethroids was confirmed in 49% of the sites, to organochlorines in 80%, to carbamates in 49% and to organophosphates in 62%. Seven countries have developed their insecticide resistance monitoring and management plans.
- The COVID-19 pandemic affected all countries in the region in 2020. The Democratic People's Republic of Korea reported zero cases of COVID-19. Owing to the pandemic, diagnostic services were disrupted, as shown by the 27% decrease in malaria suspects tested in 2020 compared with 2019. Similarly, there was evidence of disruption in malaria preventive services of varying degrees across the region. Promisingly, several countries had creatively integrated their malaria services with those of the COVID-19 response activities, such as screening for both malaria and COVID-19 using an integrated surveillance approach, which was beneficial to both programmes.
- Challenges include decreased funding, continuing threat of multiple artemisinin-based combination therapy failures in the countries of the Greater Mekong subregion (GMS) and vector resistance to pyrethroids. Imported malaria has increasingly become a critical challenge for those countries on the verge of malaria elimination, and this has led to the reversal of gains as demonstrated by the resurgence of local transmission near the international borders with the high-burden neighbouring countries of Bhutan and Timor-Leste.

ANNEX 4 - E. WHO WESTERN PACIFIC REGION

EPIDEMIOLOGY

Population denominator used to compute incidence and mortality rate: 771 million
Parasites: *P. falciparum* and mixed (70%), *P. vivax* (30%) and other (<1%)
Vectors: *An. anthropophagus, An. balabacensis, An. barbirostris s.l., An. dirus s.l., An. donaldi, An. epirotivulus, An. farauti s.l., An. flavirostris, An. jeyporiensis, An. koliensis, An. litoralis, An. maculatus s.l., An. mangyanus, An. minimus s.l., An. punctulatus s.l., An. sinensis s.l.* and *An. sundaicus s.l.*

FUNDING (US$), 2010–2020

214.1 million (2010), 148.9 million (2015), 138.7 million (2020); decrease 2010–2020: 35%
Proportion of domestic source[a] in 2020: 48%
Regional funding mechanisms: Mekong Malaria Elimination (MME) initiative in the Greater Mekong subregion: Cambodia, China (Yunnan), the Lao People's Democratic Republic and Viet Nam (supported by RAI2e Global Fund)

[a] Domestic source excludes patient service delivery costs and out-of-pocket expenditure.

INTERVENTIONS, 2010–2020

Number of people protected by IRS: 2.8 million (2010), 1.6 million (2015), 910 000 (2020)
Total LLINs distributed:[a] 4.4 million (2010), 4.3 million (2015), 2.1 million (2020)
Number of RDTs distributed:[b] 1.6 million (2010), 2.5 million (2015), 5.8 million (2020)
Number of ACT courses distributed: 591 000 (2010), 1.3 million (2015), 1.6 million (2020)
Number of any antimalarial treatment courses (incl. ACT) distributed: 963 000 (2010), 1.4 million (2015), 1.6 million (2020)

[a] Data were not available for Cambodia, Solomon Islands and Vanuatu in 2020; includes PBO nets, G2 nets and Royal Guard nets in 2020.
[b] Data were not available for Cambodia in 2020.

REPORTED CASES AND DEATHS IN THE PUBLIC SECTOR, 2010–2020

Total (presumed and confirmed) cases: 1.8 million (2010), 814 000 (2015), 1.1 million (2020)
Confirmed cases: 315 000 (2010), 502 000 (2015), 860 000 (2020)
Percentage of total cases confirmed: 17.6% (2010), 61.7% (2015), 81.4% (2020)
Indigenous cases: 310 888 (2010), 496 750 (2015), 855 595 (2020)
Imported cases: 3005 (2010), 3804 (2015), 1346 (2020)
Introduced cases: 108 (2010), 0 (2015), 59 (2020)
Deaths: 910 (2010), 236 (2015), 207 (2020)
Indigenous deaths: 910 (2010), 215 (2015), 193 (2020)

ESTIMATED CASES AND DEATHS, 2010–2020

Cases: 1.7 million (2010), 1.2 million (2015), 1.7 million (2020); increase 2010–2020: 2%
Deaths: 3480 (2010), 2450 (2015), 3240 (2020); decrease 2010–2020: 7%

ACCELERATION TO ELIMINATION

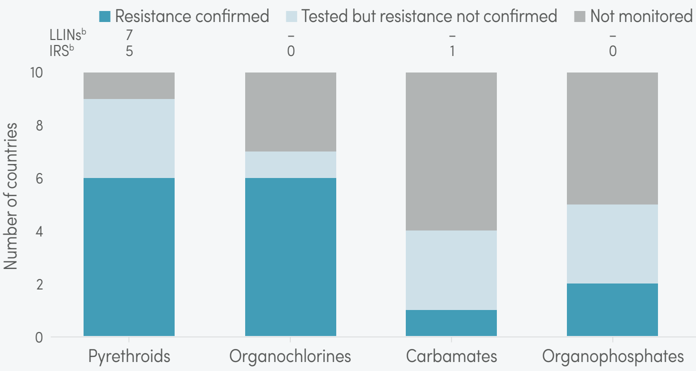
Countries with subnational/territorial elimination programme: the Philippines
Countries with nationwide elimination programme: Cambodia, the Lao People's Democratic Republic, Malaysia, the Republic of Korea, Vanuatu and Viet Nam
Zero indigenous cases for 3 consecutive years (2018, 2019 and 2020): Malaysia
Certified as malaria free since 2010: China (2021)

THERAPEUTIC EFFICACY STUDIES (CLINICAL AND PARASITOLOGICAL FAILURE AMONG PATIENTS WITH *P. FALCIPARUM* MALARIA, %)

Medicine	Study years	No. of studies	Min.	Median	Max.	Percentile 25	Percentile 75
AL	2015–2020	12	0.0	0.0	17.2	0.0	0.7
AS-MQ	2015–2020	19	0.0	0.0	1.9	0.0	0.0
AS-PY	2017–2019	8	0.0	1.7	5.1	0.0	2.5
DHA-PPQ	2015–2019	22	0.0	11.8	68.1	0.0	33.2

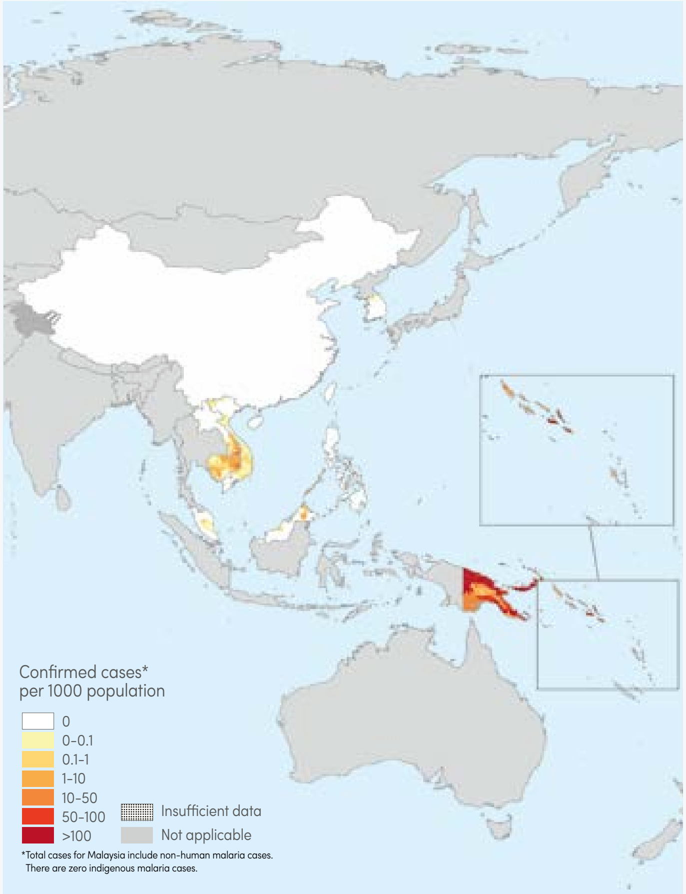
AL: artemether-lumefantrine; AS-MQ: artesunate-mefloquine; AS-PY: artesunate-pyronaridine; DHA-PPQ: dihydroartemisinin-piperaquine.

STATUS OF INSECTICIDE RESISTANCE[a] PER INSECTICIDE CLASS (2010–2020) AND USE OF EACH CLASS FOR MALARIA VECTOR CONTROL (2020)

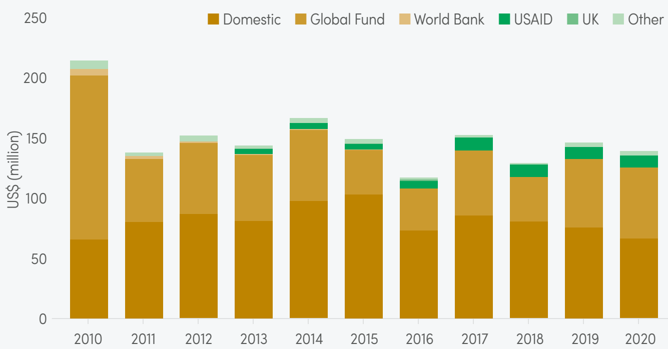


[a] Resistance is considered confirmed when it was detected to one insecticide in the class, in at least one malaria vector from one collection site.
[b] Number of countries that reported using the insecticide class for malaria vector control (2020).

A. Confirmed malaria cases per 1000 population, 2020

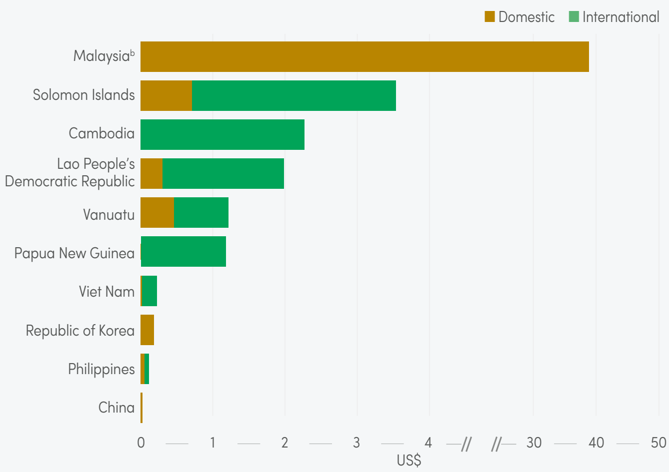


B. Malaria funding[a] by source, 2010–2020



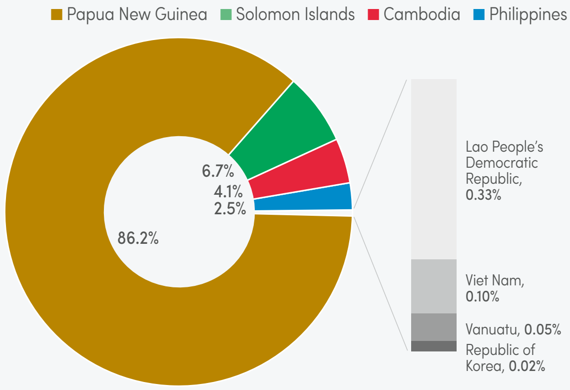
Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; UK: United Kingdom of Great Britain and Northern Ireland; USAID: United States Agency for International Development.
[a] Excludes patient service delivery costs and out-of-pocket expenditure.

C. Malaria funding[a] per person at risk, average 2018–2020



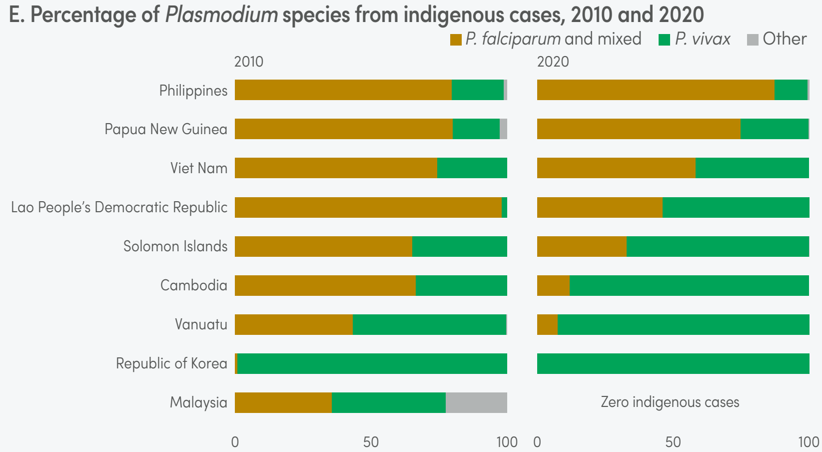
[a] Excludes costs related to health staff, costs at subnational level and out-of-pocket expenditure.
[b] No international funding was reported in 2020.

D. Share of estimated malaria cases, 2020

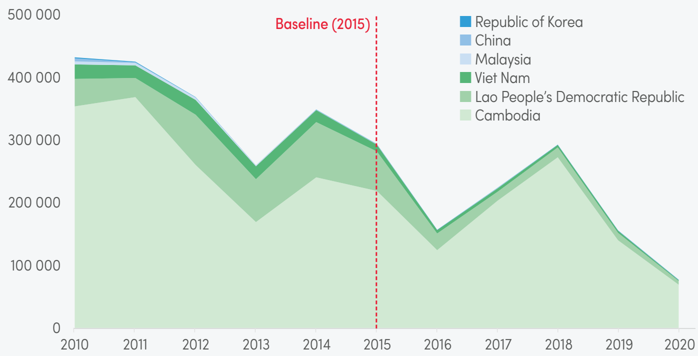


Note: Countries with zero cases: China and Malaysia.

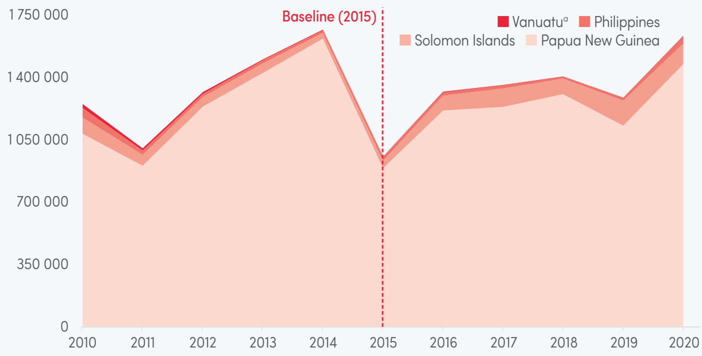
E. Percentage of *Plasmodium* species from indigenous cases, 2010 and 2020



F. Estimated number of cases in countries that reduced case incidence by ≥40% in 2020 compared with 2015

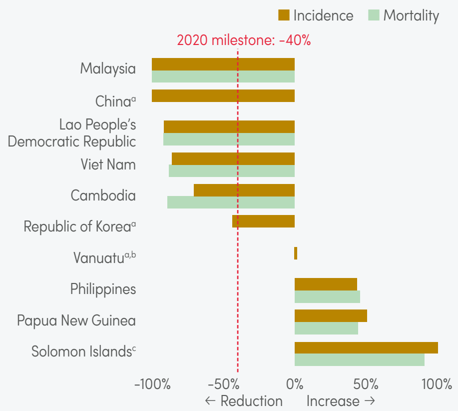


G. Estimated number of cases in countries with an increase or no change in case incidence, 2015–2020



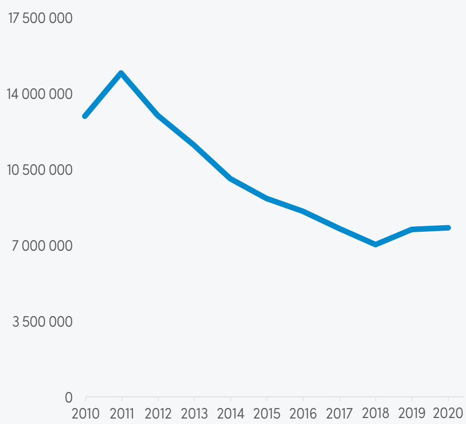
[a] Malaria cases in 2015 are likely to be underestimated; this confounds assessment of progress towards the 2020 GTS target relative to a 2015 baseline.

H. Change in estimated malaria incidence and mortality rates, 2015–2020

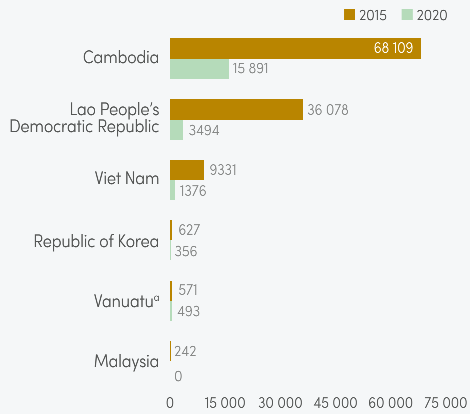


[a] There have been no estimated indigenous deaths between 2015 and 2020 in these countries; [b] Malaria cases in 2015 are likely to be underestimated; this confounds assessment of progress towards the 2020 GTS target relative to a 2015 baseline; [c] Change in estimated incidence is more than 100%.

I. Total number of suspected malaria cases tested, 2010–2020



J. Reported indigenous cases in countries with national elimination activities, 2015 versus 2020



[a] Malaria cases in 2015 are likely to be underestimated; this confounds assessment of progress towards the 2020 GTS target relative to a 2015 baseline.

KEY MESSAGES

- Eight countries in the WHO Western Pacific Region are at risk of malaria, which is predominantly caused by *P. falciparum* (70%), with *P. vivax* accounting for just under a third of all reported cases (30%). In 2020, the region had more than 1.7 million estimated malaria cases and about 3240 estimated deaths – a 2% increase and a 7% reduction from 2010, respectively. Most cases occurred in Papua New Guinea (86.2%) which, together with Solomon Islands (6.7%) and Cambodia (4.1%), comprised 97% of the estimated cases in the region. About 1.1 million cases were reported in the public and private sectors and in the community, of which almost 81.4% were confirmed. This was a significant improvement over 2015, when only 61.7% of cases were confirmed. There were 207 malaria deaths reported in the region in 2020, of which 193 were indigenous and most were in Papua New Guinea.
- Six of the 10 malaria endemic countries in the region in 2015 achieved the GTS 2020 target of more than a 40% reduction in case incidence by 2020 or zero malaria cases: Cambodia, China, the Lao People's Democratic Republic, Malaysia, the Republic of Korea and Viet Nam. China was certified as malaria free in early 2021 and Malaysia reported zero indigenous cases for the third consecutive year in 2020. Countries that have experienced an increase in estimated cases since 2015 are Papua New Guinea, the Philippines and Solomon Islands. There was no change in estimated case incidence in Vanuatu when compared with 2015. In 2015, Vanuatu was affected by a major cyclone that severely disrupted malaria diagnostic services and care seeking. As a result, malaria cases in 2015 are likely to be underestimated, which confounds assessment of progress towards the 2020 GTS target relative to a 2015 baseline. In 2016, there was a large increase in reported malaria cases as a result of increased transmission, but since then case incidence has decreased significantly, by 81%. All countries reduced the malaria mortality rate by at least 40% by 2020, with all countries reporting zero indigenous cases except for Papua New Guinea, the Philippines and Solomon Islands.
- Malaysia has reported zero indigenous non-zoonotic malaria cases since 2018. However, Malaysia is facing increasing cases of zoonotic malaria due to *P. knowlesi*, which increased from 1600 cases to more than 4000 between 2016 and 2018. *P. knowlesi* cases declined slightly in 2019 and 2020 (to 3213 and 2609 cases, respectively), but resulted in six and five deaths in 2019 and 2020, respectively. The Republic of Korea continues to face the challenge of malaria transmission among military personnel along the country's northern border. The Philippines has continued its subnational elimination efforts, reporting zero indigenous cases in 78 out of 81 provinces.
- Three countries of the GMS (Cambodia, the Lao People's Democratic Republic and Viet Nam), supported through a regional artemisinin-resistance initiative financed by the Global Fund, aimed to eliminate *P. falciparum* by 2020 and all species of malaria by 2030. The percentage of reported cases in Cambodia due to *P. falciparum* fell significantly, from 61% in 2015 to 12% in 2020, owing to intensified efforts in community outreach and active case detection. Although the goal of *P. falciparum* elimination by 2020 has not been met, and targets will be delayed for a few years, much progress continues to be made.
- Vector resistance to pyrethroids was confirmed in 49% of the sites, to organochlorines in 63%, to carbamates in 17% and to organophosphates in 56%. Six malaria endemic countries have developed their insecticide resistance monitoring and management plans.
- Challenges include resurgence of malaria in Solomon Islands and sustained high levels of malaria in Papua New Guinea due to challenges in health system strengthening, and often inadequate surveillance and response activities to halt transmission in the highest burden provinces. Recently, efforts have been initiated to improve access to services and case-based surveillance in the Pacific Island countries, and community efforts to halt malaria transmission in the GMS countries have intensified, particularly in Cambodia and the Lao People's Democratic Republic. Although all countries have reported minor disruptions to implementing malaria interventions because of COVID-19, no major delays to service delivery have been reported. This is supported by the trend in suspected malaria cases tested over time, which showed no decrease in 2020 compared with 2019.

ANNEX 5 – A. POLICY ADOPTION, 2020

WHO region Country/area	Insecticide-treated mosquito nets				Indoor residual spraying		Chemoprevention	
	ITNs/LLINs are distributed free of charge	ITNs/LLINs are distributed through ANC	ITNs/LLINs are distributed through EPI/well baby clinic	ITNs/LLINs are distributed through mass campaigns	IRS is recommended by malaria control programme	DDT is used for IRS	IPTp is used to prevent malaria during pregnancy	SMC or IPTc is used
AFRICAN								
Angola	black	black	black	grey	black	red	black	red
Benin	black	black	black	black	black	red	black	black
Botswana	black	grey	grey	grey	black	grey	NA	NA
Burkina Faso	black	black	black	grey	grey	yellow	black	black
Burundi	black	black	black	grey	black	red	black	red
Cabo Verde	NA	NA	NA	NA	black	red	NA	NA
Cameroon	black	black	red	black	red	red	black	black
Central African Republic	black	black	grey	black	red	red	black	grey
Chad	black	black	black	black	black	red	black	black
Comoros	grey	black	black	black	black	red	grey	NA
Congo	black	black	grey	grey	grey	yellow	black	red
Côte d'Ivoire	black	black	black	grey	black	yellow	black	red
Democratic Republic of the Congo	black	black	black	black	red	red	black	red
Equatorial Guinea	grey	grey	red	grey	grey	red	grey	red
Eritrea	black	black	red	grey	black	yellow	red	NA
Eswatini	NA	NA	NA	grey	black	grey	NA	NA
Ethiopia	black	red	red	black	black	yellow	red	NA
Gabon	grey	grey	grey	red	red	red	black	red
Gambia	black	black	black	grey	red	red	black	black
Ghana	black	black	black	grey	black	yellow	black	grey
Guinea	black	grey	grey	grey	red	red	black	black
Guinea-Bissau	grey	grey	grey	grey	grey	red	grey	grey
Kenya	black	black	black	black	black	red	black	red
Liberia	grey	grey	red	grey	grey	red	grey	red
Madagascar	black	black	black	grey	black	yellow	black	NA
Malawi	black	black	black	grey	black	red	black	red
Mali	black	black	black	black	black	red	black	black
Mauritania	black	black	grey	black	yellow	red	black	red
Mayotte	–	–	–	–	–	red	NA	NA
Mozambique	black	black	red	black	black	black	black	red
Namibia	grey	NA	NA	grey	black	black	red	NA
Niger	black	black	grey	grey	red	red	grey	black
Nigeria	black	black	grey	black	grey	red	black	black
Rwanda	black	black	black	black	grey	red	NA	NA
Sao Tome and Principe	black	black	black	grey	black	red	black	NA
Senegal	black	black	black	grey	black	red	black	black
Sierra Leone	black	black	black	black	red	red	black	red
South Africa	red	red	red	red	black	black	red	NA
South Sudan[2]	black	black	black	black	grey	red	black	black
Togo	grey	grey	grey	grey	grey	red	grey	black
Uganda	black	black	black	black	grey	yellow	black	grey
United Republic of Tanzania[3]								
Mainland	black	black	black	black	black	red	black	red
Zanzibar	black	black	black	black	black	red	grey	red
Zambia	black	black	black	black	black	black	black	red
Zimbabwe	black	black	black	black	black	black	grey	NA
AMERICAS								
Belize	grey	red	red	grey	grey	red	NA	NA
Bolivia (Plurinational State of)	black	black	red	grey	black	red	NA	NA
Brazil	black	red	red	grey	black	yellow	NA	NA
Colombia	black	red	red	black	black	red	NA	NA
Costa Rica	grey	red	red	red	black	red	NA	NA
Dominican Republic	grey	red	red	grey	black	red	NA	NA
Ecuador	black	red	red	black	black	yellow	NA	NA

Testing				Treatment				
Patients of all ages should get a diagnostic test	Malaria diagnosis is free of charge in the public sector	RDTs are used at community level	G6PD test is recommended before treatment with primaquine	ACT for treatment of *P. falciparum*	Pre-referral treatment with quinine or artemether IM or artesunate suppositories	Single low dose of primaquine with ACT to reduce transmissibility of *P. falciparum*[1]	Primaquine is used for radical treatment of *P. vivax* cases	Directly observed treatment with primaquine is undertaken
●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●
●	●	●	NA	●	●	●	●	●
●	●	●	NA	●	●	NA	NA	NA
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●	●	●	●	NA	NA	●	●	●
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ANNEX 5 – A. POLICY ADOPTION, 2020

WHO region Country/area	Insecticide-treated mosquito nets				Indoor residual spraying		Chemoprevention	
	ITNs/LLINs are distributed free of charge	ITNs/LLINs are distributed through ANC	ITNs/LLINs are distributed through EPI/well baby clinic	ITNs/LLINs are distributed through mass campaigns	IRS is recommended by malaria control programme	DDT is used for IRS	IPTp is used to prevent malaria during pregnancy	SMC or IPTc is used
AMERICAS								
El Salvador	⚪	NA	NA	NA	⚫	🔴	NA	NA
French Guiana	⚪	⚪	🔴	⚪	⚪	🔴	NA	NA
Guatemala	⚫	🔴	🔴	⚫	⚫	🔴	NA	NA
Guyana	⚫	⚪	🔴	⚪	⚪	🔴	NA	NA
Haiti	⚫	⚪	🔴	⚫	⚫	🔴	NA	NA
Honduras	⚫	🔴	🔴	⚫	⚫	🔴	NA	NA
Mexico	⚫	🔴	🔴	⚫	⚫	🟡	NA	NA
Nicaragua	⚫	🔴	🔴	⚫	⚫	🔴	NA	NA
Panama	⚫	🔴	🔴	⚫	⚫	🔴	NA	NA
Peru	⚫	🔴	🔴	🔴	⚫	🔴	NA	NA
Suriname	⚫	⚪	⚪	⚫	🔴	🔴	NA	NA
Venezuela (Bolivarian Republic of)	⚫	⚫	🔴	⚫	⚪	🟡	NA	NA
EASTERN MEDITERRANEAN								
Afghanistan	⚫	⚫	⚫	⚫	🔴	🔴	NA	NA
Djibouti	⚫	⚪	⚪	⚫	⚫	🔴	NA	NA
Iran (Islamic Republic of)	⚫	⚪	⚪	⚪	⚫	🔴	NA	NA
Pakistan	⚫	⚫	🔴	⚫	⚫	🔴	NA	NA
Saudi Arabia	⚫	🔴	🔴	🔴	⚫	🟡	NA	NA
Somalia	⚫	⚫	🔴	⚫	⚫	🔴	⚪	🔴
Sudan	⚫	⚫	⚫	⚫	⚫	🟡	⚪	🔴
Yemen	⚪	⚪	⚪	⚫	⚫	🔴	NA	NA
SOUTH-EAST ASIA								
Bangladesh	⚫	🔴	🔴	⚫	⚪	🟡	NA	NA
Bhutan	⚪	🔴	🔴	⚫	⚫	🔴	NA	NA
Democratic People's Republic of Korea	⚪	🔴	🔴	⚪	⚫	🟡	NA	NA
India	⚫	⚪	🔴	⚪	⚫	⚫	NA	NA
Indonesia	⚫	⚫	🔴	⚫	⚫	🔴	NA	NA
Myanmar	⚫	⚪	🔴	⚫	⚫	🔴	NA	NA
Nepal	⚪	⚫	🔴	⚫	⚫	🔴	NA	NA
Thailand	⚫	🔴	NA	⚫	⚫	🔴	NA	NA
Timor-Leste	⚫	⚫	🔴	⚫	⚫	🔴	NA	NA
WESTERN PACIFIC								
Cambodia	⚫	🔴	🔴	⚪	🔴	🔴	NA	NA
China	⚫	🔴	🔴	🟡	⚫	🟡	NA	NA
Lao People's Democratic Republic	⚫	⚫	🔴	⚫	⚫	🔴	NA	NA
Malaysia	⚫	🔴	🔴	⚫	⚫	🟡	NA	NA
Papua New Guinea	⚫	⚫	🔴	⚫	⚫	🔴	⚪	NA
Philippines	⚫	⚪	🔴	⚪	⚫	🔴	NA	NA
Republic of Korea	⚫	NA	NA	⚪	⚪	🟡	NA	NA
Solomon Islands	⚫	⚪	⚪	⚪	⚪	🔴	NA	NA
Vanuatu	⚫	⚪	🔴	⚫	⚪	🔴	NA	NA
Viet Nam	⚫	NA	NA	⚫	⚫	🔴	NA	NA

ACT: artemisinin-based combination therapy; ANC: antenatal care; DDT: dichlorodiphenyltrichloroethane; EPI: Expanded Programme on Immunization; G6PD: glucose-6-phosphate dehydrogenase; IM: intramuscular; IPTc: intermittent preventive treatment in children; IPTp: intermittent preventive treatment in pregnancy; IRS: indoor residual spraying; ITN: insecticide-treated mosquito net; LLIN: long-lasting insecticidal net; *P.*: *Plasmodium*; RDT: rapid diagnostic test; SMC: seasonal malaria chemoprevention; WHO: World Health Organization.

[1] Single dose of primaquine (0.75 mg base/kg) for countries in the WHO Region of the Americas.

[2] In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf).

[3] Where national data for the United Republic of Tanzania are unavailable, refer to Mainland and Zanzibar.

Testing				Treatment				
Patients of all ages should get a diagnostic test	Malaria diagnosis is free of charge in the public sector	RDTs are used at community level	G6PD test is recommended before treatment with primaquine	ACT for treatment of *P. falciparum*	Pre-referral treatment with quinine or artemether IM or artesunate suppositories	Single low dose of primaquine with ACT to reduce transmissibility of *P. falciparum*[1]	Primaquine is used for radical treatment of *P. vivax* cases	Directly observed treatment with primaquine is undertaken
grey	green	red	red	NA	red	grey	grey	grey
grey	green	red	grey	–	red	red	grey	red
grey	green	black	red	red	red	grey	black	black
grey	green	black	red	black	black	grey	black	black
grey	green	black	red	NA	NA	black	black	grey
grey	blue	black	red	red	red	black	black	red
grey	blue	red	red	black	red	red	red	grey
grey	blue	black	red	red	red	grey	black	black
grey	green	black	black	black	red	black	black	black
grey	green	black	red	black	red	grey	grey	grey
grey	green	black	red	grey	grey	grey	grey	red
grey	green	black	red	black	grey	grey	black	black
grey	green	black	black	black	grey	black	black	red
grey	green	red	grey	black	red	grey	grey	grey
black	light green	black	grey	black	red	grey	grey	grey
black	green	red	grey	black	grey	black	black	red
black	green	red	black	black	black	black	black	black
grey	green	black	grey	black	black	black	black	grey
grey	light blue	black	red	black	grey	red	red	red
grey	green	black	black	black	red	black	black	NA
grey	green	black	red	black	grey	black	black	red
grey	green	red	red	black	red	grey	grey	black
grey	green	NA	red	NA	NA	NA	black	black
grey	light green	grey	red	black	red	black	grey	red
grey	green	black	red	black	red	grey	black	red
grey	green	black	NA	black	black	grey	black	red
grey	green	black	grey	black	yellow	grey	grey	red
grey	green	black	black	black	red	black	black	red
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grey	green	black	black	grey	red	grey	black	red
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grey	light green	red	grey	black	grey	grey	grey	red
grey	green	black	black	black	grey	grey	black	black
grey	green	black	black	black	red	black	black	black

Data as of 2 November 2021

black = Policy exists and has been implemented this year.
grey = Policy exists but is not implemented this year or no data exists to support implementation.
red = Policy does not exist.
yellow = Policy discontinued.
green = Both microscopy and RDT are free.
light green = Diagnosis is free but diagnostic test was not specified.
blue = Only microscopy is free.
light blue = Only RDT is free.
purple = Neither microscopy nor RDT are free.
NA = Policy not applicable.
– = Question not answered and there is no information from previous years.

ANNEX 5 – B. ANTIMALARIAL DRUG POLICY, 2020

WHO region Country/area	*P. falciparum*				*P. vivax*
	Uncomplicated unconfirmed	Uncomplicated confirmed	Severe	Prevention during pregnancy	Treatment
AFRICAN					
Angola	AL	AL	AS	SP(IPT)	AL
Benin	NA	AL	AS	SP(IPT)	NA
Botswana	–	AL+PQ	AS	NA	AL+PQ
Burkina Faso	AL	AL	AS	SP(IPT)	–
Burundi	AL	AL	AS	SP(IPT)	–
Cabo Verde	–	–	–	–	–
Cameroon	NA	AL; AS-PYR; AS+AQ; DHA-PPQ	AM; AS; QN	SP(IPT)	NA
Central African Republic	AL	AL	AS	SP(IPT)	–
Chad	AL; AS+AQ	AL; AS+AQ	ART; AS; QN	SP(IPT)	–
Comoros	AL	AL	QN	–	–
Congo	AS+AQ	AS+AQ	AS	SP(IPT)	–
Democratic Republic of the Congo	AS+AQ	AL; AS+AQ	AS; QN	SP(IPT)	–
Equatorial Guinea	AS+AQ	–	AS	SP(IPT)	–
Eritrea	AS+AQ	AS+AQ	AS	NA	AS+AQ
Eswatini	–	AL	AS	–	PQ
Ethiopia	AL	AL+PQ	AS	AL	CQ+PQ
Gabon	AL; AS+AQ	AL; AS+AQ	AS	SP(IPT)	–
Gambia	AL	AL	AS	SP(IPT)	–
Ghana	AL; AS+AQ; DHA-PPQ	AL; AS+AQ	AM; AS; QN	SP(IPT)	AL+PQ; AS+AQ+PQ; DHA-PPQ+PQ
Guinea	AL; AS	AL; AS	AS; AS-QN; AS+AL	SP(IPT)	NA
Guinea-Bissau	AL	AL	QN	–	–
Kenya	AL	AL	AS	SP(IPT)	PQ
Liberia	–	–	–	–	–
Madagascar	AS+AQ	AS+AQ	AS	SP(IPT)	AS+AQ
Malawi	AL	AL	AS	SP(IPT)	–
Mali	AL	AL	AS	SP(IPT)	AL
Mauritania	AS+AQ	AS+AQ	AS	SP(IPT)	AS+AQ+PQ
Mayotte	–	–	–	–	–
Mozambique	AL	AS+AQ	AS	SP(IPT)	–
Namibia	AL	AL	QN	–	AL
Niger	AL	AL	AS; QN	SP(IPT)	–
Nigeria	AL; AS+AQ	AL; AS-PYR; AS+AQ; DHA-PPQ	AS	SP(IPT)	–
Rwanda	AL	AL	AS; QN	NA	ACT+PQ
Sao Tome and Principe	–	–	–	–	–
Senegal	NA	AL; AS+AQ	AS	SP(IPT)	NA
Sierra Leone	AL	AL; AS+AQ	AM; AS; QN	SP(IPT)	–
South Africa	AL	AL	AS; QN	–	AL
South Sudan[1]	AS+AQ	AS+AQ	AM; AS; QN	SP(IPT)	AS+AQ+PQ
Togo	AL; AS+AQ	AL; AS+AQ	AS; AM; QN	SP(IPT)	–
Uganda	AL	AL	AS	SP(IPT)	–
United Republic of Tanzania	–	–	–	–	–
Mainland	AL	AL	AM; AS; QN	SP(IPT)	–
Zanzibar	AS+AQ	AS+AQ	AS	–	PQ
Zambia	AL	AL	AS	–	NA
Zimbabwe	–	AL	AS	SP(IPT)	–
AMERICAS					
Belize	–	CQ+PQ	–	–	–
Bolivia (Plurinational State of)	–	AL+PQ	AS	–	CQ+PQ
Brazil	–	AL+PQ; AS+MQ+PQ	–	–	–
Colombia	AL+PQ	AL+PQ	AS	CQ	CQ+PQ
Costa Rica	–	CQ+PQ; ACT+PQ	–	–	CQ+PQ

ANNEX 5 – B. ANTIMALARIAL DRUG POLICY, 2020

WHO region Country/area	*P. falciparum*				*P. vivax*
	Uncomplicated unconfirmed	Uncomplicated confirmed	Severe	Prevention during pregnancy	Treatment
AMERICAS					
Dominican Republic	–	CQ+PQ	AS	–	CQ+PQ
Ecuador	–	AL+PQ	AS+AL+PQ	–	CQ+PQ
El Salvador	–	AL+PQ	AL	–	CQ+PQ
French Guiana	–	AL+PQ	AS	QN	CQ+PQ
Guatemala	–	CQ+PQ	CQ+PQ	–	CQ+PQ
Guyana	–	AL+PQ	AM; AS-QN; QN+CL	–	CQ+PQ
Haiti	–	CQ+PQ	AS	–	CQ+PQ
Honduras	–	CQ+PQ	AS	–	CQ+PQ
Mexico	NA	AL	AS	NA	CQ+PQ
Nicaragua	–	CQ+PQ	AS	–	–
Panama	–	AL+PQ	AS	–	CQ+PQ
Peru	–	AS+MQ+PQ	AS	–	CQ+PQ
Suriname	–	AL+PQ	AS	–	CQ+PQ
Venezuela (Bolivarian Republic of)	–	AL+PQ	–	–	CQ+PQ
EASTERN MEDITERRANEAN					
Afghanistan	AL+PQ	AL+PQ	AM; AS; QN	–	CQ+PQ
Djibouti	AL	AL+PQ	AS	–	AL+PQ
Iran (Islamic Republic of)	–	AS+SP+PQ	AS; QN	–	CQ+PQ
Pakistan	CQ	AL+PQ	CQ+PQ	–	CQ+PQ
Saudi Arabia	NA	AS+SP+PQ	AS+AM+QN	NA	CQ+PQ
Somalia	AL	AL+PQ	AS	SP(IPT)	AL+PQ
Sudan	AL	AL	AS; QN	SP(IPT)	AL+PQ
Yemen	AS+SP	AS+SP	AS; QN	–	CQ+PQ
SOUTH-EAST ASIA					
Bangladesh	NA	AL+PQ	AS+AL+PQ	NA	CQ+PQ
Bhutan	AL+PQ	AL	AM; QN	–	CQ+PQ
Democratic People's Republic of Korea	NA	NA	NA	NA	CQ+PQ
India	–	AL+PQ; AS+SP+PQ	AM; AS; QN	–	CQ+PQ
Indonesia	–	DHA-PPQ	AS	–	DHA+PPQ
Myanmar	AL+PQ	AL+PQ	AM; AS; QN	NA	CQ+PQ
Nepal	–	AL+PQ	AS	NA	CQ+PQ
Thailand	–	AS-PYR; DHA-PPQ+PQ	AS; QN	–	CQ+PQ
Timor-Leste	AL+PQ	AL+PQ	AS; QN	NA	AL+PQ
WESTERN PACIFIC					
Cambodia	AS+MQ	AS+MQ	AS	NA	AL+PQ; AS+MQ+PQ
China	–	ART-PPQ; AS+AQ; DHA-PPQ; PYR	AM; AS; PYR	–	CQ+PQ; PQ+PPQ; ACTs+PQ; PYR
Lao People's Democratic Republic	–	AL+PQ	AS	–	AL+PQ
Malaysia	–	AL	AS	–	AL+PQ
Papua New Guinea	–	AL	AM; AS	–	AL+PQ
Philippines	–	AL+PQ	AS	NA	AL+PQ
Republic of Korea	–	–	–	–	–
Solomon Islands	AL	AL	AS+AL; QN	CQ	AL+PQ
Vanuatu	–	AL	AS	CQ	PQ
Viet Nam	AS-PYR; DHA-PPQ	DHA-PPQ	AS	NA	CQ+PQ

Data as of 8 November 2021

ACT: artemisinin-based combination therapy; AL: artemether-lumefantrine; AM: artemether; AQ: amodiaquine; ART: artemisinin; AS: artesunate; CL: clindamycline; CQ: chloroquine; DHA: dihydroartemisinin; IPT: intermittent preventive treatment; MQ: mefloquine; NA: Not applicable; PPQ: piperaquine; PQ: primaquine; PYR: pyronaridine; QN: quinine; SP: sulfadoxine-pyrimethamine; WHO: World Health Organization.

"–" refers to data not available.

[1] In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf).

ANNEX 5 – C. FUNDING FOR MALARIA CONTROL, 2018–2020

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/USAID[2]	World Bank[3]	UK[4]
AFRICAN					
Angola	2018	12 484 560	22 654 733	0	0
	2019	5 088 945	22 266 483	0	0
	2020	5 924 771	19 000 000	0	0
Benin	2018	4 884 252	16 476 170	0	0
	2019	14 343 177	17 205 919	0	0
	2020	12 401 934	17 000 000	0	0
Botswana	2018	1 519 623	0	0	0
	2019	273 682	0	0	0
	2020	133 414	0	0	0
Burkina Faso	2018	33 521 376	25 744 015	8 970 620	0
	2019	33 672 757	25 302 822	11 697 110	0
	2020	38 845 769	26 000 000	11 697 110	0
Burundi	2018	1 859 254	9 267 845	0	0
	2019	31 523 355	8 096 903	0	0
	2020	20 781 065	8 000 000	0	0
Cabo Verde	2018	−19 579	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Cameroon	2018	17 585 028	23 169 614	0	0
	2019	31 762 667	22 772 540	0	0
	2020	14 891 198	23 500 000	0	146 314
Central African Republic	2018	17 678 106	0	0	0
	2019	11 382 096	0	0	0
	2020	14 017 225	0	0	0
Chad	2018	18 868 418	0	0	0
	2019	38 537 776	0	0	0
	2020	13 170 623	0	0	0
Comoros	2018	2 367 213	0	0	0
	2019	1 529 368	0	0	0
	2020	1 927 026	0	0	0
Congo	2018	1 221 723	0	0	0
	2019	10 408 507	0	0	0
	2020	5 158 903	0	0	0
Côte d'Ivoire	2018	28 292 612	25 744 015	0	0
	2019	57 677 365	25 302 822	0	0
	2020	45 301 336	25 000 000	0	0
Democratic Republic of the Congo	2018	79 927 159	51 488 031	0	2 233 420
	2019	119 378 181	50 605 644	0	756 572
	2020	151 725 825	55 000 000	0	1 769 381
Equatorial Guinea	2018	0	0	0	0
	2019	-221 287	0	0	0
	2020	0	0	0	0
Eritrea	2018	4 934 509	0	0	0
	2019	9 051 153	0	0	0
	2020	4 464 199	0	0	0
Eswatini	2018	597 034	0	0	0
	2019	846 409	0	0	0
	2020	565 771	0	0	0
Ethiopia	2018	37 571 203	37 071 382	0	0
	2019	26 991 934	36 436 064	0	0
	2020	14 587 592	36 000 000	0	0

Contributions reported by countries							
Government (NMP)	Global Fund	World Bank	PMI/USAID	Other bilaterals	WHO	UNICEF	Other contributions[7]
46 457 232 [5]	9 578 147		22 000 000		88 217		
1 754 960	2 864 156		20 000 000				
2 397 346			22 000 000				
611 841	4 252 659	0	827 211 110	0	21 292	75 628	0
10 889 600	15 167 653	0	2 435 941	0	0	0	0
208 585	19 234 523	0	3 267 868	0	0	0	0
2 124 880	2 087 088	0	0	0		0	0
2 447 859	219 328	0	0	0		0	0
27 055 987							
7 740 637 [5]	14 880 669	5 321 114	16 646 476		431 795	228 084	2 900 368
12 069 804 [6]	66 864 802	6 473 917	20 960 657		107 706	546 944	
55 115 902	27 553 483	42 623	18 844 577		52 206	333 334	8 289 677
1 157 984	4 734 738		9 000 000		68 488	433 441	4 664 286
4 328 977	24 301 509		4 734 719		159 500	372 925	
9 822	986 489				11 959	75 337	
621 612	221 609				25 641		
519 158	116 809				82 598		
605 465	182 196				11 497		
10 607 209 [5]	47 200 683		29 913 228				
61 194 530 [5]	33 828 144	0	21 148 951	0	0	0	0
43 712 888	24 499 314	0	27 157 756	0	0	0	0
675 455	8 399 445				50 000	306 968	
156 326 [5]	16 631 715				199 800	656 890	
165 951	15 452 952				50 000		1 273 044
550 311 [6]							
0 [6]							
–							
114 684		0	0	0	60 000		0
116 073 [6]	824 954						
48 272	1 968 573					1 932	
1 963 640	9 090 909	0	0	0	0	0	9 090
1 290 322	6 689 800	0	0	0	67 741	0	15 000
18 075 060 [5]	12 660 948	0	7 200	0	0	0	15 000
12 866 344 [6]	28 330 619	877 696	9 151 372	27 724 798	47 903	32 090	435 865
6 097 961	60 947 905		21 342 862		5 984	60 980	2 500 000
17 420 770	33 908 462		25 000 000				
1 948 241	92 444 112	0	49 075 000	0	636 951	0	0
1 427 241	112 504 296	0	41 897 052		148 208	802 250	
1 427 241	141 146 584	0	39 293 479	0	412 688	0	32 000 000
3 247 337 [6]							
3 191 685 [6]							
3 219 511 [6]							
413 506 [6]	2 748 778	0	0	0	82 500	0	0
406 419 [6]	4 788 233	0	0	0	120 000	0	0
409 962 [6]	12 302 113				0		
989 110	1 376 660	0	0	0		0	0
838 430	2 652 105	0	0	0	10 613	0	0
880 200	848 285	0	0	0	10 613	0	0
20 758 465	44 800 000		26 358 971				14 000 000
22 907 737	26 083 562		18 000 000				122 344 828
26 629 739	27 356 758		32 000 000				

ANNEX 5 – C. FUNDING FOR MALARIA CONTROL, 2018–2020

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/USAID[2]	World Bank[3]	UK[4]
AFRICAN					
Gabon	2018	0	0	0	0
	2019	0	0	0	0
	2020	-27 120	0	0	0
Gambia	2018	8 226 640	0	0	0
	2019	3 453 362	0	0	0
	2020	5 616 458	0	0	0
Ghana	2018	45 478 988	28 833 297	0	2 222 583
	2019	36 204 747	28 339 161	0	1 479 848
	2020	36 439 665	28 000 000	0	737 480
Guinea	2018	12 907 201	15 446 409	1 146 007	0
	2019	29 334 052	15 181 693	511 941	0
	2020	15 885 247	16 000 000	511 941	0
Guinea-Bissau	2018	7 915 737	0	0	0
	2019	4 872 667	0	0	0
	2020	20 104 831	0	0	0
Kenya	2018	12 812 436	36 041 621	0	0
	2019	33 830 143	35 423 951	0	0
	2020	16 393 978	33 500 000	0	243 607
Liberia	2018	20 755 003	14 416 649	0	0
	2019	6 471 627	14 169 580	0	0
	2020	9 254 620	14 000 000	0	0
Madagascar	2018	41 567 380	26 773 776	0	0
	2019	6 477 516	26 314 935	0	0
	2020	33 586 711	26 000 000	0	0
Malawi	2018	31 451 631	24 714 255	0	0
	2019	14 639 470	24 290 709	0	0
	2020	40 010 280	24 000 000	0	0
Mali	2018	31 385 531	25 744 015	11 296 922	0
	2019	21 351 795	25 302 822	10 771 657	0
	2020	26 981 463	25 000 000	10 771 657	0
Mauritania	2018	4 140 198	0	0	0
	2019	74 107	0	0	0
	2020	492 562	0	0	0
Mozambique	2018	36 837 649	29 863 058	0	0
	2019	51 512 442	29 351 274	0	0
	2020	88 711 803	29 000 000	0	0
Namibia	2018	764 774	0	0	0
	2019	625 904	0	0	0
	2020	1 345 033	0	0	0
Niger	2018	29 159 692	18 535 691	5 625 767	0
	2019	21 286 629	18 218 032	7 614 489	0
	2020	37 140 815	18 000 000	7 614 489	0
Nigeria	2018	68 589 687	72 083 243	36 337 760	379 643
	2019	116 680 157	70 847 902	3 896 635	2 552 530
	2020	101 911 883	77 000 000	3 896 635	4 191 651
Rwanda	2018	10 226 999	18 535 691	0	0
	2019	34 946 385	18 218 032	0	0
	2020	24 011 230	20 000 000	0	0
Sao Tome and Principe	2018	0	0	0	0
	2019	-515 725	0	0	0
	2020	0	0	0	0

Contributions reported by countries							
Government (NMP)	Global Fund	World Bank	PMI/USAID	Other bilaterals	WHO	UNICEF	Other contributions[7]
149 835 [6]	0	0	0	0	128 016	0	49 674
404 001 [6]	0			1 885 319			
80 240					2 000		6 000
628 547 [6]	8 376 620				39 000	50 414	176 987
1 203 441 [5]	3 940 063				68 000	90 000	288 646
923 283 [6]							
10 897 688 [6]	47 579 039	0	30 634 694	7 560 000	300 000	0	0
10 897 688 [6]	28 442 224	0	22 448 510	0	300 000	0	0
10 897 688 [6]	60 415 856	0	28 000 000	0	300 000	0	0
6 438 381	12 000 000	156 000	14 000 000		45 000		
951 075	25 261 667		15 000 000		39 000		
962 595 [6]			15 000 000				
651 820	3 199 732	0	0	0		0	0
– [6]	540 184 296						
–							
1 698 239 [6]							
6 568 505	14 497 642		34 000 000				
5 982 219 [5]	48 427 650	0	34 000 000	0	0	0	0
317 602 [6]							
19 621 989	11 500 991	0	12 000 000	0	0	0	0
19 859 668 [6]							
13 007	33 200 289	0	26 000 000		46 000		
0 [6]	18 378 714		26 000 000		50 000		
7 368	17 500 000	0	26 000 000		40 000		
282 401	33 049 389		20 000 000				
317 711	12 768 682				150 000		
281 214	162 082 558	0	24 000 000		0	300 000	
2 181 572 [5]	54 053 651	6 406 499	25 000 000			337 884	
1 273 817	19 414 667	1 085 642	25 000 000	0	24 083	2 420	7 224
6 349 805	9 401 568	3 682 999	25 000 000		103 223	4 356 515	5 579
2 191 549	164 778						
124 788	175 296						
1 191 535 [6]	3 172 626						
2 136 147	45 915 417		29 000 000			1 590 000	4 361 414
1 848 592	62 708 218		29 000 000	39 548 431	414 944	1 102 707	17 667 110
13 780 299	84 260 635		29 000 000	1 102 477	67 741	2 051 725	
11 216 160	908 515	0	0	0	100 000	100 000	1 148 515
11 123 042	3 377 753	0	0	0	100 000	0	150 000
10 321 813	1 055 154				100 000		150 000
7 363 777	20 159 800	4 490 567	18 000 000	0	220 356	674 811	0
1 332 407 [5]	16 329 651	6 319 943	18 000 000	0	86 206	693 054	0
2 432 008	42 538 813	5 666 648	18 000 000		372 600	382 247	20 000
2 299 147 [6]	43 206 463		70 000 000				
9 902 510 [6]	131 373 863		70 000 000				
6 100 828 [6]	116 796 451		70 000 000				
13 460 220	27 505 974		18 000 000				
28 907 060	18 517 439		18 000 000				
30 856 856	29 647 540		18 000 000				
0 [6]							
117 201	517 594	0	0	3 322 449	126 121	52 141	0
86 331	164 173				75 939	4 186	0

ANNEX 5 – C. FUNDING FOR MALARIA CONTROL, 2018–2020

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/USAID[2]	World Bank[3]	UK[4]
AFRICAN					
Senegal	2018	12 770 038	24 714 255	0	0
	2019	11 712 209	24 290 709	0	0
	2020	10 496 155	22 500 000	0	0
Sierra Leone	2018	1 485 140	15 446 409	0	758 114
	2019	1 231 378	15 181 693	0	0
	2020	794 970	15 000 000	0	0
South Africa	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	155 441
South Sudan[8]	2018	11 450 401	0	0	4 858 196
	2019	12 535 869	0	0	12 199 645
	2020	13 961 689	0	0	5 376 633
Togo	2018	6 759 982	0	1 044 250	0
	2019	8 769 090	0	745 455	0
	2020	16 348 862	0	745 455	0
Uganda	2018	66 677 031	33 982 100	0	11 214 246
	2019	39 778 964	33 399 725	0	11 952 162
	2020	86 093 441	35 000 000	0	5 779 625
United Republic of Tanzania[9]	2018	29 607 027	45 309 467	0	0
	2019	55 532 397	44 532 967	0	94 030
	2020	87 641 361	42 000 000	0	0
Mainland	2018				
	2019				
	2020				
Zanzibar	2018				
	2019				
	2020				
Zambia	2018	22 764 545	30 892 818	849 952	0
	2019	24 010 103	30 363 386	347 252	191 160
	2020	40 964 888	30 000 000	347 252	0
Zimbabwe	2018	13 338 190	15 446 409	0	0
	2019	17 512 630	15 181 693	0	0
	2020	32 077 379	15 000 000	0	0
AMERICAS					
Belize	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Bolivia (Plurinational State of)	2018	3 447 420	0	0	0
	2019	832 734	0	0	0
	2020	1 851 397	0	0	0
Brazil	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Colombia	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Costa Rica	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0

Contributions reported by countries							
Government (NMP)	Global Fund	World Bank	PMI/USAID	Other bilaterals	WHO	UNICEF	Other contributions[7]
4 931 741	11 602 821	0	24 000 000	11 602 821	0	0	0
9 420 000	9 005 006	0	24 000 000	0	0	0	14 567 962
39 489 943	11 880 855	0	21 818 182	1 478 320	0	0	6 246 030
65 189 [5]	8 728 599		15 000 000		70 000	148 214	2 742
128 621	7 522 931		15 000 000		70 000	2 059	4 779
98 654 [6]			15 000 000				
16 954 533	4 197 290	0	0	0	50 000	0	
19 251 230	6 591 498	0	0	0	45 000	0	1 132 611
19 810 750	624 227	0	0	0	0	0	0
2 737 761 [6]							
1 069 896	17 047 017	3 124 679	0	3 755 637	0		
1 910 308 [6]							
353 435	23 830 061	440 567	0	0	4 715	553 567	0
366 589 [6]							
2 781 818							
7 243 128	47 530 743	0	33 000 000	14 073 138		743 791	0
7 283 521	58 333 000	0	33 000 000	14 389 262		1 254 438	705 940
7 283 521	76 941 854	0	33 000 000	6 014 987			
6 763 166 [6]	146 767 363	0	16 104 693	0	14 574	0	12 168
4 998 776	27 145 381	0	9 871 122	10 000	57 875	0	0
5 911 246 [6]	0	0	1 034 687	0	0	0	10 000
145 258 808	145 258 808		713 228				12 168
4 898 342	25 110 093	0	8 774 918	0	57 875	0	
–							
79 708	1 508 555	0	15 391 465	0	14 574	0	14 574
100 434	2 035 288	0	1 096 204	10 000	0	0	0
78 569	0	0	1 034 687	0	0	0	10 000
18 159 340	24 605 077		3 000 000		200 000		3 692 991
15 340 495	17 019 922		30 000 000		300 000		5 330 000
15 340 495	47 613 297		30 000 000		300 000		
2 786 540	16 973 379	0	11 000 000	0	118 000	0	0
3 765 250	25 931 599		11 208 498		140 000		
1 782 150	12 796 329		12 000 000				
252 000	11 122	0	3 234	0	5 609	0	0
252 000	0	0	11 058	0	0	0	0
243 860	20 554	0	0	0	0	0	0
416 666							
292 852	1 191 940	0	0	0	27 891	0	0
150 000	1 269 187						
23 923 126 [5]	0	0	82 861	0		0	
53 733 857 [5]	0	0	154 641				
53 341 754 [5]			13 000				
3 237 708	0	0	70 647	0		0	
5 999 473	0	0	269 661	0		0	
5 328 737	0	0		0		0	1 066 811
5 000 000 [5]	0	0	0	0	12 155	0	0
5 000 000 [5]	0	0	7 991	0	22 842	0	0
200 361	0	0	0	0	56 000	0	8 000

ANNEX 5 – C. FUNDING FOR MALARIA CONTROL, 2018–2020

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/USAID[2]	World Bank[3]	UK[4]
AMERICAS					
Dominican Republic	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Ecuador	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
French Guiana	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Guatemala	2018	2 255 925	0	0	0
	2019	627 212	0	0	0
	2020	2 824 177	0	0	0
Guyana	2018	60 159	0	0	0
	2019	76 610	0	0	0
	2020	298 748	0	0	0
Haiti	2018	5 644 175	0	0	0
	2019	6 111 310	0	0	0
	2020	7 712 154	0	0	0
Honduras	2018	1 148 327	0	0	0
	2019	1 563 589	0	0	0
	2020	1 936 518	0	0	0
Mexico	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Nicaragua	2018	2 357 365	0	0	0
	2019	3 010 785	0	0	0
	2020	1 599 467	0	0	0
Panama	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Peru	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Suriname	2018	844 305	0	0	0
	2019	663 273	0	0	0
	2020	913 854	0	0	0
Venezuela (Bolivarian Republic of)	2018	0	0	0	0
	2019	0	0	0	0
	2020	12 721 755	0	0	0
EASTERN MEDITERRANEAN					
Afghanistan	2018	9 840 907	0	0	0
	2019	10 322 667	0	0	0
	2020	6 241 719	0	0	0
Djibouti	2018	671 630	0	72 362	0
	2019	1 068 401	0	25 627	0
	2020	1 085 107	0	25 627	0
Iran (Islamic Republic of)	2018	0	0	0	0
	2019	-106 533	0	0	0
	2020	0	0	0	0

Contributions reported by countries							
Government (NMP)	Global Fund	World Bank	PMI/USAID	Other bilaterals	WHO	UNICEF	Other contributions[7]
367 647	9 949 957	0	0	0	143 176	0	48 938
2 560 753	0	0	313 661	0	322 922	0	98 488
–	0	0	0	0	36 902	0	11 883 985
6 898 763 [5]	0	0	0	0	85 733	0	
2 675 521 [5]	0	0	71 420	0	76 400	0	0
1 107 023	0	0	40 000	0	31 000		33 000
0 [6]							
–							
–							
3 492 749	1 724 076	0	138 643	0		0	580 000
1 277 993	520 837		76 014		110 535		
3 168 528	2 984 711				11 122		1 025 373
1 503 535	340 471	0	211 698	0	0	0	0
732 166	299 843	0	1 000 000	0	140 000	0	0
611 633	421 050	0	28 415	0	0	0	0
408 174 [5]	7 384 832	0	0	0	275 872		514 271
2 284 758 [5]	6 006 513	0	10 445	0	266 004		203 638
–		0	131 147	0	75 612		123 742
543 312	1 929 881	0	46 855	0	36 961	0	714 145
543 312	1 511 759	0	67 612	595 460	2 613	0	621 496
543 312	926 108	0	0	0	45 451	0	
37 500 000	0	0	0	0	0	0	0
37 000 000	0	0	41 177	0	59 429	0	0
8 112 653	0	0	0	0	0	0	0
3 263 970	1 986 357		13 254		83 000		401 133
6 154 533	2 313 411		100	400 000	13 408		15 020
6 906 836	1 607 911				15 235		444 514
8 000 000 [5]	0	0	85 165	0	18 823	0	147 827
6 383 374	475 156		32 085	668 596	62 342		
5 800 000	0	0	9 058	0	137 791	0	826 090
2 381 660 [5]			90 000				
3 711 574 [5]	0	0	193 079	0		0	0
14 629 756			51 143				
1 034 627	922 115	0	22 037	0	8 861	0	49 344
1 286 407	695 291		46 808		5 000		30 000
1 471 949	849 957			15 000			65 000
940 [5]			0		435 366		
0 [6]					147 419		
–					39 384		
205 952 [6]	10 556 626				26 571		
0 [6]	7 759 216				80 885		
–	11 733 984				19 367		
3 393 250 [6]	871 414			0	30 000	0	
1 457 180 [5]	171 627				406 776		
487 046 [5]		0	0	0	0	0	
3 300 000	0	0	0		38 286		
2 930 000	0	0	0	0	38 000	0	0
2 700 000	0	0	0	0	156 373		

ANNEX 5 – C. FUNDING FOR MALARIA CONTROL, 2018–2020

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/USAID[2]	World Bank[3]	UK[4]
EASTERN MEDITERRANEAN					
Pakistan	2018	13 995 190	0	0	0
	2019	15 063 447	0	0	0
	2020	11 924 106	0	0	0
Saudi Arabia	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Somalia	2018	7 725 218	0	0	0
	2019	4 298 124	0	0	0
	2020	10 292 652	0	0	0
Sudan	2018	35 757 242	0	0	0
	2019	44 828 255	0	0	0
	2020	47 483 985	0	0	0
Yemen	2018	-7 464	0	16 975 706	0
	2019	-57 088	0	17 703 039	0
	2020	0	0	17 703 039	0
SOUTH-EAST ASIA					
Bangladesh	2018	7 146 766	0	0	0
	2019	5 471 537	0	0	0
	2020	13 598 588	0	0	0
Bhutan	2018	336 705	0	0	0
	2019	388 202	0	0	0
	2020	1 311 072	0	0	0
Democratic People's Republic of Korea	2018	2 383 424	0	0	0
	2019	0	0	0	0
	2020	-899 923	0	0	0
India	2018	278 680	0	0	0
	2019	22 312 035	0	0	0
	2020	17 173 499	0	0	0
Indonesia	2018	10 285 033	0	0	0
	2019	17 701 615	0	0	0
	2020	14 054 302	0	0	0
Myanmar	2018	17 514 120	10 297 606	0	0
	2019	29 787 435	10 121 129	0	542 668
	2020	31 955 477	10 000 000	0	354 620
Nepal	2018	1 450 496	0	0	0
	2019	1 544 715	0	0	0
	2020	1 622 255	0	0	0
Thailand	2018	6 220 504	3 036 339	0	0
	2019	11 663 420	3 036 339	0	0
	2020	12 427 130	0	0	0
Timor-Leste	2018	2 499 477	0	0	0
	2019	2 334 837	0	0	0
	2020	2 993 130	0	0	0

Contributions reported by countries							
Government (NMP)	Global Fund	World Bank	PMI/USAID	Other bilaterals	WHO	UNICEF	Other contributions[7]
20 321 437 [6]	9 615 605				196 378		
2 443 594	14 600 000				296 000		
3 204 601	11 858 304				149 566		
30 000 000	0	0	0	0	10 000	0	0
30 000 000	0	0	0	0	0	0	0
30 000 000	0	0	0	0	0	0	0
90 726	5 534 919	0	0	0	56 000		0
120 100	9 474 797	0	0	0	73 840	0	0
162 135	9 515 651	0	0	0		0	
16 726 945	21 485 294	0	0	0	60 000	203 000	9 619
0 [6]							
–	51 917 466				50 000		
0 [5]	1 890 037				1 427 948		
0 [6]	6 123 238						
0 [5]	7 203 048						
2 496 429	6 835 307	0	0	0	250 000	0	0
2 634 763	7 082 673	0	0	0	100 000	0	0
2 468 160 [5]	15 561 791	0	0	0	44 600	0	0
176 791	577 403	0	0	0	34 687	0	0
251 860	418 069	0	0	0	40 391	0	121 212
173 000	530 814	0	0	0	31 728	0	114 285
2 181 000	3 219 957	0	0	0		0	
2 211 100	0	0	0	0	700 000	0	0
2 240 300	0	0	0	0		434 830	
46 783 323	34 958 663	0	0	0		0	
73 643 089	31 242 857	0	0	0		0	
63 193 385	22 618 171	0	0	0		0	
21 683 909 [5]	12 272 515				260 738	933 225	
24 594 057 [5]	25 652 637				100 000	782 076	
17 090 224 [5]	21 448 055				100 000		
6 780 092 [5]	29 581 578		9 000 000	6 607 886	25 000		
11 123 879 [5]	40 110 516		10 000 000	610 000	50 000		
13 348 655 [5]	28 727 247		10 000 000	3 367 484	50 000		
613 873	1 107 196	0	120 482	0	31 214	0	0
613 873	2 727 909	0	621 652	0	40 000	0	0
3 565 140	1 862 647	0	0	0	40 000	0	0
7 131 736	8 337 877	0	1 308 800	0	78 056	0	93 546
5 695 904	8 872 808		1 047 408		70 000		37 710
5 773 910	8 247 913	0	885 845	0	87 663	0	27 514
1 121 287	1 573 936	0	0	0	26 600	0	5 000
2 309 101 [6]	2 281 466				40 000		256 000
3 045 247					60 000		21 340

ANNEX 5 – C. FUNDING FOR MALARIA CONTROL, 2018–2020

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/USAID[2]	World Bank[3]	UK[4]
WESTERN PACIFIC					
Cambodia	2018	10 689 429	10 297 606	0	0
	2019	18 328 232	10 121 129	0	0
	2020	19 528 347	10 000 000	0	0
Lao People's Democratic Republic	2018	4 017 940	0	0	0
	2019	6 227 120	0	0	0
	2020	7 095 958	0	0	0
Malaysia	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Papua New Guinea	2018	7 492 885	0	0	0
	2019	10 326 713	0	0	0
	2020	9 497 920	0	0	0
Philippines	2018	3 290 275	0	0	0
	2019	3 099 315	0	0	0
	2020	4 466 039	0	0	0
Republic of Korea	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Solomon Islands	2018	1 781 111	0	0	0
	2019	1 982 984	0	0	0
	2020	517 941	0	0	0
Vanuatu	2018	0	0	0	0
	2019	0	0	0	0
	2020	0	0	0	0
Viet Nam	2018	9 573 269	0	0	0
	2019	16 662 029	0	0	0
	2020	17 753 043	0	0	0

Global Fund: Global Fund to Fight AIDS, Tuberculosis and Malaria; NGO: nongovernmental organization; NMP: national malaria programme; PMI: United States President's Malaria Initiative; UK: United Kingdom of Great Britain and Northern Ireland government; UNICEF: United Nations Children's Fund; USAID: United States Agency for International Development; WHO: World Health Organization.

"–" refers to data not available.

[1] Source: Global Fund.

[2] Source: www.foreignassistance.gov.

[3] Source: Organisation for Economic Co-operation and Development (OECD) creditor reporting system (CRS) database.

[4] Source: Final UK aid spend.

[5] Budget not expenditure.

Contributions reported by countries							
Government (NMP)	Global Fund	World Bank	PMI/USAID	Other bilaterals	WHO	UNICEF	Other contributions[7]
83 636	3 181 783	0	10 000 000	0	628 297	0	
65 788	4 388 138	0	10 000 000	0		0	0
65 145		0	10 000 000	0		0	
1 914 750	3 725 427	0	500 000	0	288 108	0	1 783 267
928 955	5 327 000	0	686 183	0	1 039 774	0	1 301 618
480 800	5 157 000	0	903 988	0		0	551 020
49 561 180	0	0	0	0	0	0	0
48 817 455	0	0	0	0	0	0	0
48 244 346	0	0	0	0	0	0	0
108 100	7 407 034	0	0	0	86 500	0	1 083 168
48 600	8 831 155			1 474 700	95 000		
50 000	94 632 334				52 000		
3 548 266	4 190 984	0	0	0	0	0	0
2 453 765	3 412 622	0	0	0	0	0	0
4 899 135	5 150 000	0	0	0	0	0	0
433 726	0	0	0	0	0	0	0
719 992	0	0	0	0	0	0	0
806 742	0	0	0	0	0	0	0
979 891	1 494 080				79 770		
299 919	717 728	0	0	455 000	37 607	0	0
111 509	121 522			578 144	23 400		
128 194	131 786	0	0	92 363	9 367	0	0
181 350	182 877	0	0	0	178 245	0	0
105 506	218 935				166 293		
1 813 863	7 901 624	0	0	0	105 045	0	315 396
1 620 317	10 221 830	0	0	0	333 000	0	385 000
1 938 068	9 366 317						858 369

Data as of 27 October 2021

[6] WHO NMP funding estimates.

[7] Other contributions as reported by countries: NGOs, foundations, etc.

[8] South Sudan became an independent state on 9 July 2011 and a Member State of WHO on 27 September 2011. South Sudan and the Sudan have distinct epidemiological profiles comprising high transmission and low transmission areas, respectively. For this reason, data up to June 2011 from the Sudanese high transmission areas (10 southern states which correspond to contemporary South Sudan) and low transmission areas (15 northern states which correspond to contemporary Sudan) are reported separately.

[9] Where national totals for the United Republic of Tanzania are unavailable, refer to the sum of Mainland and Zanzibar.

Note: Negative disbursements reflect recovery of funds on behalf of the financing organization.

Note: All contributions reported by donors are displayed in US 2020 constant dollars.

ANNEX 5 – D. COMMODITIES DISTRIBUTION AND COVERAGE, 2018–2020

WHO region Country/area	Year	No. of LLINs sold or delivered	Modelled percentage of population with access to an ITN	No. of people protected by IRS	No. of RDTs distributed	Any first-line treatment courses delivered (including ACT)	No. of malaria cases treated with any first-line treatment courses (including ACT)	ACT treatment courses delivered	No. of malaria cases treated with ACT
AFRICAN									
Algeria	2018	–	–	–	–	1 242	–	–	–
	2019	–	–	–	–	1 014	1 014	–	–
	2020	–	–	–	–	2 726	2 726	–	–
Angola	2018	3 863 521	52.5	–	2 000 350	1 950 000	6 092 332	1 950 000	6 092 332
	2019	1 545 055	27.2	–	–	2 477 124	5 575 259	2 477 124	5 575 259
	2020	527 785	14.1	44 633	7 570 498	2 575 738*	5 797 209	2 575 738[+]	5 797 209
Benin	2018	504 501	59.2	1 321 758	2 016 745	1 815 236	340 062	1 815 236	340 062
	2019	505 670	30.5	1 077 411	3 984 677	4 455 581	2 353 657	4 455 581	2 353 657
	2020	9 637 292	69	1 104 928	4 202 384	3966505*	2 095 303	3 966 505[+]	2 095 303
Botswana	2018	–	–	83 488	3 141	1 954	451	1 954	451
	2019	–	–	154 663	2 526	3 198	272	3 198	272
	2020	–	–	152 560	–	11 205*	953	11 205[+]	953
Burkina Faso	2018	1 946 047	49.2	766 374	13 026 870	11 968 368	10 807 674	11 968 368	10 807 674
	2019	1 145 782	66.4	587 248	–	12 428 300	11 223 002	12 428 300	11 223 002
	2020	1 017 084	68.3	508 017	12 936 865	11 336 876*	10 237 424	11 336 876[+]	10 237 424
Burundi	2018	986 025	71.4	1 754 679	7 012 203	5 149 436	4 903 851	5 032 209	4 903 851
	2019	7 528 556	50.5	725 449	–	9 338 611	8 444 710	9 271 032	8 444 710
	2020	682 757	64.5	1 243 848	7 773 268	4 743 324*	4 289 288	4 708 998[+]	4 289 288
Cabo Verde	2018	21	–	–	9 588	21	0	21	0
	2019	–	–	302 520	–	40	40	40	40
	2020	–	–	233 171	4 399	10	10	10[#]	10
Cameroon	2018	573 843	63.2	–	1 739 286	1 064 668	557 576	918 505	557 576
	2019	8 860 653	69.4	–	2 082 527	1 905 965	1 834 114	1 905 965	1 157 011
	2020	2 270 567	71.8	–	2 840 269	18 49 716[$]	1 433 934	1 849 716[+]	1 122 865
Central African Republic	2018	753 889	76.7	–	1 189 881	1 773 072	1 068 750	1 773 072	1 068 750
	2019	103 848	75.2	–	2 764 293	5 753 501	2 654 215	5 640 687	2 602 171
	2020	2 312 311	67.6	–	–	4 293 758*	1 980 804	3 773 875[+]	1 740 970
Chad	2018	461 667	48	–	–	1 285 356	1 285 356	1 231 431	1 231 431
	2019	613 700	18.5	–	1 788 730	1 665 212	1 665 212	1 595 351	1 595 351
	2020	9 138 032	47.6	1 707 286	2 340 650	1 806 225[^]	1 806 225	1 452 420[#]	1 452 420
Comoros	2018	31 012	67.4	–	–	19 682	19 682	19 682	19 682
	2019	–	48.1	–	–	11 593	11 593	11 593	11 593
	2020	462 154	70.9	57 658	–	4 546[$]	4 546	4 546[#]	4 546
Congo	2018	4 641	32.1	–	–	–	–	–	–
	2019	2 648 456	73.2	–	–	200 000	427 959	200 000	233 389
	2020	1 488	84	–		48 459	103 692	88 858[+]	103 692
Côte d'Ivoire	2018	16 703 932	74.4	–	6 069 250	6 799 565	4 871 874	6 799 565	4 871 874
	2019	1 410 391	60.4	–	6 456 625	4 657 570	5 200 350	4 657 570	5 200 350
	2020	1 579 505	49	193 935	4 837 781	4 365 387	4 666 036	4 365 387	4 666 036
Democratic Republic of the Congo	2018	16 919 441	59.2	111 735	18 549 327	16 917 207	8 997 911	16 917 207	8 997 911
	2019	20 710 146	64.7	–	26 963 687	18 853 210	18 853 210	18 853 209	18 853 209
	2020	20 620 188	62.8	–	28 054 832	19 192 708	19 192 708	19 192 707[#]	19 192 707
Equatorial Guinea	2018	120 376	46.4	74 416	78 695	15 633	–	15 633	–
	2019	14 843	45.5	61 561	54 340	15 769	–	15 769	–
	2020	–	35.5	–	–	–	–	–	–
Eritrea	2018	60 083	61.6	376 143	400 900	301 525	23 584	301 525	23 584
	2019	124 225	54.6	437 194	388 395	207 150	65 697	207 150	65 697
	2020	88 119	41.3	466 238	505 675	118 350	73 419	118 350[+]	73 419
Eswatini	2018	–	–	39 144	61 974	631	615	579	615
	2019	–	–	15 055	72 369	586	586	546	580
	2020	–	–	53 517	104 325	316[^]	316	298	316
Ethiopia	2018	11 466 972	18.9	10 486 854	4 053 200	3 773 179	748 601	3 036 690	748 601
	2019	15 754 582	25.5	7 782 034	8 190 815	11 931 656	1 015 792	5 070 567	836 293
	2020	6 517 480	23.7	6 349 834	7 055 575	17 135 346*	1 458 804	7 258 381[+]	1 197 131

ANNEX 5 – D. COMMODITIES DISTRIBUTION AND COVERAGE, 2018–2020

WHO region Country/area	Year	No. of LLINs sold or delivered	Modelled percentage of population with access to an ITN	No. of people protected by IRS	No. of RDTs distributed	Any first-line treatment courses delivered (including ACT)	No. of malaria cases treated with any first-line treatment courses (including ACT)	ACT treatment courses delivered	No. of malaria cases treated with ACT
AFRICAN									
Gabon	2018	4 582	16.9	–	71 787	208 953	208 953	208 953	208 953
	2019	–	15.8	–	250	117 126	117 126	117 126	117 126
	2020	0	11.8	–	1 250	30 819[$]	30 819	30 819[#]	30 819
Gambia	2018	115 801	61.4	426 788	678 621	113 563	90 622	113 563	90 622
	2019	1 115 780	64	507 872	505 895	66 899	53 386	66 899	53 385
	2020	71 469	48.7	477 032	525 505	90 603[$]	72 300	90 603[+]	72 300
Ghana	2018	16 839 135	84.9	1 855 326	13 119 275	5 253 298	3 862 330	5 253 298	3 862 330
	2019	2 924 717	78.9	1 986 408	12 866 700	4 208 875	6 164 160	4 208 875	6 164 159
	2020	2 957 388	56.5	2 214 552	–	7 037 451*	5 174 075	7 037 451[+]	5 174 075
Guinea	2018	658 976	30.6	–	2 741 607	1 886 685	1 546 406	1 886 685	1 546 406
	2019	8 964 940	69.6	–	2 857 744	2 069 825	1 696 515	2 069 825	1 696 515
	2020	–	74.7	–	–	2 187 117[$]	1 831 203	2 187 117[+]	1 792 653
Guinea-Bissau	2018	93 859	64.8	–	320 217	162 773	162 773	147 927	157 003
	2019	102 586	40.6	–	325 690	155 848	155 848	140 478	140 478
	2020	–	18.8	–	–	152 900*	152 900	137 821[#]	137 821
Kenya	2018	2 673 730	69.6	1 833 860	–	10 124 902	6 427 624	8 856 248	6 115 406
	2019	1 797 075	58.9	2 011 860	4 179 875	8 285 622	5 259 988	7 247 430	5 004 487
	2020	1 349 895	36.9	1 792 495	7 223 850	9 293 158*	5 899 605	8 543 728[+]	5 899 605
Liberia	2018	2 500 796	50.2	–	–	994 008	1 113 579	994 008	1 113 579
	2019	197 736	61.5	–	536 915	2 108 721	1 004 895	2 108 721	732 322
	2020	–	23.8	–	–	1 790 171[$]	621 695	1 790 171[+]	621 695
Madagascar	2018	13 520 356	61.7	–	4 731 125	2 165 450	893 163	2 165 450	893 163
	2019	1 078 541	68.3	1 640 183	2 899 007	975 587	1 008 480	975 587	1 008 480
	2020	1 720 923	46.1	981 936	1 950 471	1 613 457[$]	1 667 856	1 613 457	1 667 856
Malawi	2018	11 805 392	73.1	–	13 003 518	9 186 040	7 043 006	9 186 040	7 043 006
	2019	1 064 495	71.5	1 456 138	–	6 638 406	5 089 716	6 638 406	5 089 716
	2020	926 690	42.3	2 379 659	16 258 123	7 957 086[$]	7 095 977	7 957 086[+]	6 100 758
Mali	2018	4 993 868	67.4	665 581	6 105 500	3 558 964	1 814 505	3 558 964	1 814 505
	2019	4 005 010	74.2	690 793	3 656 317	5 543 127	2 846 438	5 543 127	2 826 112
	2020	8 680 286	83.1	503 043	2 927 529	3 516 929[$]	2 629 557	3 516 929[+]	1 793 074
Mauritania	2018	479 637	44.6	–	117 000	25 890	25 416	25 416	25 416
	2019	22 470	12	–	–	–	–	–	–
	2020	1 632 858	40	–	–	760[$]	760	760[#]	760
Mayotte	2018	–	–	–	–	44	–	44	–
	2019	–	–	–	–	–	–	–	–
	2020	–	–	–	–	–	–	–	–
Mozambique	2018	1 337 905	65.2	4 211 138	21 180 223	16 293 318	10 064 430	16 293 318	10 064 430
	2019	6 614 068	53.2	6 303 792	21 365 400	16 867 851	10 742 632	16 867 851	10 742 632
	2020	18 536 930	63.5	6 880 851	–	17 475 193[$]	11 129 430	17 475 193[+]	11 129 430
Namibia	2018	35 000	–	549 243	49 852	35 355	31 886	31 886	31 886
	2019	–	–	149 306	247 425	3 404	3 404	3 404	3 404
	2020	–	–	1 017 366	–	13 636[^]	13 636	13 636[#]	13 636
Niger	2018	4 024 529	74.8	–	5 149 981	3 536 000	2 891 780	3 536 000	2 891 780
	2019	–	76.3	–	5 831 287	3 211 243	3 031 506	3 211 243	3 031 506
	2020	–	82.9	–	–	3 678 980[$]	3 454 246	3 678 980[+]	3 454 246
Nigeria	2018	27 675 958	50.3	–	18 662 105	32 707 785	15 853 741	32 707 785	15 853 741
	2019	32 360 674	48.3	–	26 312 300	38 240 771	21 252 650	38 240 771	21 252 650
	2020	25 510 470	41.9	–	15 593 375	17 892 696	19 902 369	17 892 696	19 902 369
Rwanda	2018	974 847	53.7	1 621 955	5 364 990	5 233 680	1 610	5 214 330	1 610
	2019	536 637	36.9	4 532 103	4 904 370	4 231 880	3 566 544	4 215 120	3 545 251
	2020	4 840 999	59.3	–	–	1 243 100[$]	1 045 546	1 243 100[+]	1 045 546
Sao Tome and Principe	2018	142 894	–	–	–	2 940	2 940	2 940	2 940
	2019	16 260	–	53 401	221 450	2 457	2 457	2 457	2 457
	2020	11 107	–	69 902	–	1 772	1 772	1 772[#]	1 772

ANNEX 5 – D. COMMODITIES DISTRIBUTION AND COVERAGE, 2018–2020

WHO region Country/area	Year	No. of LLINs sold or delivered	Modelled percentage of population with access to an ITN	No. of people protected by IRS	No. of RDTs distributed	Any first-line treatment courses delivered (including ACT)	No. of malaria cases treated with any first-line treatment courses (including ACT)	ACT treatment courses delivered	No. of malaria cases treated with ACT
AFRICAN									
Senegal	2018	617 470	48.2	–	2 646 144	1 606 813	530 944	1 490 147	520 898
	2019	9 373 577	73.4	51 652	2 552 381	1 073 464	354 708	971 497	339 598
	2020	581 648	76.3	793 026	3 324 538	1 347 665*	445 313	1 265 623[+]	442 413
Sierra Leone	2018	502 834	69	–	4 316 420	3 415 480	1 291 222	3 415 480	1 291 222
	2019	492 622	49.9	–	3 930 606	4 751 000	2 813 086	4 751 000	2 404 286
	2020	9 614 878	67.3	–	429 467	1 302 117*	658 948	1 302 117[+]	658 948
South Africa	2018	–	–	1 600 747	887 300	51 142	–	51 142	–
	2019	–	–	1 477 420	879 625	–	13 833	10 592	13 833
	2020	–	–	1 830 342	435 600	–	20 190	16 028[#]	16 028
South Sudan[1]	2018	963 092	42.3	–	–	2 680 776	76 328	2 680 776	76 328
	2019	713 717	36	344 242	–	4 308 214	122 665	4 308 214	122 665
	2020	4 273 644	48	–	280 150	220 548	822 563	195 878	822 563
Togo	2018	224 265	79.1	–	2 485 086	1 988 845	1 572 717	2 055 831	1 560 097
	2019	407 911	66.1	–	2 957 298	2 889 270	2 284 746	1 499 012	2 266 412
	2020	–	83.1	–	–	2 169 770[$]	1 729 667	1 134 827	1 715 787
Uganda	2018	11 220 492	80.2	4 436 156	28 200 125	25 606 514	25 275 210	25 606 514	5 244 003
	2019	1 855 163	60.7	4 478 754	30 979 775	17 706 390	28 847 873	17 706 390	9 728 920
	2020	25 700 518	69	4 671 960	36 746 550	26 674 975*	30 962 280	26 674 975[+]	14 656 782
United Republic of Tanzania[2]	2018	6 378 169	58.6	2 842 635	30 263 725	16 425 610	7 600 480	16 425 210	7 600 480
	2019	6 968 606	54.4	2 989 048	26 058 455	8 487 473	6 385 075	8 485 301	6 385 075
	2020	19 684 506	53.4	2 510 463	41 180 225	5 276 251[$]	3 970 308	5 276 251	3 970 308
Mainland	2018	6 200 375	–	2 507 920	29 906 950	16 420 560	–	16 420 560	–
	2019	6 745 132	–	2 507 920	25 699 255	8 479 635	6 378 890	8 479 635	6 378 890
	2020	19 386 472	–	2 285 089	40 821 350	10 314 557*	7 759 228	10 314 557[+]	7 759 228
Zanzibar	2018	177 794	–	334 715	356 775	5 050	–	4 650	–
	2019	223 474	–	481 128	359 200	7 838	6 963	5 666	6 185
	2020	298 034	–	225 374	358 875	0	–	0	–
Zambia	2018	689 288	64.4	6 436 719	17 868 550	27 071 994	27 071 994	27 071 994	27 071 994
	2019	1 024 635	48.7	11 767 404	17 737 525	19 134 471	19 134 471	19 134 471	19 134 471
	2020	6 179 374	34.4	11 157 421	28 988 900	7 473 255	7 473 255	7 473 255[#]	7 473 255
Zimbabwe	2018	1 015 246	36.8	3 020 032	1 484 134	615 359	76 551	615 359	76 551
	2019	2 160 175	37.3	3 164 344	1 445 007	2 446 203	304 309	2 446 203	304 309
	2020	727 377	37.5	3 528 051	–	443 164[$]	443 164	443 164[#]	443 164
AMERICAS									
Argentina	2018	–	–	155	–	213	–	92	–
	2019	–	–	–	–	–	–	–	–
	2020	–	–	–	–	–	–	–	–
Belize	2018	2 619	–	36 688	–	7	–	–	–
	2019	0	–	43 497	–	2	2	0	0
	2020	0	–	45 100	0	0	0	0	0
Bolivia (Plurinational State of)	2018	23 500	–	2 000	–	5 920	5 920	5 920	5 920
	2019	27 000	–	29 228	36 800	9 357	9 357	9 357	9 357
	2020	91 700	–	29 228	–	12 093[$]	12 093	12 093[#]	12 093
Brazil	2018	300 000	–	99 321	114 775	634 935	–	79 200	–
	2019	–	–	84 126	102 275	491 126	491 126	74 360	74 360
	2020	173 850	–	148 897	148 200	172 047	172 047	23 691[#]	23 691
Colombia	2018	101 008	–	60 000	13 252	46 217	–	26 507	–
	2019	336 432	–	143 320	25 000	97 324	–	59 100	–
	2020	336 432	–	–	–	80 916[^]	80 916	40 386[#]	40 386
Costa Rica	2018	3 100	–	4 095	700	108	–	5	–
	2019	–	–	–	–	–	–	–	–
	2020	–	–	6 895	5 175	141[^]	141	–	–

ANNEX 5 – D. COMMODITIES DISTRIBUTION AND COVERAGE, 2018–2020

WHO region Country/area	Year	No. of LLINs sold or delivered	Modelled percentage of population with access to an ITN	No. of people protected by IRS	No. of RDTs distributed	Any first-line treatment courses delivered (including ACT)	No. of malaria cases treated with any first-line treatment courses (including ACT)	ACT treatment courses delivered	No. of malaria cases treated with ACT
AMERICAS									
Dominican Republic	2018	5 052	–	36 891	42 425	484	–	9	–
	2019	–	–	33 226	55 000	1 314	1 314	7	7
	2020	12 150	–	37 821	–	829^	829	–	–
Ecuador	2018	50 000	–	775 884	51 200	1 806	–	191	–
	2019	31 271	–	698 292	73 425	5 030	1 909	2 650	265
	2020	4 983	–	17 276	41 968	5 272*	2 001	2 430+	243
El Salvador	2018	4 817	–	32 691	–	2	3	1	3
	2019	1 813	–	23 512	–	–	–	–	–
	2020	–	–	11 370	0	0	0	0	0
French Guiana	2018	–	–	–	–	–	–	–	–
	2019	–	–	–	–	–	–	–	–
	2020	–	–	–	–	–	–	–	–
Guatemala	2018	310 218	–	15 358	75 300	3 246	2 785	2 785	2 785
	2019	128 982	–	4 091	61 275	–	–	–	–
	2020	–	–	12 115	–	1 233*	1 058	1 058#	1 058
Guyana	2018	43 181	–	–	–	11 767	7 814	3 073	7 814
	2019	1 759	–	–	37 800	28 006	12 463	6 622	12 463
	2020	1 816	–	–	22 175	6 384*	2 841	481	905
Haiti	2018	1 919	–	42 130	207 800	17 211	8 296	8 296	8 296
	2019	19 063	–	–	293 200	22 172	10 687	8 861	8 861
	2020	–	–	–	–	44 300*	21 353	21 353#	21 353
Honduras	2018	53 944	–	338 730	15 000	364	651	45	651
	2019	32 091	–	–	17 580	–	–	–	–
	2020	20 760	–	109 404	–	503*	900	62	900
Mexico	2018	17 891	–	85 812	–	803	–	10	–
	2019	19 001	–	83 581	–	641	12	12	12
	2020	13 301	–	72 759	–	–	369	–	–
Nicaragua	2018	47 301	–	183 098	117 350	86 195	15 934	15 934	15 934
	2019	228 589	–	139 795	63 500	35 649	13 226	13 135	13 135
	2020	61 520	–	226 731	–	68 813*	25 530	25 479#	25 479
Panama	2018	–	–	19 500	20 000	715	–	3	–
	2019	3 952	–	12 806	30 000	–	3	–	3
	2020	–	–	12 492	–	–	1 582	–	5
Paraguay	2018	–	–	–	–	–	–	–	–
	2019	–	–	–	–	–	–	–	–
	2020	–	–	–	–	–	–	–	–
Peru	2018	83 220	–	23 420	180 000	65 000	–	14 500	–
	2019	–	–	59 438	204 000	51 289	4 724	4 724	4 724
	2020	93 067	–	–	–	34 721*	3 198	3 198#	3 198
Suriname	2018	15 000	–	–	13 575	275	275	275	275
	2019	6 847	–	–	20 625	202	202	202	202
	2020	6 864	–	–	17 250	236^	236	127#	127
Venezuela (Bolivarian Republic of)	2018	81 402	–	–	100 000	404 924	404 924	97 293	97 293
	2019	256 311	–	–	250 000	398 285	398 285	90 153	90 153
	2020	73 605	–	–	115 417	231 384^	231 384	48 292#	48 292
EASTERN MEDITERRANEAN									
Afghanistan	2018	649 383	–	–	28 915	47 665	31 114	47 665	31 114
	2019	1 336 070	–	–	714 700	180 992	169 504	180 992	118 145
	2020	2 140 845	–	–	337 840	153 403$	103 466	153 403+	100 136
Djibouti	2018	109 500	31.8	–	91 416	98 380	24 883	98 380	24 883
	2019	218 650	20.5	37 663	335 625	148 890	47 691	148 890	47 691
	2020	145 392	6.9	28 496	–	215 507*	69 029	215 507+	69 029

ANNEX 5 – D. COMMODITIES DISTRIBUTION AND COVERAGE, 2018–2020

WHO region Country/area	Year	No. of LLINs sold or delivered	Modelled percentage of population with access to an ITN	No. of people protected by IRS	No. of RDTs distributed	Any first-line treatment courses delivered (including ACT)	No. of malaria cases treated with any first-line treatment courses (including ACT)	ACT treatment courses delivered	No. of malaria cases treated with ACT
EASTERN MEDITERRANEAN									
Iran (Islamic Republic of)	2018	4 500	–	117 174	128 650	–	626	2 576	50
	2019	–	–	64 365	7 737	–	1 192	8 139	158
	2020	–	–	73 846	–	–	1 051	6 491[+]	126
Pakistan	2018	2 762 975	–	2 937 767	2 584 675	1 000 000	345 565	65 000	345 565
	2019	2 413 275	–	1 657 670	3 895 000	290 170	413 533	57 781	90 178
	2020	1 515 426	–	120 610	3 616 500	428 738	347 500	99 425	347 500
Saudi Arabia	2018	127 801	–	242 009	–	1 908	–	1 908	–
	2019	–	–	225 510	135 000	25 000	2 152	15 000	1 515
	2020	–	–	129 105	165 000	37 930*	3 265	31 990[+]	3 231
Somalia	2018	388 454	22.5	2 120 728	755 750	260 580	51 819	260 580	51 819
	2019	388 766	18.3	82 720	974 700	174 030	38 112	174 030	38 112
	2020	1 565 552	19.3	283 665	554 500	109 490[$]	23 978	109 490	23 978
Sudan	2018	3 454 519	61.9	3 830 195	4 117 300	4 195 600	4 195 600	4 195 600	4 195 600
	2019	8 565 841	58.3	3 886 652	7 246 975	4 297 167	4 297 167	4 297 167	4 297 167
	2020	4 703 295	56	3 901 092	4 849 600	4 863 826	4 863 826	4 863 826[#]	4 863 826
Yemen	2018	1 461 760	–	995 328	571 175	440 265	–	38 420	–
	2019	612 884	–	1 982 284	907 425	458 103	–	42 698	–
	2020	855 693	–	762 755	–	–	–	–	–
SOUTH-EAST ASIA									
Bangladesh	2018	1 559 423	–	72 000	500 440	10 762	10 459	8 609	10 459
	2019	727 253	–	98 786	756 573	17 225	17 225	15 099	15 099
	2020	1 316 909	–	–	805 166	6 130	6 130	4 885[#]	4 885
Bhutan	2018	29 770	–	76 809	12 300	293	54	293	17
	2019	13 906	–	118 730	29 100	235	235	42	11
	2020	122 670	–	122 406	42 675	–	54	31[+]	8
Democratic People's Republic of Korea	2018	500 815	–	169 841	657 050	3 698	631	631	631
	2019	30 928	–	–	458 743	4 000	1 869	1 869	1 869
	2020	0	–	402 861	354 097	3 893*	1 819	1 819[#]	1 819
India	2018	9 648 400	–	34 290 886	10 500 000	1 400 000	29 453	1 100 000	29 453
	2019	22 410 000	–	30 363 425	–	12 641 952	338 494	12 641 952	338 494
	2020	25 221 044	–	23 950 862	20 000 000	4 447 618[$]	186 532	4 447 618[+]	119 087
Indonesia	2018	340 074	–	305 493	255 300	670 603	133 860	670 603	133 860
	2019	200 990	–	164 192	1 980 775	1 174 186	234 381	1 174 186	234 381
	2020	3 448 169	–	38 332	613 300	1 208 253[$]	241 181	1 208 253[+]	241 181
Myanmar	2018	775 251	–	14 017	1 761 775	57 144	53 056	57 144	53 056
	2019	11 046 312	–	4 361	2 652 010	51 779	53 003	51 779	23 623
	2020	569 016	–	17 381	2 944 555	34 132[$]	15 572	34 132[+]	15 572
Nepal	2018	319 046	–	230 000	132 065	3 949	1 193	120	1 193
	2019	162 409	–	263 000	205 636	13 621	710	3 522	63
	2020	72 561	–	41 235	202 300	8 249*	430	2 180[+]	39
Thailand	2018	131 425	–	165 580	30 550	25 292	4 411	9 892	443
	2019	80 000	–	489 105	303 613	31 276	3 904	11 976	536
	2020	102 150	–	219 162	69 912	26 766*	3 341	3 910[+]	175
Timor-Leste	2018	35 367	–	154 410	144 061	5 633	8	5 633	8
	2019	97 586	–	175 654	249 750	1 070	9	1 070	9
	2020	176 785	–	116 949	137 668	1 664*	14	1 664[+]	14

ANNEX 5 – D. COMMODITIES DISTRIBUTION AND COVERAGE, 2018–2020

WHO region Country/area	Year	No. of LLINs sold or delivered	Modelled percentage of population with access to an ITN	No. of people protected by IRS	No. of RDTs distributed	Any first-line treatment courses delivered (including ACT)	No. of malaria cases treated with any first-line treatment courses (including ACT)	ACT treatment courses delivered	No. of malaria cases treated with ACT
WESTERN PACIFIC									
Cambodia	2018	1 624 507	–	–	–	184 630	60 067	184 630	60 067
	2019	–	–	–	923 375	98 965	32 197	98 965	32 197
	2020	–	–	–	–	28 693[$]	9 335	28 693	9 335
China	2018	5 987	–	161 224	–	–	–	–	–
	2019	1 807	–	206 599	–	2 487	2 487	2 125	2 125
	2020	–	–	174 619	–	1 051ˆ	1 051	–	–
Lao People's Democratic Republic	2018	50 403	–	2 052	34 387	8 931	8 880	34 765	8 827
	2019	1 085 527	–	3 333	1 371 367	21 071	6 551	21 071	6 550
	2020	100 518	–	2 333	1 667 795	11 251*	3 498	11 185[+]	3 477
Malaysia	2018	213 073	–	–	–	4 630	–	3 891	–
	2019	112 054	–	323 208	–	3 933	3 933	3 933	3 923
	2020	123 115	–	305 688	–	2 830	2 830	2 829[#]	2 829
Papua New Guinea	2018	1 480 705	–	–	2 268 750	1 385 940	337 480	1 385 940	337 480
	2019	1 476 976	–	–	2 454 525	1 323 042	788 796	1 323 042	788 796
	2020	1 579 301	–	200	3 139 420	1 258 396[$]	750 439	1 258 396	750 254
Philippines	2018	1 156 837	–	1 015 672	168 300	4 318	4 559	4 318	4 559
	2019	695 691	–	731 696	370 700	49 359	5 435	16 857	4 845
	2020	329 412	–	476 804	77 645	54 372*	5 987	20 830[+]	5 987
Republic of Korea	2018	–	–	–	–	576	–	–	–
	2019	–	–	–	20 000	196	196	–	–
	2020	–	–	–	–	386ˆ	386	–	–
Solomon Islands	2018	150 248	–	–	386 975	233 917	–	233 917	–
	2019	297 010	–	–	484 750	230 880	83 733	230 880	83 364
	2020	–	–	–	275 000	241 203*	87 477	239 064[+]	86 319
Vanuatu	2018	27 151	–	–	50 850	640	640	–	–
	2019	80 623	–	–	4 490	7 235	571	579	571
	2020	–	–	–	59 825	6 285*	496	503[+]	496
Viet Nam	2018	1 193 024	–	319 866	576 930	45 040	4 525	40 000	4 525
	2019	31 740	–	696 751	472 173	31 348	5 892	27 704	3 134
	2020	53 155	–	433 405	531 795	9 220*	1 733	7 231[+]	818

Data as of 18 November 2021

ACT: artemisinin-based combination therapy; IRS: indoor residual spraying; ITN: insecticide-treated mosquito net; LLIN: long-lasting insecticidal net; RDT: rapid diagnostic test; WHO: World Health Organization.

"–" refers to data not available.

[1] In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf).

[2] Where national data for the United Republic of Tanzania are unavailable, refer to Mainland and Zanzibar.

* Any first-line courses delivered (including ACT) are calculated.

ˆ The number of malaria cases treated with any first-line treatment courses (including ACT) has been used as a proxy for any first-line treatment courses delivered (including ACT), or the country reports the number of patients treated rather than the number of treatment courses delivered.

[$] ACT treatment courses delivered are used to replace missing data for any first-line treatment courses delivered (including ACT).

[+] ACT treatment courses delivered are calculated.

[#] The number of malaria cases treated with ACT has been used as a proxy for ACT treatment courses delivered, or the country reports the number of patients treated rather than the number of treatment courses delivered.

Note: Similar adjustments were made for 2018 and 2019 where data on deliveries of first-line treatment courses and ACT were missing.

ANNEX 5 – Ea. HOUSEHOLD SURVEY RESULTS, 2016–2020, COMPILED BY STATCOMPILER

WHO region Country/area	Source	% of households					% of population	
		with at least one ITN	with at least one ITN for every two persons who stayed in the household the previous night	with IRS in the past 12 months	with at least one ITN and/or IRS in the past 12 months	with at least one ITN for every two persons and/or IRS in the past 12 months	with access to an ITN	who slept under an ITN last night
AFRICAN								
Angola	2015–16 DHS	30.9	11.3	1.6	31.8	12.5	19.7	17.6
Benin	2017–18 DHS	91.5	60.5	8.7	92.0	63.8	77.2	71.1
Burkina Faso	2017–18 MIS	75.3	32.8	–	–	–	54.5	44.1
Burundi	2016–17 DHS	46.2	17.1	1.0	46.8	17.9	32.3	34.7
Cameroon	2018 DHS	73.4	40.7	–	–	–	58.5	53.9
Ethiopia	2016 DHS	–	–	–	–	–	–	–
Gambia	2019–20 DHS	77.3	36.3	–	–	–	60.8	37.8
Ghana	2016 MIS	73.0	50.9	8.1	74.1	53.6	65.8	41.7
Ghana	2019 MIS	73.7	51.8	5.8	75.0	54.7	66.7	43.2
Guinea	2018 DHS	43.9	16.7	–	–	–	30.7	22.7
Kenya	2020 MIS	49.0	28.7	–	–	–	39.6	34.9
Liberia	2016 MIS	61.5	25.2	1.2	62.1	25.9	41.5	39.3
Liberia	2019–20 DHS	54.7	25.2	–	–	–	39.7	39.0
Madagascar	2016 MIS	79.5	44.4	6.9	80.9	47.9	62.1	68.2
Malawi	2015–16 DHS	56.9	23.5	4.9	58.6	27.0	38.8	33.9
Malawi	2017 MIS	82.1	41.7	–	–	–	63.1	55.4
Mali	2018 DHS	89.8	54.8	–	–	–	75.2	72.9
Mozambique	2018 MIS	82.2	51.2	–	–	–	68.5	68.4
Nigeria	2018 DHS	60.6	29.8	–	–	–	47.5	43.2
Rwanda	2017 MIS	84.1	55.1	19.6	89.2	66.9	71.9	63.9
Rwanda	2019–20 DHS	66.4	34.3	–	–	–	50.8	47.7
Senegal	2016 DHS	82.4	56.4	5.3	82.9	58.0	75.7	63.1
Senegal	2017 DHS	84.2	50.4	4.2	84.5	52.3	72.8	56.9
Senegal	2018 DHS	76.6	39.0	2.1	76.8	40.1	62.2	51.6
Senegal	2019 DHS	81.0	56.8	2.4	81.5	57.7	74.2	62.5
Sierra Leone	2016 MIS	60.3	16.2	1.7	61.1	17.7	37.1	38.6
Sierra Leone	2019 DHS	67.9	25.0	–	–	–	46.8	50.6
South Africa	2016 DHS	–	–	–	–	–	–	–
Togo	2017 MIS	85.2	71.4	–	–	–	82.3	62.5
Uganda	2016 DHS	78.4	51.1	–	–	–	64.6	55.0
Uganda	2018–19 MIS	83.0	53.9	10.1	84.2	58.7	71.5	59.2
United Republic of Tanzania	2015–16 DHS	65.6	38.8	5.5	66.2	41.0	55.9	49.0
United Republic of Tanzania	2017 MIS	77.9	45.4	–	–	–	62.5	52.2
Zambia	2018 DHS	78.3	40.9	35.3	83.3	60.4	59.9	46.4

% of ITNs	% of pregnant women		% of children <5 years				% of children <5 years with fever in the past 2 weeks			
that were used last night	who slept under an ITN	who took 3+ doses of IPTp	who slept under an ITN	with moderate or severe anaemia	with a positive RDT	with a positive microscopy blood smear	for whom advice or treatment was sought	who had blood taken from a finger or heel for testing	who took antimalarial drugs	who took an ACT among those who received any antimalarial
71.0	23.0	20.0	21.7	34.0	13.5	–	51.8	34.3	18.1	76.7
73.4	79.3	13.7	76.3	43.8	36.3	39.1	53.1	17.7	17.5	37.0
76.0	58.2	57.7	54.4	50.1	20.2	16.9	73.5	48.8	51.1	79.4
86.9	43.9	12.9	39.9	36.3	37.9	26.8	69.6	66.4	47.0	11.3
76.2	61.0	31.9	59.8	31.0	24.0	–	61.0	21.4	32.7	21.2
–	–	–	–	32.0	–	–	35.3	–	7.7	11.5
55.0	44.2	52.2	44.0	20.7	0.4	–	64.2	27.3	3.5	46.7
47.7	50.0	59.6	52.2	35.2	27.9	20.6	71.9	30.3	50.1	58.8
50.1	48.7	61.0	54.1	27.9	23.0	14.1	69.0	34.1	45.9	84.5
64.0	28.1	35.7	26.6	43.8	–	–	62.3	20.5	24.8	18.2
80.2	39.8	21.8	42.0	21.3	4.4	3.0	63.6	35.5	20.2	91.0
71.2	39.5	23.1	43.7	49.2	44.9	–	78.2	49.8	65.5	81.1
74.7	46.5	40.3	44.3	41.6	–	–	80.9	49.0	52.1	41.2
78.7	68.5	10.6	73.4	20.5	5.1	6.9	59.0	15.5	10.1	17.0
73.3	43.9	30.4	42.7	36.1	–	–	67.0	52.0	37.6	91.8
76.8	62.5	41.1	67.5	37.1	36.0	24.3	54.4	37.6	29.4	96.4
88.7	83.7	28.3	79.1	56.7	18.9	–	52.8	16.4	18.7	31.0
85.4	76.4	40.6	72.7	55.2	38.9	–	68.6	47.9	32.7	98.6
80.6	58.0	16.6	52.2	41.1	36.2	22.6	72.8	13.8	43.5	52.0
71.0	68.5	–	68.0	–	11.8	7.2	55.6	38.1	19.6	98.7
78.0	56.1	–	55.6	15.2	2.7	0.9	62.3	40.7	8.1	92.4
68.2	69.0	22.1	66.6	36.7	0.9	0.9	49.9	13.0	1.7	85.0
68.6	61.8	22.0	60.7	41.8	0.9	0.4	51.4	16.1	4.7	65.5
74.5	55.7	22.4	56.4	–	–	–	52.8	13.8	5.1	24.0
68.2	68.1	19.6	65.4	–	–	–	50.0	15.7	1.4	–
89.0	44.0	31.1	44.1	49.2	52.7	40.1	71.7	51.1	57.0	96.0
89.5	63.8	35.7	59.1	37.9	–	–	75.4	61.3	55.9	31.9
–	–	–	–	37.0	–	–	–	–	–	–
52.3	69.0	41.7	69.7	47.8	43.9	28.3	55.9	29.3	31.1	76.3
74.0	64.1	17.2	62.0	29.2	30.4	–	81.2	49.0	71.5	87.8
74.3	65.4	41.0	60.3	25.0	18.2	9.8	87.0	50.7	62.5	87.7
69.4	53.9	8.0	54.4	31.2	14.4	5.6	81.2	35.9	51.1	84.9
66.7	51.4	25.8	54.6	30.5	7.3	–	75.4	43.1	36.2	89.4
64.2	48.9	58.7	51.6	29.5	–	–	77.2	63.0	34.9	96.9

ANNEX 5 – Ea. HOUSEHOLD SURVEY RESULTS, 2016–2020, COMPILED BY STATCOMPILER

WHO region Country/area	Source	% of households					% of population	
		with at least one ITN	with at least one ITN for every two persons who stayed in the household the previous night	with IRS in the past 12 months	with at least one ITN and/or IRS in the past 12 months	with at least one ITN for every two persons and/or IRS in the past 12 months	with access to an ITN	who slept under an ITN last night
AMERICAS								
Haiti	2016–17 DHS	30.7	12.3	2.6	32.2	14.5	19.9	13.0
EASTERN MEDITERRANEAN								
Pakistan	2017–18 DHS	3.6	0.6	5.1	8.4	5.7	2.0	0.2
SOUTH-EAST ASIA								
India	2015–16 DHS	7.6	3.3	–	–	–	5.3	4.2
Myanmar	2015–16 DHS	26.8	14.1	–	–	–	21.2	15.6
Nepal	2016 DHS	–	–	–	–	–	–	–
Timor-Leste	2016 DHS	64.0	32.8	–	–	–	48.3	47.6
WESTERN PACIFIC								
Papua New Guinea	2016–18 DHS	68.5	45.2	–	–	–	57.9	46.0

ACT: artemisinin-based combination therapy; DHS: demographic and health survey; IPTp: intermittent preventive treatment in pregnancy; IRS: indoor residual spraying; ITN: insecticide-treated mosquito net; MIS: malaria indicator survey; RDT: rapid diagnostic test; WHO: World Health Organization.

"–" refers to not applicable or data not available.

Sources: Nationally representative household survey data from DHS and MIS, compiled through STATcompiler – https://www.statcompiler.com/.

% of ITNs	% of pregnant women		% of children <5 years				% of children <5 years with fever in the past 2 weeks			
that were used last night	who slept under an ITN	who took 3+ doses of IPTp	who slept under an ITN	with moderate or severe anaemia	with a positive RDT	with a positive microscopy blood smear	for whom advice or treatment was sought	who had blood taken from a finger or heel for testing	who took antimalarial drugs	who took an ACT among those who received any antimalarial
62.3	16.0	–	18.2	37.5	–	–	46.8	15.8	1.1	–
11.6	0.4	–	0.4	–	–	–	81.4	–	9.2	3.3
68.9	4.7	–	5.0	30.8	–	–	81.1	10.8	20.1	8.5
58.3	18.4	–	18.6	26.7	–	–	66.7	3.0	0.8	–
–	–	–	–	26.5	–	–	–	–	–	–
79.9	60.1	–	55.7	12.6	–	–	57.6	24.5	10.0	11.1
67.9	49.0	23.5	51.5	–	–	–	49.5	24.6	21.3	3.3

Data as of 3 November 2021

ANNEX 5 – Eb. HOUSEHOLD SURVEY RESULTS, 2016–2020, COMPILED THROUGH WHO CALCULATIONS

WHO region Country/area	Survey	Fever prevalence	Health sector where treatment was sought							Diagnostic testing coverage in each health sector	
		Overall	Public excluding community health workers	Community health workers	Formal medical private excluding pharmacies	Pharmacies or accredited drug stores	Informal private	No treatment seeking	Trained provider	Public excluding community health workers	Community health workers
AFRICAN											
Benin	2017 DHS	20 (18, 21)	22 (20, 24)	0 (0, 0)	9 (8, 11)	9 (8, 11)	14 (12, 16)	46 (43, 49)	40 (37, 43)	52 (47, 57)	–
Burkina Faso	2017 MIS	20 (19, 22)	71 (67, 75)	1 (0, 1)	1 (1, 4)	0 (0, 1)	2 (1, 3)	26 (22, 30)	73 (69, 76)	66 (61, 70)	–
Burundi	2016 DHS	40 (38, 41)	54 (51, 56)	3 (2, 4)	10 (8, 12)	5 (4, 5)	1 (0, 1)	30 (28, 32)	69 (67, 71)	87 (86, 89)	95 (89, 98)
Cameroon	2018 DHS	16 (14, 17)	20 (17, 23)	1 (0, 1)	12 (9, 15)	12 (9, 14)	21 (18, 24)	37 (33, 41)	43 (39, 47)	52 (44, 61)	–
Gambia	2019 DHS	15 (14, 17)	45 (41, 49)	0 (0, 1)	7 (5, 10)	13 (10, 16)	1 (0, 2)	35 (31, 39)	64 (60, 68)	42 (37, 48)	–
Ghana	2019 MIS	30 (27, 33)	34 (30, 38)	0 (0, 1)	20 (17, 24)	14 (10, 18)	3 (1, 5)	30 (26, 35)	67 (63, 71)	78 (72, 83)	–
Guinea	2018 DHS	17 (16, 19)	40 (36, 43)	0 (0, 1)	5 (3, 6)	0 (0, 0)	24 (21, 27)	32 (29, 36)	45 (41, 48)	42 (37, 47)	–
Liberia	2019 DHS	26 (23, 28)	39 (35, 44)	0 (0, 0)	14 (11, 17)	26 (22, 31)	7 (5, 9)	19 (16, 22)	76 (72, 79)	82 (77, 87)	–
Madagascar	2016 MIS	16 (15, 18)	36 (31, 41)	7 (5, 10)	10 (8, 14)	1 (1, 2)	7 (5, 10)	40 (36, 44)	53 (49, 58)	31 (25, 39)	37 (22, 54)
Malawi	2017 MIS	40 (38, 43)	38 (34, 43)	3 (2, 5)	6 (4, 8)	2 (1, 4)	7 (5, 10)	46 (41, 51)	48 (43, 52)	76 (70, 82)	–
Mali	2018 DHS	16 (15, 17)	24 (21, 27)	3 (2, 5)	2 (1, 3)	7 (5, 9)	23 (19, 27)	42 (38, 46)	36 (33, 39)	46 (39, 53)	37 (22, 56)
Mozambique	2018 MIS	31 (28, 35)	64 (57, 70)	4 (2, 7)	0 (0, 1)	0 (0, 1)	1 (1, 3)	31 (26, 37)	68 (62, 73)	72 (67, 76)	41 (13, 76)
Nigeria	2018 DHS	24 (23, 25)	27 (25, 29)	1 (1, 1)	38 (36, 40)	5 (4, 6)	4 (3, 5)	26 (25, 28)	70 (68, 72)	35 (32, 38)	9 (4, 18)
Rwanda	2019 DHS	19 (18, 20)	44 (41, 46)	11 (9, 13)	5 (3, 6)	5 (4, 6)	1 (1, 2)	37 (34, 40)	62 (59, 65)	64 (59, 68)	68 (61, 75)
Senegal	2019 DHS	16 (14, 17)	42 (37, 47)	0 (0, 1)	3 (2, 4)	4 (2, 6)	2 (1, 4)	50 (44, 55)	48 (43, 53)	32 (26, 38)	–
Sierra Leone	2019 DHS	17 (16, 18)	66 (62, 69)	1 (1, 3)	2 (1, 3)	6 (5, 8)	1 (1, 2)	25 (22, 27)	74 (71, 77)	78 (74, 82)	31 (13, 58)
South Africa	2016 DHS	21 (19, 23)	41 (36, 45)	0 (0, 1)	12 (9, 16)	15 (12, 20)	2 (1, 3)	31 (27, 36)	67 (62, 72)	–	–
Togo	2017 MIS	24 (22, 27)	26 (22, 31)	5 (4, 8)	7 (5, 9)	3 (2, 5)	16 (12, 21)	43 (37, 49)	42 (37, 47)	78 (71, 84)	76 (60, 87)
Uganda	2018 MIS	27 (24, 30)	33 (29, 37)	7 (5, 9)	38 (34, 41)	12 (10, 15)	1 (1, 1)	13 (11, 15)	86 (84, 88)	84 (79, 88)	77 (68, 83)
United Republic of Tanzania	2017 MIS	21 (19, 22)	46 (43, 50)	0 (0, 1)	13 (11, 16)	17 (15, 20)	1 (1, 2)	25 (22, 28)	75 (71, 78)	66 (60, 71)	–
Zambia	2018 DHS	16 (15, 17)	69 (66, 72)	3 (2, 5)	4 (3, 6)	0 (0, 1)	1 (0, 2)	23 (20, 26)	76 (73, 79)	78 (73, 82)	83 (64, 93)

Notes:
The analysis is presented as: point estimate (95% confidence interval).
Figures with fewer than 30 children in the denominator were removed.
"–" refers to not applicable or data not available.

Diagnostic testing coverage in each health sector				Antimalarial treatment coverage in each health sector							ACT use among antimalarial treatment in each health sector		
Formal medical private excluding pharmacies	Pharmacies or accredited drug stores	Informal private	Trained provider	Public excluding community health workers	Community health workers	Formal medical private excluding pharmacies	Pharmacies or accredited drug stores	Self-treatment	No treatment seeking	Trained provider	Public	Private	Informal private
30 (23, 38)	9 (6, 14)	8 (5, 12)	37 (33, 40)	38 (34, 44)	–	34 (27, 41)	23 (17, 30)	12 (9, 17)	7 (5, 9)	34 (30, 37)	44 (36, 52)	31 (24, 39)	40 (26, 55)
–	–	25 (13, 42)	66 (61, 70)	69 (64, 73)	–	–	–	62 (37, 82)	10 (7, 14)	68 (64, 72)	80 (76, 83)	82 (54, 95)	–
86 (82, 89)	36 (30, 44)	54 (26, 79)	84 (82, 86)	69 (66, 71)	93 (87, 97)	55 (49, 62)	32 (26, 40)	56 (27, 81)	9 (8, 11)	66 (63, 68)	12 (10, 14)	10 (6, 15)	–
54 (43, 65)	11 (7, 19)	8 (5, 15)	42 (36, 48)	58 (49, 66)	–	48 (38, 58)	33 (24, 43)	46 (38, 54)	12 (9, 16)	48 (43, 54)	25 (17, 35)	21 (15, 27)	15 (8, 27)
54 (33, 73)	27 (19, 36)	–	40 (35, 45)	5 (3, 8)	–	5 (1, 18)	6 (3, 14)	–	1 (0, 4)	5 (3, 7)	71 (51, 85)	–	–
30 (22, 39)	8 (4, 16)	3 (0, 28)	50 (45, 55)	63 (56, 70)	–	55 (46, 63)	57 (44, 69)	50 (24, 76)	18 (14, 24)	59 (54, 65)	88 (80, 93)	86 (77, 92)	–
37 (23, 53)	–	4 (2, 8)	42 (37, 47)	41 (35, 47)	–	52 (33, 70)	–	24 (17, 31)	10 (7, 14)	42 (37, 48)	22 (15, 31)	15 (8, 25)	7 (3, 18)
66 (54, 77)	25 (19, 32)	38 (25, 53)	60 (55, 65)	72 (67, 76)	–	62 (51, 72)	42 (31, 53)	76 (67, 83)	22 (17, 29)	59 (54, 64)	40 (33, 46)	47 (38, 56)	34 (19, 52)
7 (3, 14)	–	3 (1, 13)	27 (22, 33)	13 (8, 19)	19 (10, 33)	13 (6, 25)	–	18 (9, 35)	5 (3, 9)	14 (10, 19)	9 (3, 26)	37 (8, 80)	–
76 (61, 86)	10 (2, 38)	4 (1, 14)	73 (67, 78)	55 (48, 62)	–	55 (39, 69)	22 (4, 64)	21 (9, 41)	7 (5, 11)	54 (48, 61)	98 (94, 99)	97 (81, 99)	–
16 (5, 38)	8 (3, 17)	5 (3, 9)	36 (30, 42)	61 (54, 68)	56 (38, 72)	29 (11, 57)	17 (9, 30)	5 (2, 10)	4 (3, 6)	50 (44, 57)	35 (27, 43)	20 (9, 38)	–
–	–	–	70 (65, 74)	47 (40, 53)	57 (44, 70)	–	–	–	10 (6, 17)	47 (41, 53)	98 (97, 99)	–	–
8 (6, 9)	11 (7, 16)	3 (1, 5)	18 (17, 20)	64 (61, 66)	57 (39, 73)	51 (48, 53)	37 (32, 43)	23 (17, 31)	19 (17, 21)	55 (53, 56)	54 (50, 57)	50 (46, 53)	35 (22, 50)
67 (54, 78)	31 (21, 42)	–	62 (58, 66)	9 (6, 12)	40 (32, 49)	10 (5, 20)	7 (3, 16)	–	1 (0, 2)	13 (11, 17)	92 (84, 97)	–	–
13 (4, 37)	10 (2, 37)	0 (0, 0)	29 (24, 35)	3 (2, 6)	–	0 (0, 0)	2 (0, 14)	–	0 (0, 0)	3 (2, 5)	–	–	–
78 (50, 93)	23 (13, 36)	18 (6, 44)	73 (69, 76)	73 (68, 77)	71 (39, 91)	81 (59, 92)	57 (44, 69)	46 (17, 77)	23 (18, 30)	72 (67, 76)	31 (27, 36)	33 (23, 45)	–
–	–	–	–	0 (0, 0)	–	1 (0, 5)	1 (0, 4)	–	1 (0, 7)	0 (0, 1)	–	–	–
45 (31, 60)	5 (1, 25)	4 (2, 11)	66 (60, 72)	70 (60, 79)	83 (69, 91)	54 (37, 70)	32 (14, 57)	10 (5, 17)	7 (4, 10)	66 (59, 73)	82 (74, 88)	56 (38, 73)	–
48 (43, 53)	20 (15, 28)	34 (15, 60)	58 (54, 62)	72 (66, 76)	90 (84, 93)	72 (67, 77)	54 (42, 66)	–	30 (23, 37)	70 (66, 74)	89 (84, 93)	87 (82, 91)	–
76 (68, 83)	13 (8, 21)	–	55 (51, 60)	34 (28, 40)	–	49 (41, 57)	57 (48, 66)	–	24 (19, 30)	42 (36, 47)	96 (92, 98)	83 (73, 90)	–
79 (65, 89)	–	–	78 (73, 82)	42 (37, 47)	86 (72, 93)	54 (41, 67)	–	–	10 (7, 13)	44 (40, 49)	97 (95, 98)	94 (76, 99)	–

Data as of 3 November 2021

ACT: artemisinin-based combination therapy; DHS: demographic and health survey; MIS: malaria indicator survey; WHO: World Health Organization.

Sources: Nationally representative household survey data from DHS and MIS, compiled through WHO calculations.

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Algeria[1,2,3]	2000	1 823 421	–	34	–	–	2	–
	2001	1 847 461	–	6	–	–	1	–
	2002	1 871 169	–	10	–	–	0	–
	2003	1 895 196	–	5	–	–	0	–
	2004	1 920 337	–	2	–	–	0	–
	2005	1 947 214	–	1	–	–	0	–
	2006	1 976 072	–	1	–	–	0	–
	2007	2 006 967	–	26	–	–	0	–
	2008	2 040 075	–	3	–	–	0	–
	2009	2 075 512	–	0	–	–	0	–
	2010	2 113 315	–	1	–	–	1	–
	2011	2 153 492	–	1	–	–	0	–
	2012	2 195 930	–	55	–	–	0	–
	2013	2 240 351	–	8	–	–	0	–
	2014	2 286 377	–	0	–	–	0	–
	2015	2 333 623	–	0	–	–	0	–
	2016	2 381 988	–	0	–	–	0	–
	2017	2 431 199	–	0	–	–	0	–
	2018	2 480 496	–	0	–	–	0	–
	2019	2 528 936	–	0	–	–	0	–
	2020	2 575 810	–	0	–	–	0	–
Angola	2000	16 395 477	3 241 000	5 340 066	8 217 000	21 200	23 661	26 500
	2001	16 945 753	3 404 000	5 535 342	8 616 000	21 900	24 478	27 600
	2002	17 519 418	3 343 000	5 415 619	8 290 000	20 500	22 952	26 000
	2003	18 121 477	3 648 000	5 685 269	8 440 000	20 100	22 694	25 700
	2004	18 758 138	4 068 000	5 885 039	8 143 000	19 500	22 169	25 300
	2005	19 433 604	4 607 000	6 141 449	7 987 000	18 900	21 709	25 000
	2006	20 149 905	4 704 000	6 072 435	7 749 000	17 600	20 525	24 000
	2007	20 905 360	4 424 000	5 735 024	7 335 000	15 400	18 237	21 700
	2008	21 695 636	3 878 000	5 064 933	6 547 000	12 700	15 280	18 500
	2009	22 514 275	3 359 000	4 431 095	5 803 000	10 900	13 342	16 400
	2010	23 356 247	2 998 000	4 034 069	5 266 000	9 960	12 398	15 500
	2011	24 220 660	2 833 000	3 806 828	5 005 000	9 310	11 832	15 200
	2012	25 107 925	2 878 000	3 872 052	5 072 000	8 860	11 461	15 000
	2013	26 015 786	3 099 000	4 180 694	5 537 000	8 740	11 586	15 600
	2014	26 941 773	3 361 000	4 493 340	5 847 000	8 890	12 036	16 600
	2015	27 884 380	3 767 000	4 926 711	6 389 000	9 090	12 551	17 800
	2016	28 842 482	4 224 000	5 464 271	6 916 000	9 440	13 430	19 500
	2017	29 816 769	4 849 000	6 230 177	7 879 000	9 680	13 941	20 600
	2018	30 809 787	5 087 000	6 600 911	8 403 000	9 390	13 489	20 000
	2019	31 825 299	5 436 000	7 232 418	9 379 000	9 440	13 622	20 500
	2020	32 866 268	5 484 000	8 268 572	11 960 000	9 990	15 989	28 800
Benin	2000	6 865 946	2 117 000	2 906 648	3 903 000	7 470	7 898	8 370
	2001	7 076 728	2 309 000	3 062 820	3 979 000	7 990	8 455	8 960
	2002	7 295 400	2 491 000	3 273 171	4 230 000	8 330	8 825	9 360
	2003	7 520 556	2 654 000	3 461 238	4 435 000	9 110	9 668	10 300
	2004	7 750 003	2 930 000	3 713 286	4 639 000	10 200	10 839	11 500
	2005	7 982 223	3 133 000	3 880 119	4 777 000	11 200	11 896	12 700
	2006	8 216 893	3 210 000	3 990 012	4 930 000	11 900	12 682	13 600
	2007	8 454 790	3 279 000	4 075 243	5 002 000	11 300	12 034	12 900
	2008	8 696 915	3 255 000	4 064 889	5 004 000	9 990	10 694	11 500
	2009	8 944 713	3 133 000	3 959 981	4 961 000	8 860	9 508	10 200
	2010	9 199 254	2 999 000	3 830 368	4 804 000	8 040	8 632	9 300
	2011	9 460 829	2 854 000	3 662 477	4 619 000	7 740	8 348	9 010
	2012	9 729 254	2 778 000	3 555 478	4 482 000	8 080	8 738	9 460
	2013	10 004 594	2 800 000	3 596 818	4 546 000	9 010	9 774	10 600
	2014	10 286 839	2 928 000	3 746 939	4 724 000	9 430	10 285	11 200
	2015	10 575 962	3 233 000	4 083 754	5 100 000	10 000	10 991	12 100
	2016	10 872 072	3 686 000	4 549 900	5 570 000	10 200	11 228	12 400
	2017	11 175 192	3 810 000	4 717 923	5 813 000	9 190	10 224	11 400
	2018	11 485 035	3 744 000	4 706 391	5 897 000	8 810	9 898	11 100
	2019	11 801 151	3 650 000	4 735 800	6 064 000	8 640	9 889	11 300
	2020	12 123 198	3 326 000	4 707 522	6 488 000	8 420	10 123	12 600

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Botswana	2000	1 089 496	13 000	19 146	34 000	1	49	120
	2001	1 110 275	4 700	7 698	14 000	0	19	48
	2002	1 130 140	2 100	3 663	7 100	0	9	24
	2003	1 149 863	740	1 862	4 500	0	4	15
	2004	1 170 513	250	1 217	3 700	0	3	12
	2005	1 192 752	840	1 466	2 800	0	3	9
	2006	1 217 172	3 200	4 801	7 800	0	12	27
	2007	1 243 391	490	1 292	3 200	0	3	10
	2008	1 270 028	1 200	2 457	5 200	0	6	17
	2009	1 295 128	1 300	2 719	5 200	0	6	18
	2010	1 317 411	1 300	2 229	3 900	0	5	13
	2011	1 336 173	520	682	930	0	1	3
	2012	1 352 181	230	304	410	0	0	1
	2013	1 367 430	570	724	980	0	1	3
	2014	1 384 712	1 600	2 073	3 000	0	5	10
	2015	1 405 992	350	454	610	0	1	2
	2016	1 431 987	910	1 315	2 000	0	3	7
	2017	1 461 921	2 300	2 920	3 900	0	7	14
	2018	1 494 401	620	803	1 100	0	2	4
	2019	1 527 309	200	257	350	0	0	1
	2020	1 559 080	1 200	1 759	2 700	0	4	9
Burkina Faso	2000	11 607 951	5 567 000	7 002 044	8 659 000	38 700	41 277	44 000
	2001	11 944 589	5 730 000	7 189 899	8 855 000	39 200	41 824	44 700
	2002	12 293 097	5 846 000	7 324 867	9 040 000	38 000	40 688	43 600
	2003	12 654 624	5 937 000	7 404 515	9 120 000	35 800	38 366	41 200
	2004	13 030 576	5 868 000	7 328 543	9 092 000	32 100	34 556	37 100
	2005	13 421 935	5 654 000	7 165 234	8 886 000	29 300	31 546	34 000
	2006	13 829 173	5 606 000	7 164 531	8 969 000	28 300	30 542	32 900
	2007	14 252 029	5 963 000	7 500 979	9 301 000	28 900	31 272	33 800
	2008	14 689 725	6 523 000	8 163 719	9 993 000	31 100	33 805	36 600
	2009	15 141 098	7 008 000	8 660 267	10 640 000	33 100	36 176	39 400
	2010	15 605 211	7 180 000	8 915 088	10 950 000	31 800	35 034	38 500
	2011	16 081 915	7 221 000	8 959 042	10 940 000	29 800	33 208	36 800
	2012	16 571 252	7 155 000	8 851 576	10 760 000	26 800	30 247	34 000
	2013	17 072 791	6 719 000	8 317 848	10 180 000	22 400	25 694	29 400
	2014	17 586 029	6 378 000	7 879 925	9 608 000	19 100	22 278	26 100
	2015	18 110 616	6 130 000	7 671 964	9 493 000	17 200	20 471	24 500
	2016	18 646 350	5 308 000	7 134 681	9 375 000	16 100	19 443	23 900
	2017	19 193 236	4 818 000	7 095 168	10 060 000	15 500	19 292	24 400
	2018	19 751 466	4 819 000	7 292 399	10 600 000	15 000	19 064	24 700
	2019	20 321 383	4 718 000	7 439 282	11 030 000	14 400	18 813	25 100
	2020	20 903 278	5 042 000	8 150 690	12 410 000	14 300	19 979	29 100
Burundi	2000	6 378 871	2 313 000	3 047 638	3 931 000	11 400	12 288	13 300
	2001	6 525 546	2 315 000	3 060 075	3 988 000	10 500	11 335	12 300
	2002	6 704 118	2 060 000	2 886 631	3 915 000	8 710	9 397	10 200
	2003	6 909 161	1 842 000	2 650 702	3 726 000	7 680	8 294	8 990
	2004	7 131 688	1 646 000	2 364 479	3 278 000	6 500	6 988	7 560
	2005	7 364 857	1 544 000	2 155 222	2 924 000	5 580	5 970	6 420
	2006	7 607 850	1 413 000	1 993 096	2 755 000	5 150	5 506	5 910
	2007	7 862 226	1 191 000	1 757 387	2 495 000	4 930	5 271	5 650
	2008	8 126 104	1 098 000	1 603 138	2 275 000	4 920	5 253	5 640
	2009	8 397 661	1 021 000	1 468 145	2 068 000	4 840	5 188	5 580
	2010	8 675 606	1 017 000	1 468 912	2 040 000	4 710	5 051	5 440
	2011	8 958 406	1 034 000	1 477 281	2 050 000	4 450	4 773	5 160
	2012	9 245 992	1 074 000	1 521 970	2 099 000	4 330	4 664	5 070
	2013	9 540 302	1 150 000	1 624 753	2 233 000	4 190	4 535	4 970
	2014	9 844 301	1 216 000	1 734 733	2 378 000	4 220	4 630	5 150
	2015	10 160 034	1 400 000	1 973 819	2 683 000	4 380	4 867	5 520
	2016	10 488 002	1 747 000	2 400 698	3 212 000	4 880	5 582	6 540
	2017	10 827 010	1 985 000	2 707 373	3 624 000	5 120	5 974	7 170
	2018	11 175 379	2 366 000	3 223 461	4 296 000	4 550	5 237	6 220
	2019	11 530 577	2 400 000	3 426 146	4 790 000	4 560	5 284	6 370
	2020	11 890 781	2 131 000	3 506 219	5 442 000	4 730	5 822	7 700

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Cabo Verde[1,2]	2000	111 326	–	144	–	–	0	–
	2001	113 282	–	107	–	–	0	–
	2002	115 168	–	76	–	–	2	–
	2003	116 980	–	68	–	–	4	–
	2004	118 720	–	45	–	–	4	–
	2005	120 388	–	68	–	–	2	–
	2006	121 984	–	80	–	–	8	–
	2007	123 517	–	18	–	–	2	–
	2008	125 019	–	35	–	–	2	–
	2009	126 533	–	65	–	–	2	–
	2010	128 087	–	47	–	–	1	–
	2011	129 703	–	7	–	–	1	–
	2012	131 362	–	1	–	–	0	–
	2013	133 052	–	22	–	–	0	–
	2014	134 751	–	26	–	–	1	–
	2015	136 432	–	7	–	–	0	–
	2016	138 096	–	48	–	–	1	–
	2017	139 749	–	423	–	–	2	–
	2018	141 378	–	2	–	–	0	–
	2019	142 983	–	0	–	–	0	–
	2020	144 556	–	0	–	–	0	–
Cameroon	2000	15 513 944	4 767 000	6 263 468	8 128 000	16 100	17 144	18 300
	2001	15 928 910	4 843 000	6 484 711	8 494 000	16 400	17 459	18 600
	2002	16 357 605	4 895 000	6 575 562	8 624 000	16 700	17 775	18 900
	2003	16 800 869	5 248 000	6 996 994	9 075 000	17 200	18 374	19 600
	2004	17 259 322	5 797 000	7 478 042	9 527 000	18 200	19 432	20 800
	2005	17 733 408	6 073 000	7 658 081	9 570 000	18 800	20 137	21 600
	2006	18 223 677	6 022 000	7 638 072	9 532 000	18 600	19 887	21 400
	2007	18 730 283	5 944 000	7 488 144	9 310 000	16 900	18 138	19 500
	2008	19 252 674	5 509 000	6 997 342	8 756 000	14 900	15 930	17 100
	2009	19 789 922	4 779 000	6 243 010	8 017 000	13 500	14 457	15 500
	2010	20 341 236	4 485 000	5 916 662	7 642 000	12 500	13 328	14 300
	2011	20 906 392	4 232 000	5 612 172	7 242 000	11 500	12 280	13 200
	2012	21 485 267	4 109 000	5 543 813	7 322 000	11 500	12 327	13 200
	2013	22 077 300	4 194 000	5 786 535	7 873 000	11 600	12 467	13 400
	2014	22 681 853	4 242 000	5 940 368	8 116 000	11 800	12 725	13 700
	2015	23 298 376	4 400 000	6 087 831	8 288 000	12 200	13 171	14 300
	2016	23 926 549	4 564 000	6 163 766	8 114 000	12 500	13 699	15 000
	2017	24 566 070	4 682 000	6 155 492	7 878 000	12 300	13 633	15 100
	2018	25 216 261	4 765 000	6 236 858	7 993 000	11 400	12 770	14 300
	2019	25 876 387	4 604 000	6 316 506	8 497 000	11 200	12 683	14 400
	2020	26 545 864	4 506 000	6 900 814	10 120 000	12 300	14 841	18 200
Central African Republic	2000	3 640 421	1 065 000	1 608 936	2 341 000	6 640	7 379	8 190
	2001	3 722 016	1 069 000	1 615 118	2 360 000	6 820	7 593	8 470
	2002	3 802 129	1 100 000	1 651 740	2 399 000	7 040	7 872	8 830
	2003	3 881 185	1 169 000	1 703 351	2 392 000	7 460	8 393	9 490
	2004	3 959 883	1 250 000	1 767 974	2 444 000	8 000	9 087	10 400
	2005	4 038 380	1 255 000	1 796 295	2 511 000	8 300	9 530	11 000
	2006	4 118 075	1 237 000	1 812 384	2 563 000	8 530	9 918	11 700
	2007	4 198 004	1 220 000	1 814 818	2 653 000	8 360	9 837	11 800
	2008	4 273 368	1 142 000	1 806 806	2 728 000	7 610	9 105	11 100
	2009	4 337 623	1 059 000	1 776 590	2 808 000	6 980	8 528	10 700
	2010	4 386 765	972 000	1 735 412	2 891 000	6 240	7 803	9 990
	2011	4 418 639	929 000	1 704 764	2 888 000	5 520	7 045	9 260
	2012	4 436 411	917 000	1 675 743	2 837 000	5 150	6 770	9 130
	2013	4 447 945	912 000	1 651 034	2 763 000	4 720	6 361	8 800
	2014	4 464 171	900 000	1 618 953	2 737 000	4 350	5 995	8 530
	2015	4 493 171	832 000	1 556 627	2 661 000	3 930	5 555	8 150
	2016	4 537 683	811 000	1 516 132	2 580 000	3 570	5 172	7 760
	2017	4 596 023	803 000	1 510 710	2 626 000	3 230	4 788	7 400
	2018	4 666 375	793 000	1 515 019	2 634 000	3 010	4 553	7 220
	2019	4 745 179	810 000	1 532 089	2 666 000	2 860	4 452	7 280
	2020	4 829 764	831 000	1 622 774	2 900 000	2 940	5 079	9 360

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Chad	2000	8 264 159	1 337 000	2 206 959	3 440 000	7 980	8 459	9 010
	2001	8 583 024	1 341 000	2 303 533	3 734 000	8 590	9 111	9 710
	2002	8 920 465	1 128 000	2 085 966	3 486 000	8 170	8 665	9 220
	2003	9 271 268	1 152 000	2 117 386	3 609 000	8 400	8 926	9 520
	2004	9 628 165	1 187 000	2 136 583	3 639 000	8 460	9 005	9 610
	2005	9 986 071	1 213 000	2 228 197	3 721 000	8 880	9 464	10 100
	2006	10 342 616	1 320 000	2 336 909	3 836 000	9 400	10 030	10 800
	2007	10 699 573	1 434 000	2 419 751	3 792 000	9 800	10 485	11 300
	2008	11 061 128	1 731 000	2 513 300	3 495 000	10 200	10 911	11 800
	2009	11 433 558	2 041 000	2 672 984	3 431 000	10 600	11 455	12 400
	2010	11 821 258	2 159 000	2 760 481	3 475 000	10 900	11 829	12 900
	2011	12 225 633	2 002 000	2 660 817	3 471 000	10 600	11 550	12 600
	2012	12 644 755	1 738 000	2 559 176	3 669 000	10 300	11 321	12 400
	2013	13 075 669	1 462 000	2 489 517	4 005 000	10 100	11 158	12 400
	2014	13 513 945	1 388 000	2 550 213	4 313 000	9 950	11 126	12 400
	2015	13 956 455	1 458 000	2 646 943	4 502 000	9 890	11 163	12 600
	2016	14 402 207	1 599 000	2 775 765	4 518 000	9 990	11 437	13 100
	2017	14 852 327	1 663 000	2 915 825	4 711 000	10 000	11 673	13 700
	2018	15 308 245	1 785 000	3 155 109	5 143 000	9 760	11 509	13 800
	2019	15 772 263	1 824 000	3 205 889	5 265 000	9 650	11 619	14 300
	2020	16 245 995	1 870 000	3 351 197	5 676 000	9 340	12 415	16 600
Comoros[1]	2000	542 358	24 000	35 309	47 000	2	89	190
	2001	555 895	24 000	35 335	47 000	2	89	190
	2002	569 480	24 000	35 347	48 000	2	89	190
	2003	583 213	24 000	35 347	48 000	2	89	190
	2004	597 230	24 000	35 342	48 000	2	89	190
	2005	611 625	24 000	35 336	47 000	2	89	190
	2006	626 427	24 000	35 332	47 000	2	89	190
	2007	641 624	24 000	35 328	47 000	2	89	190
	2008	657 227	24 000	35 325	47 000	2	89	190
	2009	673 251	24 000	35 322	47 000	2	89	190
	2010	689 696	–	36 538	–	3	92	140
	2011	706 578	–	24 856	–	2	62	97
	2012	723 865	–	49 840	–	4	125	200
	2013	741 511	–	53 156	–	5	135	210
	2014	759 390	–	2 203	–	0	5	8
	2015	777 435	–	1 300	–	0	3	5
	2016	795 597	–	1 143	–	0	2	4
	2017	813 890	–	3 230	–	0	8	12
	2018	832 322	–	15 186	–	1	38	60
	2019	850 891	–	17 599	–	1	45	70
	2020	869 595	–	4 546	–	0	11	18
Congo	2000	3 127 420	762 000	1 111 363	1 563 000	2 820	3 034	3 270
	2001	3 217 930	791 000	1 130 380	1 592 000	2 780	2 983	3 210
	2002	3 310 376	705 000	1 058 967	1 521 000	2 580	2 749	2 940
	2003	3 406 915	701 000	1 071 326	1 563 000	2 470	2 630	2 810
	2004	3 510 468	715 000	1 083 781	1 588 000	2 360	2 505	2 670
	2005	3 622 775	699 000	1 040 222	1 504 000	2 230	2 366	2 520
	2006	3 745 143	662 000	987 425	1 425 000	2 080	2 198	2 330
	2007	3 876 123	624 000	935 722	1 347 000	1 920	2 028	2 140
	2008	4 011 487	584 000	878 588	1 267 000	1 780	1 871	1 970
	2009	4 145 400	554 000	854 722	1 274 000	1 740	1 828	1 920
	2010	4 273 738	547 000	859 591	1 292 000	1 740	1 835	1 940
	2011	4 394 842	560 000	872 297	1 274 000	1 760	1 870	1 990
	2012	4 510 197	601 000	882 608	1 256 000	1 770	1 897	2 040
	2013	4 622 757	617 000	896 580	1 262 000	1 840	2 015	2 230
	2014	4 736 965	605 000	883 444	1 250 000	1 850	2 047	2 310
	2015	4 856 093	599 000	893 590	1 270 000	1 820	2 023	2 320
	2016	4 980 996	602 000	946 509	1 423 000	1 870	2 118	2 500
	2017	5 110 701	633 000	1 051 980	1 642 000	1 920	2 200	2 670
	2018	5 244 363	705 000	1 141 343	1 754 000	1 910	2 191	2 690
	2019	5 380 504	752 000	1 161 743	1 728 000	1 930	2 220	2 770
	2020	5 518 092	722 000	1 176 331	1 826 000	1 920	2 354	3 370

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Côte d'Ivoire	2000	16 454 660	6 664 000	8 402 895	10 400 000	27 200	29 036	31 100
	2001	16 853 027	7 059 000	8 796 365	10 820 000	28 800	30 820	33 100
	2002	17 231 539	7 208 000	9 013 441	11 090 000	29 400	31 509	33 800
	2003	17 599 613	7 374 000	9 179 349	11 260 000	29 200	31 397	33 700
	2004	17 970 493	7 467 000	9 270 982	11 450 000	27 700	29 819	32 000
	2005	18 354 513	7 139 000	8 921 724	11 010 000	26 400	28 487	30 600
	2006	18 754 914	7 150 000	8 922 496	10 900 000	25 900	27 989	30 200
	2007	19 171 250	7 346 000	9 035 145	10 990 000	26 600	28 815	31 100
	2008	19 605 568	7 641 000	9 370 105	11 340 000	26 100	28 268	30 700
	2009	20 059 147	7 934 000	9 733 759	11 820 000	25 800	28 135	30 600
	2010	20 532 944	8 062 000	9 894 039	11 960 000	23 200	25 440	27 800
	2011	21 028 652	8 032 000	9 812 222	11 870 000	19 500	21 484	23 600
	2012	21 547 188	6 479 000	8 242 023	10 310 000	14 200	15 726	17 400
	2013	22 087 506	4 880 000	6 499 239	8 507 000	11 500	12 797	14 200
	2014	22 647 672	4 469 000	6 012 351	7 976 000	10 600	11 943	13 400
	2015	23 226 148	4 028 000	5 753 943	7 861 000	12 100	13 725	15 600
	2016	23 822 726	3 878 000	5 986 942	8 753 000	14 400	16 648	19 300
	2017	24 437 475	3 698 000	6 353 352	10 280 000	15 300	17 879	20 900
	2018	25 069 226	3 877 000	6 827 252	11 190 000	12 600	14 986	17 900
	2019	25 716 554	4 174 000	7 231 163	11 640 000	12 200	14 829	18 100
	2020	26 378 275	4 087 000	7 571 801	12 880 000	12 200	15 913	22 400
Democratic Republic of the Congo	2000	47 105 832	17 730 000	22 117 306	27 260 000	92 100	100 494	110 000
	2001	48 428 536	18 110 000	22 753 379	28 340 000	91 700	100 192	110 000
	2002	49 871 666	18 440 000	23 456 540	29 300 000	92 800	101 603	112 000
	2003	51 425 584	19 480 000	24 401 918	30 350 000	96 100	105 469	116 000
	2004	53 068 868	20 540 000	25 538 947	31 460 000	102 000	112 034	124 000
	2005	54 785 898	21 350 000	26 389 768	32 210 000	102 000	112 725	125 000
	2006	56 578 046	21 930 000	26 813 132	32 550 000	104 000	115 483	129 000
	2007	58 453 680	22 090 000	27 125 730	32 930 000	99 100	111 542	125 000
	2008	60 411 194	22 060 000	26 880 773	32 550 000	93 400	106 681	121 000
	2009	62 448 574	21 200 000	25 851 664	31 190 000	87 500	101 421	117 000
	2010	64 563 854	20 560 000	25 174 268	30 480 000	77 700	91 831	107 000
	2011	66 755 154	19 750 000	24 413 631	29 710 000	66 400	79 887	94 300
	2012	69 020 748	19 140 000	23 848 321	29 190 000	55 200	67 528	80 900
	2013	71 358 804	18 570 000	23 298 085	28 960 000	47 500	59 293	72 400
	2014	73 767 448	17 920 000	22 683 834	28 290 000	44 600	56 829	70 900
	2015	76 244 540	17 700 000	22 550 355	28 260 000	44 600	58 167	74 500
	2016	78 789 144	18 180 000	23 438 237	29 880 000	47 900	63 964	84 300
	2017	81 398 776	19 430 000	25 087 950	32 040 000	49 400	67 792	92 300
	2018	84 068 096	21 040 000	26 975 676	34 280 000	46 700	65 555	92 200
	2019	86 790 564	21 380 000	27 831 537	35 410 000	45 400	65 331	94 600
	2020	89 561 400	22 260 000	29 036 471	37 180 000	53 300	82 511	131 000
Equatorial Guinea	2000	606 180	162 000	235 276	334 000	580	633	700
	2001	631 662	174 000	245 740	338 000	590	644	710
	2002	658 388	183 000	256 076	348 000	600	657	730
	2003	686 670	195 000	269 468	364 000	620	682	760
	2004	716 949	210 000	282 782	374 000	640	707	780
	2005	749 527	225 000	297 172	387 000	640	712	790
	2006	784 494	234 000	307 995	397 000	590	656	730
	2007	821 686	242 000	317 101	406 000	550	610	680
	2008	860 839	234 000	308 886	403 000	510	569	640
	2009	901 589	219 000	295 005	386 000	480	535	600
	2010	943 640	217 000	294 885	392 000	520	598	690
	2011	986 861	223 000	306 228	410 000	530	617	720
	2012	1 031 191	248 000	338 449	454 000	560	667	790
	2013	1 076 412	270 000	374 281	506 000	610	735	890
	2014	1 122 273	272 000	387 205	529 000	620	770	960
	2015	1 168 575	270 000	389 894	550 000	570	706	880
	2016	1 215 181	261 000	388 740	567 000	540	666	840
	2017	1 262 008	241 000	373 828	557 000	530	651	840
	2018	1 308 966	214 000	347 938	531 000	520	632	820
	2019	1 355 982	205 000	333 972	523 000	520	643	840
	2020	1 402 985	190 000	337 892	553 000	520	674	940

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Eritrea	2000	2 292 413	14 000	42 048	87 000	2	97	270
	2001	2 374 721	19 000	54 461	108 000	2	130	340
	2002	2 481 059	12 000	32 823	64 000	1	74	200
	2003	2 600 972	23 000	49 490	86 000	3	112	260
	2004	2 719 809	7 600	15 093	26 000	0	32	79
	2005	2 826 653	16 000	27 680	42 000	2	59	130
	2006	2 918 209	10 000	16 438	23 000	1	36	76
	2007	2 996 540	24 000	37 568	52 000	4	60	120
	2008	3 062 782	13 000	20 767	29 000	2	37	76
	2009	3 119 920	18 000	27 656	39 000	3	41	81
	2010	3 170 437	53 000	83 471	118 000	9	161	320
	2011	3 213 969	49 000	76 678	107 000	8	141	280
	2012	3 250 104	33 000	52 483	76 000	6	85	170
	2013	3 281 453	31 000	49 309	70 000	5	88	180
	2014	3 311 444	70 000	109 689	152 000	11	227	460
	2015	3 342 818	41 000	64 020	89 000	6	128	260
	2016	3 376 558	47 000	86 561	138 000	7	198	440
	2017	3 412 894	74 000	115 928	161 000	12	221	450
	2018	3 452 797	64 000	99 716	138 000	10	196	390
	2019	3 497 117	129 000	200 382	278 000	19	437	890
	2020	3 546 427	102 000	158 889	221 000	13	372	760
Eswatini[1]	2000	281 520	340	792	1 400	0	2	5
	2001	283 810	–	1 395	–	0	3	5
	2002	285 335	–	670	–	0	1	2
	2003	286 382	–	342	–	0	0	1
	2004	287 360	–	574	–	0	1	2
	2005	288 561	–	279	–	0	0	1
	2006	290 106	–	155	–	–	0	–
	2007	291 942	–	84	–	–	0	–
	2008	293 985	–	58	–	–	0	–
	2009	296 089	–	106	–	–	0	–
	2010	298 155	–	268	–	0	0	1
	2011	300 168	–	379	–	0	0	1
	2012	302 199	–	409	–	0	1	1
	2013	304 316	–	728	–	0	1	2
	2014	306 606	–	389	–	0	0	1
	2015	309 130	–	318	–	0	0	1
	2016	311 918	–	250	–	0	0	1
	2017	314 946	–	440	–	0	1	1
	2018	318 156	–	686	–	0	1	2
	2019	321 477	–	239	–	–	0	–
	2020	324 845	–	233	–	–	0	–
Ethiopia	2000	45 032 869	6 233 000	10 012 002	15 170 000	1 240	16 808	34 800
	2001	46 348 411	3 555 000	10 740 816	19 300 000	1 110	18 031	41 900
	2002	47 696 619	3 541 000	9 818 962	18 220 000	1 040	16 864	41 600
	2003	49 075 997	4 396 000	10 682 423	24 360 000	1 090	18 702	55 500
	2004	50 482 860	3 820 000	11 221 054	33 330 000	760	21 110	82 900
	2005	51 915 486	2 789 000	7 893 191	23 720 000	520	15 072	59 300
	2006	53 372 658	2 362 000	7 565 788	23 760 000	430	13 798	55 000
	2007	54 858 556	2 064 000	6 664 422	19 960 000	400	11 526	44 800
	2008	56 383 037	2 198 000	5 674 236	16 430 000	420	9 840	37 000
	2009	57 959 068	2 478 000	7 876 855	23 360 000	440	14 838	55 400
	2010	59 595 175	2 994 000	9 254 141	26 870 000	540	17 096	65 300
	2011	61 295 151	4 384 000	9 513 941	23 750 000	850	15 005	49 200
	2012	63 054 338	5 976 000	11 007 934	24 140 000	1 190	17 579	49 700
	2013	64 862 335	6 839 000	12 428 044	22 800 000	1 420	21 978	53 500
	2014	66 704 096	3 726 000	10 591 119	18 620 000	960	17 624	42 100
	2015	68 568 110	3 473 000	9 173 386	16 280 000	880	16 199	38 700
	2016	70 450 352	2 833 000	6 501 344	11 720 000	650	11 879	28 200
	2017	72 351 951	2 495 000	4 851 370	8 381 000	520	9 158	21 100
	2018	74 272 600	1 551 000	2 793 314	4 202 000	230	6 500	14 200
	2019	76 213 540	1 467 000	2 645 193	3 951 000	250	5 708	12 300
	2020	78 175 245	2 340 000	4 231 328	6 335 000	380	9 433	20 500

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Gabon	2000	1 228 359	243 000	398 161	615 000	330	359	400
	2001	1 258 008	237 000	386 020	595 000	310	337	380
	2002	1 288 310	210 000	354 240	566 000	280	299	330
	2003	1 319 946	179 000	305 782	487 000	240	254	280
	2004	1 353 788	148 000	240 402	372 000	210	219	240
	2005	1 390 550	126 000	197 886	296 000	190	201	210
	2006	1 430 144	108 000	171 998	259 000	190	199	210
	2007	1 472 565	100 000	161 791	250 000	190	199	210
	2008	1 518 538	101 000	177 824	288 000	200	210	220
	2009	1 568 925	121 000	224 120	383 000	210	226	240
	2010	1 624 146	152 000	280 006	465 000	240	252	270
	2011	1 684 629	191 000	338 757	558 000	260	283	310
	2012	1 749 677	232 000	395 572	639 000	290	318	360
	2013	1 817 070	249 000	438 354	716 000	320	360	410
	2014	1 883 801	280 000	489 638	804 000	330	386	450
	2015	1 947 690	293 000	494 568	774 000	340	394	470
	2016	2 007 882	290 000	462 369	716 000	330	390	470
	2017	2 064 812	286 000	452 031	683 000	320	382	470
	2018	2 119 275	277 000	443 712	676 000	320	377	470
	2019	2 172 578	271 000	448 958	698 000	320	381	480
	2020	2 225 728	259 000	479 563	818 000	330	424	600
Gambia	2000	1 317 708	368 000	491 730	709 000	550	577	610
	2001	1 360 070	371 000	491 620	717 000	500	527	560
	2002	1 404 263	371 000	491 827	712 000	470	489	510
	2003	1 449 925	374 000	492 303	714 000	450	468	490
	2004	1 496 524	370 000	492 874	720 000	430	449	470
	2005	1 543 745	372 000	493 387	715 000	430	441	460
	2006	1 591 444	371 000	493 699	714 000	430	441	460
	2007	1 639 846	373 000	493 777	714 000	430	441	460
	2008	1 689 288	372 000	493 650	713 000	430	445	460
	2009	1 740 277	372 000	493 445	713 000	430	450	470
	2010	1 793 199	371 000	493 286	715 000	450	470	490
	2011	1 848 142	385 000	473 874	575 000	460	480	500
	2012	1 905 020	419 000	523 991	638 000	470	487	510
	2013	1 963 708	409 000	574 774	816 000	480	493	510
	2014	2 024 037	237 000	303 721	378 000	490	504	520
	2015	2 085 860	347 000	450 479	564 000	500	514	540
	2016	2 149 134	225 000	297 058	375 000	500	523	540
	2017	2 213 900	111 000	148 057	189 000	520	538	560
	2018	2 280 092	144 000	196 018	253 000	540	560	590
	2019	2 347 696	86 000	109 975	137 000	540	569	600
	2020	2 416 664	148 000	210 897	301 000	560	615	680
Ghana	2000	19 278 850	6 644 000	8 390 825	10 420 000	18 600	19 388	20 200
	2001	19 756 929	6 638 000	8 296 535	10 280 000	17 700	18 435	19 200
	2002	20 246 376	6 302 000	7 919 784	9 810 000	16 300	16 937	17 600
	2003	20 750 308	6 143 000	7 696 197	9 525 000	15 300	15 909	16 500
	2004	21 272 328	5 977 000	7 493 504	9 316 000	14 600	15 105	15 700
	2005	21 814 648	5 815 000	7 338 128	9 117 000	14 200	14 693	15 200
	2006	22 379 057	5 811 000	7 340 195	9 138 000	14 400	14 925	15 500
	2007	22 963 946	6 044 000	7 545 707	9 296 000	13 900	14 426	15 000
	2008	23 563 832	6 538 000	8 063 544	9 824 000	14 200	14 759	15 300
	2009	24 170 943	7 059 000	8 695 038	10 500 000	15 100	15 721	16 300
	2010	24 779 614	7 531 000	9 211 717	11 200 000	15 200	15 810	16 500
	2011	25 387 713	7 770 000	9 551 273	11 500 000	16 100	16 841	17 600
	2012	25 996 454	7 756 000	9 516 545	11 530 000	15 600	16 282	17 000
	2013	26 607 641	7 355 000	9 086 246	11 130 000	14 900	15 540	16 300
	2014	27 224 480	6 713 000	8 460 913	10 550 000	13 500	14 109	14 800
	2015	27 849 203	5 945 000	7 681 390	9 749 000	12 200	12 781	13 400
	2016	28 481 947	5 071 000	6 763 906	8 777 000	11 100	11 608	12 100
	2017	29 121 464	4 241 000	5 850 313	7 778 000	10 900	11 374	12 000
	2018	29 767 108	3 608 000	5 111 179	6 980 000	11 200	11 792	12 500
	2019	30 417 858	3 383 000	4 911 921	6 910 000	11 200	11 877	12 700
	2020	31 072 945	3 467 000	5 060 166	7 087 000	11 200	12 084	13 300

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Guinea	2000	8 240 735	2 794 000	3 667 311	4 767 000	15 400	16 396	17 400
	2001	8 417 082	2 777 000	3 726 628	4 882 000	15 000	15 919	16 900
	2002	8 586 077	2 604 000	3 658 405	4 993 000	13 600	14 460	15 400
	2003	8 753 097	2 427 000	3 539 604	4 996 000	12 100	12 844	13 700
	2004	8 925 729	2 198 000	3 310 157	4 808 000	10 300	10 985	11 700
	2005	9 109 585	1 982 000	3 130 628	4 669 000	9 280	9 895	10 500
	2006	9 307 421	1 972 000	3 102 396	4 671 000	9 060	9 672	10 300
	2007	9 518 159	2 124 000	3 203 174	4 654 000	9 290	9 931	10 600
	2008	9 738 796	2 515 000	3 468 822	4 672 000	10 100	10 761	11 500
	2009	9 964 470	2 937 000	3 832 532	4 917 000	11 500	12 350	13 300
	2010	10 192 168	3 252 000	4 145 673	5 235 000	12 400	13 286	14 300
	2011	10 420 459	3 553 000	4 395 976	5 365 000	12 800	13 841	15 000
	2012	10 652 032	3 770 000	4 577 634	5 492 000	12 700	13 703	14 900
	2013	10 892 821	3 632 000	4 517 687	5 526 000	11 500	12 504	13 700
	2014	11 150 970	3 444 000	4 447 573	5 650 000	10 600	11 566	12 700
	2015	11 432 096	3 274 000	4 369 537	5 728 000	9 540	10 492	11 600
	2016	11 738 434	3 003 000	4 235 383	5 796 000	8 770	9 704	10 800
	2017	12 067 516	2 878 000	4 268 657	6 053 000	8 290	9 242	10 400
	2018	12 414 292	2 872 000	4 335 930	6 288 000	7 560	8 470	9 600
	2019	12 771 246	2 739 000	4 187 051	6 119 000	7 570	8 586	9 850
	2020	13 132 792	2 549 000	4 196 430	6 522 000	7 760	10 215	12 700
Guinea-Bissau	2000	1 201 305	283 000	479 861	764 000	2 090	2 273	2 480
	2001	1 227 105	226 000	406 016	673 000	1 590	1 717	1 870
	2002	1 254 454	168 000	327 275	576 000	1 200	1 297	1 410
	2003	1 283 297	123 000	246 480	440 000	940	1 003	1 080
	2004	1 313 492	86 000	167 413	298 000	770	816	880
	2005	1 344 931	65 000	127 536	224 000	700	742	790
	2006	1 377 582	57 000	106 558	184 000	680	716	760
	2007	1 411 545	66 000	106 532	164 000	670	712	760
	2008	1 446 936	93 000	127 914	171 000	690	735	790
	2009	1 483 920	111 000	159 662	222 000	720	774	840
	2010	1 522 603	121 000	189 755	284 000	740	806	890
	2011	1 562 996	120 000	199 885	313 000	740	812	900
	2012	1 604 981	105 000	194 666	336 000	720	797	890
	2013	1 648 259	83 000	184 328	353 000	700	783	880
	2014	1 692 433	63 000	160 854	337 000	690	772	880
	2015	1 737 207	50 000	136 360	302 000	680	768	880
	2016	1 782 434	40 000	117 007	275 000	700	795	920
	2017	1 828 146	31 000	104 397	269 000	710	814	960
	2018	1 874 304	30 000	106 349	281 000	740	873	1 050
	2019	1 920 917	37 000	121 902	309 000	740	874	1 060
	2020	1 967 998	48 000	174 987	474 000	770	1 021	1 570
Kenya	2000	31 964 557	5 442 000	6 929 773	8 712 000	11 500	11 901	12 400
	2001	32 848 569	6 390 000	7 938 230	9 747 000	13 100	13 668	14 300
	2002	33 751 745	6 048 000	7 543 097	9 336 000	12 900	13 472	14 100
	2003	34 678 778	5 732 000	7 255 664	9 057 000	12 500	13 021	13 600
	2004	35 635 260	4 880 000	6 345 814	8 033 000	11 200	11 667	12 100
	2005	36 624 894	3 686 000	5 000 527	6 625 000	10 100	10 427	10 800
	2006	37 649 036	2 798 000	3 896 588	5 285 000	9 540	9 848	10 200
	2007	38 705 936	2 220 000	3 085 187	4 163 000	9 490	9 792	10 100
	2008	39 791 984	1 901 000	2 639 673	3 558 000	9 430	9 714	10 000
	2009	40 901 802	1 873 000	2 567 362	3 446 000	9 570	9 855	10 200
	2010	42 030 686	1 982 000	2 690 765	3 592 000	9 740	10 033	10 400
	2011	43 178 270	2 090 000	2 844 630	3 772 000	10 000	10 371	10 700
	2012	44 343 470	2 228 000	3 050 368	4 081 000	10 000	10 372	10 800
	2013	45 519 982	2 360 000	3 247 830	4 380 000	10 100	10 439	10 900
	2014	46 700 066	2 396 000	3 303 940	4 419 000	10 200	10 634	11 100
	2015	47 878 348	2 404 000	3 292 619	4 391 000	10 400	10 862	11 500
	2016	49 051 524	2 258 000	3 235 476	4 449 000	10 700	11 298	12 100
	2017	50 221 148	2 062 000	3 140 919	4 571 000	11 100	11 845	12 800
	2018	51 392 568	1 923 000	3 070 698	4 639 000	11 100	11 850	12 900
	2019	52 573 968	1 791 000	2 967 868	4 593 000	11 200	11 979	13 200
	2020	53 771 298	1 564 000	2 738 383	4 452 000	11 400	12 646	14 800

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Liberia	2000	2 848 447	836 000	1 327 183	2 002 000	6 530	6 968	7 460
	2001	2 953 928	873 000	1 355 119	2 023 000	6 220	6 644	7 120
	2002	3 024 727	855 000	1 346 747	2 030 000	5 660	6 049	6 470
	2003	3 077 055	823 000	1 323 979	2 016 000	4 990	5 326	5 690
	2004	3 135 654	816 000	1 281 411	1 924 000	4 240	4 520	4 820
	2005	3 218 114	846 000	1 266 314	1 842 000	3 610	3 847	4 100
	2006	3 329 211	886 000	1 268 595	1 781 000	3 250	3 470	3 700
	2007	3 461 911	943 000	1 297 717	1 739 000	3 070	3 287	3 510
	2008	3 607 863	1 020 000	1 342 709	1 731 000	3 010	3 227	3 460
	2009	3 754 129	1 027 000	1 329 712	1 683 000	2 840	3 046	3 270
	2010	3 891 357	1 004 000	1 312 930	1 678 000	2 670	2 862	3 070
	2011	4 017 446	994 000	1 313 721	1 701 000	2 550	2 738	2 950
	2012	4 135 662	925 000	1 297 478	1 781 000	2 390	2 574	2 780
	2013	4 248 337	919 000	1 369 073	1 957 000	2 520	2 737	2 980
	2014	4 359 508	1 019 000	1 491 246	2 098 000	2 900	3 187	3 510
	2015	4 472 229	1 148 000	1 555 896	2 061 000	2 960	3 295	3 670
	2016	4 586 788	1 372 000	1 712 073	2 094 000	3 540	4 001	4 550
	2017	4 702 224	1 452 000	1 844 663	2 313 000	3 850	4 444	5 170
	2018	4 818 976	1 344 000	1 846 848	2 476 000	3 320	3 884	4 610
	2019	4 937 374	1 235 000	1 825 088	2 606 000	3 270	3 918	4 760
	2020	5 057 677	1 070 000	1 810 880	2 861 000	3 040	4 601	6 200
Madagascar	2000	15 766 806	71 000	905 987	2 004 000	38	2 239	6 620
	2001	16 260 933	150 000	1 111 496	2 366 000	54	2 747	7 940
	2002	16 765 122	23 000	898 515	2 060 000	31	2 221	6 730
	2003	17 279 139	26 000	1 180 072	2 700 000	41	2 917	8 930
	2004	17 802 992	31 000	834 134	1 861 000	35	2 062	6 150
	2005	18 336 722	25 000	662 852	1 491 000	26	1 638	4 870
	2006	18 880 265	31 000	666 523	1 461 000	27	1 647	4 880
	2007	19 433 520	135 000	442 208	876 000	24	1 092	2 940
	2008	19 996 476	257 000	469 371	791 000	34	1 160	2 760
	2009	20 569 115	534 000	882 824	1 398 000	68	2 182	4 860
	2010	21 151 640	524 000	893 540	1 448 000	70	2 208	5 020
	2011	21 743 970	503 000	823 538	1 201 000	62	2 035	4 280
	2012	22 346 641	966 000	1 594 592	2 499 000	130	3 941	8 840
	2013	22 961 259	963 000	1 497 292	2 288 000	120	3 701	8 010
	2014	23 589 897	766 000	1 078 280	1 444 000	93	2 665	5 200
	2015	24 234 080	1 704 000	2 345 948	3 082 000	210	5 800	11 200
	2016	24 894 370	1 025 000	1 408 501	1 845 000	120	3 482	6 670
	2017	25 570 511	1 440 000	1 934 795	2 485 000	170	4 783	9 050
	2018	26 262 313	1 379 000	1 848 813	2 367 000	160	4 570	8 600
	2019	26 969 306	1 429 000	1 915 533	2 449 000	170	4 735	8 910
	2020	27 691 019	2 759 000	3 695 590	4 729 000	300	9 459	18 000
Malawi	2000	11 148 751	4 002 000	5 164 430	6 501 000	16 400	17 225	18 100
	2001	11 432 001	4 278 000	5 318 574	6 511 000	15 400	16 121	16 900
	2002	11 713 663	4 127 000	5 130 061	6 307 000	13 200	13 784	14 400
	2003	12 000 183	3 771 000	4 780 799	5 984 000	11 100	11 643	12 200
	2004	12 301 837	3 609 000	4 549 207	5 641 000	9 840	10 288	10 800
	2005	12 625 950	3 709 000	4 587 934	5 619 000	9 380	9 813	10 300
	2006	12 973 693	3 684 000	4 541 568	5 582 000	9 660	10 095	10 600
	2007	13 341 808	3 743 000	4 650 432	5 705 000	10 400	10 906	11 400
	2008	13 727 899	4 044 000	5 022 864	6 178 000	10 800	11 431	12 100
	2009	14 128 161	4 354 000	5 379 216	6 581 000	10 700	11 379	12 100
	2010	14 539 609	4 455 000	5 516 206	6 793 000	10 300	10 951	11 700
	2011	14 962 118	4 381 000	5 460 330	6 703 000	9 380	9 903	10 500
	2012	15 396 010	3 861 000	4 929 530	6 223 000	8 530	8 978	9 460
	2013	15 839 287	3 504 000	4 547 495	5 836 000	7 460	7 853	8 300
	2014	16 289 550	3 246 000	4 265 161	5 483 000	6 800	7 221	7 700
	2015	16 745 305	3 096 000	4 032 938	5 159 000	6 390	6 868	7 400
	2016	17 205 253	2 979 000	3 868 572	4 944 000	6 240	6 792	7 430
	2017	17 670 193	2 954 000	3 851 092	4 948 000	6 210	6 854	7 640
	2018	18 143 215	2 850 000	3 782 274	4 901 000	6 150	6 820	7 690
	2019	18 628 749	2 613 000	3 835 146	5 384 000	6 130	6 856	7 830
	2020	19 129 955	2 354 000	4 370 301	7 403 000	6 150	7 165	8 700

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Mali	2000	10 946 448	3 014 000	4 446 769	6 409 000	24 300	25 672	27 200
	2001	11 271 603	3 116 000	4 592 575	6 621 000	22 600	23 927	25 400
	2002	11 616 890	3 232 000	4 837 950	7 029 000	21 000	22 172	23 500
	2003	11 982 692	3 375 000	5 078 371	7 262 000	20 600	21 772	23 100
	2004	12 369 078	3 626 000	5 310 943	7 535 000	21 100	22 353	23 800
	2005	12 775 509	3 843 000	5 509 314	7 925 000	21 900	23 245	24 700
	2006	13 203 378	3 737 000	5 356 747	7 601 000	21 500	22 899	24 400
	2007	13 651 455	3 703 000	5 307 761	7 484 000	20 000	21 311	22 800
	2008	14 113 578	3 696 000	5 349 875	7 469 000	17 500	18 710	20 100
	2009	14 581 427	3 787 000	5 461 653	7 550 000	16 100	17 255	18 600
	2010	15 049 352	4 132 000	5 772 983	7 951 000	16 100	17 241	18 600
	2011	15 514 593	4 471 000	6 279 267	8 582 000	18 200	19 701	21 400
	2012	15 979 492	4 942 000	6 961 475	9 455 000	21 000	22 890	25 000
	2013	16 449 854	5 334 000	7 448 756	10 240 000	22 200	24 431	27 000
	2014	16 934 213	5 365 000	7 468 113	10 370 000	19 700	21 909	24 400
	2015	17 438 772	4 827 000	6 833 022	9 671 000	15 100	16 997	19 100
	2016	17 965 448	4 860 000	6 902 717	9 818 000	12 100	13 831	15 700
	2017	18 512 429	5 057 000	7 160 192	10 190 000	12 500	14 479	16 700
	2018	19 077 755	5 200 000	7 378 847	10 480 000	14 800	17 379	20 600
	2019	19 658 023	4 629 000	6 559 792	9 323 000	14 600	17 511	21 200
	2020	20 250 834	5 124 000	7 238 665	10 280 000	15 000	19 316	25 300
Mauritania	2000	2 630 217	203 000	403 918	709 000	1 040	1 094	1 160
	2001	2 702 405	216 000	429 702	762 000	1 090	1 151	1 220
	2002	2 778 097	136 000	344 961	654 000	1 060	1 129	1 210
	2003	2 857 150	140 000	339 273	653 000	1 080	1 154	1 250
	2004	2 939 246	90 000	272 001	508 000	1 080	1 161	1 260
	2005	3 024 198	77 000	254 652	485 000	1 090	1 179	1 300
	2006	3 111 908	61 000	230 502	448 000	1 100	1 203	1 340
	2007	3 202 512	64 000	227 452	476 000	1 100	1 210	1 360
	2008	3 296 237	50 000	200 705	407 000	1 110	1 231	1 410
	2009	3 393 408	3 600	105 581	239 000	1 130	1 262	1 460
	2010	3 494 200	6 900	123 045	274 000	1 140	1 290	1 520
	2011	3 598 646	35 000	162 490	347 000	1 150	1 317	1 570
	2012	3 706 555	5 400	85 009	205 000	1 160	1 337	1 620
	2013	3 817 497	5 200	94 101	221 000	1 170	1 358	1 660
	2014	3 930 894	70 000	193 411	375 000	1 220	1 433	1 790
	2015	4 046 304	97 000	249 288	476 000	1 240	1 471	1 870
	2016	4 163 532	144 000	315 084	567 000	1 260	1 501	1 930
	2017	4 282 582	93 000	237 633	457 000	1 290	1 537	2 000
	2018	4 403 312	80 000	173 555	297 000	1 310	1 565	2 060
	2019	4 525 698	52 000	127 204	227 000	1 320	1 589	2 100
	2020	4 649 660	55 000	139 446	250 000	1 350	1 685	2 400
Mozambique	2000	17 711 925	6 997 000	8 615 872	10 600 000	42 400	45 482	48 900
	2001	18 221 884	7 468 000	9 145 042	11 050 000	42 300	45 549	49 000
	2002	18 764 147	7 704 000	9 390 868	11 360 000	39 700	42 733	46 100
	2003	19 331 097	7 653 000	9 338 510	11 290 000	36 400	39 238	42 300
	2004	19 910 549	7 383 000	9 000 844	10 870 000	31 700	34 157	36 900
	2005	20 493 927	6 950 000	8 507 688	10 240 000	27 700	29 860	32 200
	2006	21 080 108	6 808 000	8 339 418	10 120 000	26 100	28 172	30 400
	2007	21 673 319	6 726 000	8 293 266	10 020 000	25 000	27 031	29 200
	2008	22 276 596	6 833 000	8 448 036	10 240 000	24 400	26 418	28 600
	2009	22 894 718	6 977 000	8 599 988	10 470 000	24 500	26 467	28 800
	2010	23 531 567	7 110 000	8 749 153	10 670 000	24 400	26 605	29 100
	2011	24 187 500	7 272 000	8 901 620	10 770 000	23 300	25 707	28 600
	2012	24 862 673	7 478 000	9 125 970	11 040 000	22 100	24 925	28 300
	2013	25 560 752	7 620 000	9 365 613	11 340 000	21 900	25 213	29 500
	2014	26 286 192	7 670 000	9 357 690	11 390 000	21 000	24 815	29 800
	2015	27 042 001	7 691 000	9 404 450	11 360 000	19 800	23 939	29 600
	2016	27 829 930	7 715 000	9 505 893	11 550 000	18 800	23 186	29 600
	2017	28 649 007	7 565 000	9 399 765	11 580 000	17 100	21 640	28 500
	2018	29 496 009	7 448 000	9 298 943	11 480 000	14 900	19 321	26 200
	2019	30 366 043	7 230 000	9 230 756	11 620 000	14 500	19 189	26 900
	2020	31 255 435	7 209 000	10 007 802	13 430 000	16 100	23 766	38 400

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Namibia	2000	1 424 450	31 000	77 821	156 000	4	199	540
	2001	1 447 535	56 000	102 902	185 000	6	263	640
	2002	1 469 643	33 000	70 395	138 000	4	180	480
	2003	1 491 545	28 000	67 564	139 000	3	172	470
	2004	1 514 266	51 000	105 493	201 000	6	270	700
	2005	1 538 538	34 000	65 303	120 000	4	167	420
	2006	1 564 733	41 000	68 176	113 000	4	174	400
	2007	1 592 672	6 300	20 663	48 000	0	52	160
	2008	1 621 934	1 600	12 094	32 000	0	30	110
	2009	1 651 824	1 000	8 122	26 000	0	20	83
	2010	1 681 858	800	2 590	6 100	0	6	21
	2011	1 711 879	2 100	3 092	4 800	0	7	16
	2012	1 742 104	2 200	5 467	9 400	0	13	35
	2013	1 772 845	6 200	7 844	9 600	0	20	36
	2014	1 804 531	20 000	25 780	32 000	2	65	120
	2015	1 837 452	12 000	15 052	18 000	1	38	70
	2016	1 871 697	25 000	32 052	39 000	2	82	150
	2017	1 907 082	71 000	89 155	109 000	7	228	420
	2018	1 943 338	40 000	50 217	62 000	4	128	230
	2019	1 980 028	4 100	5 705	8 100	0	14	29
	2020	2 016 852	16 000	20 258	25 000	1	51	94
Niger	2000	11 331 561	2 161 000	4 115 946	7 215 000	24 000	25 663	27 500
	2001	11 751 364	2 228 000	4 150 655	7 126 000	23 300	25 034	26 900
	2002	12 189 988	2 170 000	3 987 705	6 762 000	20 400	21 946	23 600
	2003	12 647 983	2 082 000	3 727 026	6 187 000	19 300	20 714	22 300
	2004	13 125 914	2 278 000	3 928 085	6 429 000	18 500	19 908	21 400
	2005	13 624 474	2 458 000	4 188 975	6 568 000	18 200	19 595	21 100
	2006	14 143 969	2 532 000	4 311 636	6 910 000	17 500	19 018	20 600
	2007	14 685 404	2 688 000	4 605 268	7 349 000	18 000	19 662	21 400
	2008	15 250 913	3 229 000	5 370 546	8 492 000	18 700	20 669	22 700
	2009	15 843 131	3 644 000	6 013 190	9 523 000	20 300	22 734	25 400
	2010	16 464 025	4 094 000	6 821 838	10 630 000	21 500	24 628	28 100
	2011	17 114 770	4 440 000	7 327 134	11 430 000	21 700	25 514	29 700
	2012	17 795 209	4 599 000	7 646 932	11 870 000	21 200	25 584	30 500
	2013	18 504 287	4 500 000	7 709 350	12 260 000	19 900	24 706	30 300
	2014	19 240 182	4 583 000	7 875 100	12 790 000	18 300	23 360	29 500
	2015	20 001 663	4 612 000	8 078 973	13 300 000	16 500	21 498	28 100
	2016	20 788 789	4 554 000	8 057 065	13 300 000	15 300	20 478	27 600
	2017	21 602 388	4 361 000	7 870 403	13 160 000	13 200	18 087	25 100
	2018	22 442 831	4 176 000	7 741 136	13 340 000	11 600	16 340	23 400
	2019	23 310 719	3 992 000	7 612 769	13 150 000	11 500	16 391	24 200
	2020	24 206 636	3 807 000	7 845 520	14 670 000	10 800	17 435	31 200
Nigeria	2000	122 283 860	40 710 000	51 119 378	62 880 000	236 000	249 308	264 000
	2001	125 394 040	40 680 000	51 130 906	63 170 000	229 000	242 521	256 000
	2002	128 596 072	40 370 000	50 530 444	62 360 000	218 000	230 496	244 000
	2003	131 900 628	41 100 000	51 659 556	63 970 000	213 000	226 464	240 000
	2004	135 320 412	43 680 000	54 284 280	66 540 000	214 000	226 562	240 000
	2005	138 865 016	44 850 000	56 627 136	70 200 000	217 000	230 356	244 000
	2006	142 538 312	46 240 000	58 577 749	73 500 000	218 000	232 391	247 000
	2007	146 339 952	47 580 000	60 355 724	74 930 000	215 000	229 172	244 000
	2008	150 269 616	49 860 000	62 075 250	76 400 000	207 000	221 424	237 000
	2009	154 324 960	50 270 000	61 757 109	75 430 000	196 000	210 258	226 000
	2010	158 503 176	47 660 000	59 162 695	72 350 000	183 000	197 589	213 000
	2011	162 805 064	45 740 000	57 063 559	70 600 000	169 000	184 090	200 000
	2012	167 228 800	43 580 000	54 860 037	68 480 000	158 000	173 305	190 000
	2013	171 765 808	41 510 000	52 935 597	66 990 000	152 000	168 902	188 000
	2014	176 404 944	40 550 000	52 452 825	66 320 000	147 000	165 149	186 000
	2015	181 137 464	41 090 000	52 990 392	67 040 000	143 000	163 058	188 000
	2016	185 960 248	42 630 000	54 658 102	69 110 000	143 000	165 653	195 000
	2017	190 873 256	44 350 000	56 872 963	71 130 000	149 000	176 528	212 000
	2018	195 874 688	46 290 000	58 570 568	73 210 000	156 000	186 937	231 000
	2019	200 963 608	46 810 000	60 378 016	76 260 000	152 000	187 437	239 000
	2020	206 139 584	46 460 000	64 677 959	87 350 000	151 000	199 689	275 000

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Rwanda	2000	7 933 688	957 000	1 983 730	3 711 000	5 860	6 191	6 550
	2001	8 231 150	920 000	1 963 986	3 517 000	5 720	6 004	6 310
	2002	8 427 061	835 000	1 604 762	3 033 000	4 850	5 076	5 320
	2003	8 557 160	677 000	1 298 588	2 120 000	4 080	4 248	4 430
	2004	8 680 516	494 000	1 127 711	1 818 000	3 460	3 592	3 730
	2005	8 840 220	397 000	1 391 517	2 311 000	3 120	3 224	3 340
	2006	9 043 342	360 000	1 396 850	2 213 000	2 930	3 028	3 130
	2007	9 273 759	501 000	840 559	1 251 000	2 840	2 926	3 020
	2008	9 524 532	425 000	683 661	999 000	2 800	2 882	2 970
	2009	9 782 770	1 015 000	1 546 660	2 166 000	2 770	2 854	2 950
	2010	10 039 338	747 000	1 079 765	1 427 000	2 770	2 871	2 990
	2011	10 293 333	291 000	390 611	495 000	2 700	2 820	2 960
	2012	10 549 668	512 000	646 386	788 000	2 650	2 778	2 940
	2013	10 811 538	1 014 000	1 214 623	1 426 000	2 620	2 762	2 950
	2014	11 083 629	1 726 000	2 299 121	2 888 000	2 610	2 761	2 970
	2015	11 369 066	2 667 000	3 585 563	4 528 000	2 640	2 799	3 040
	2016	11 668 829	3 600 000	4 887 836	6 220 000	2 690	2 867	3 150
	2017	11 980 960	6 361 000	8 681 013	11 150 000	2 730	2 923	3 230
	2018	12 301 969	4 479 000	6 134 659	7 876 000	2 750	2 932	3 240
	2019	12 626 938	3 358 000	4 590 903	5 898 000	2 800	2 982	3 320
	2020	12 952 209	2 189 000	2 986 047	3 842 000	2 840	3 046	3 450
Sao Tome and Principe[1,2]	2000	142 264	–	31 975	–	–	254	–
	2001	144 760	–	42 086	–	–	248	–
	2002	147 450	–	50 586	–	–	321	–
	2003	150 405	–	42 656	–	–	193	–
	2004	153 736	–	46 486	–	–	169	–
	2005	157 472	–	18 139	–	–	85	–
	2006	161 676	–	5 146	–	–	26	–
	2007	166 297	–	2 421	–	–	3	–
	2008	171 122	–	6 258	–	–	16	–
	2009	175 877	–	6 182	–	–	23	–
	2010	180 372	–	2 740	–	–	14	–
	2011	184 521	–	8 442	–	–	19	–
	2012	188 394	–	12 550	–	–	7	–
	2013	192 076	–	9 243	–	–	11	–
	2014	195 727	–	1 754	–	–	0	–
	2015	199 439	–	2 056	–	–	0	–
	2016	203 221	–	2 238	–	–	1	–
	2017	207 086	–	2 239	–	–	1	–
	2018	211 032	–	2 937	–	–	0	–
	2019	215 048	–	2 732	–	–	0	–
	2020	219 161	–	1 933	–	–	0	–
Senegal	2000	9 797 731	1 764 000	3 000 479	3 963 000	6 100	6 336	6 600
	2001	10 036 102	669 000	2 746 324	4 053 000	6 160	6 404	6 670
	2002	10 283 694	505 000	2 299 641	3 797 000	5 450	5 645	5 860
	2003	10 541 470	726 000	2 137 402	3 448 000	4 870	5 034	5 210
	2004	10 810 086	308 000	1 502 581	2 869 000	4 290	4 419	4 560
	2005	11 090 123	441 000	1 389 197	2 295 000	3 960	4 066	4 180
	2006	11 382 272	442 000	1 380 317	2 459 000	3 840	3 943	4 050
	2007	11 687 078	330 000	1 160 145	2 155 000	3 770	3 869	3 970
	2008	12 004 700	396 000	628 766	914 000	3 810	3 904	4 010
	2009	12 335 092	276 000	405 713	552 000	3 820	3 917	4 020
	2010	12 678 143	536 000	766 710	1 020 000	3 810	3 908	4 010
	2011	13 033 814	447 000	637 322	850 000	3 780	3 873	3 970
	2012	13 401 990	493 000	713 894	970 000	3 710	3 792	3 880
	2013	13 782 429	605 000	851 522	1 136 000	3 750	3 834	3 930
	2014	14 174 740	399 000	546 694	717 000	3 860	3 961	4 070
	2015	14 578 450	687 000	1 010 929	1 373 000	3 920	4 042	4 180
	2016	14 993 514	469 000	684 131	924 000	3 920	4 056	4 210
	2017	15 419 354	558 000	805 707	1 068 000	4 000	4 163	4 350
	2018	15 854 324	728 000	1 047 659	1 406 000	4 190	4 400	4 670
	2019	16 296 362	457 000	672 221	912 000	4 230	4 470	4 780
	2020	16 743 930	568 000	836 014	1 134 000	4 270	4 602	5 160

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Sierra Leone	2000	4 584 570	1 490 000	2 154 734	3 031 000	13 600	14 506	15 500
	2001	4 754 069	1 557 000	2 248 700	3 139 000	14 200	15 093	16 100
	2002	4 965 770	1 558 000	2 309 209	3 286 000	13 700	14 567	15 500
	2003	5 201 074	1 541 000	2 309 575	3 338 000	12 700	13 478	14 400
	2004	5 433 995	1 612 000	2 328 946	3 291 000	11 200	11 968	12 700
	2005	5 645 629	1 573 000	2 305 873	3 313 000	10 300	10 999	11 700
	2006	5 829 240	1 504 000	2 285 588	3 312 000	9 960	10 638	11 300
	2007	5 989 641	1 613 000	2 381 690	3 412 000	10 300	10 976	11 700
	2008	6 133 599	1 897 000	2 608 564	3 490 000	11 800	12 609	13 500
	2009	6 272 735	2 126 000	2 804 315	3 633 000	13 200	14 149	15 200
	2010	6 415 636	2 193 000	2 874 660	3 749 000	14 000	15 137	16 300
	2011	6 563 238	2 206 000	2 896 554	3 744 000	13 800	14 951	16 200
	2012	6 712 586	2 266 000	2 883 917	3 598 000	12 900	14 051	15 300
	2013	6 863 975	2 263 000	2 842 351	3 508 000	11 600	12 628	13 800
	2014	7 017 153	2 204 000	2 812 427	3 517 000	10 100	11 151	12 300
	2015	7 171 909	2 242 000	2 809 720	3 499 000	9 700	10 818	12 100
	2016	7 328 846	2 281 000	2 830 700	3 465 000	8 330	9 394	10 600
	2017	7 488 427	2 188 000	2 767 811	3 456 000	7 380	8 435	9 650
	2018	7 650 149	2 102 000	2 768 412	3 591 000	6 120	7 089	8 220
	2019	7 813 207	1 843 000	2 714 910	3 868 000	5 860	6 904	8 160
	2020	7 976 985	1 393 000	2 617 968	4 451 000	6 190	8 054	10 300
South Africa[1,2]	2000	4 496 771	13 000	18 064	26 000	–	424	–
	2001	4 557 127	–	26 506	–	–	81	–
	2002	4 615 091	–	15 649	–	–	96	–
	2003	4 671 919	–	13 459	–	–	142	–
	2004	4 729 161	–	13 399	–	–	88	–
	2005	4 788 059	–	7 755	–	–	63	–
	2006	4 848 946	–	12 098	–	–	87	–
	2007	4 911 976	–	6 327	–	–	37	–
	2008	4 977 946	–	7 796	–	–	43	–
	2009	5 047 701	–	6 072	–	–	45	–
	2010	5 121 696	–	8 060	–	–	83	–
	2011	5 200 375	–	9 866	–	–	54	–
	2012	5 283 266	–	6 621	–	–	72	–
	2013	5 368 712	–	8 645	–	–	105	–
	2014	5 454 418	–	11 705	–	–	174	–
	2015	5 538 637	–	4 959	–	–	110	–
	2016	5 620 764	–	4 323	–	–	34	–
	2017	5 700 975	–	22 517	–	–	301	–
	2018	5 779 251	–	9 540	–	–	69	–
	2019	5 855 826	–	3 096	–	–	79	–
	2020	5 930 869	–	4 463	–	–	38	–
South Sudan[4]	2000	6 199 396	1 560 000	2 276 197	3 216 000	9 630	10 974	12 500
	2001	6 447 791	1 501 000	2 303 031	3 402 000	9 240	10 497	11 900
	2002	6 688 225	1 402 000	2 251 307	3 477 000	8 300	9 401	10 600
	2003	6 935 665	1 412 000	2 211 009	3 328 000	7 720	8 739	9 890
	2004	7 213 354	1 474 000	2 212 069	3 183 000	7 100	8 047	9 130
	2005	7 535 931	1 581 000	2 304 099	3 239 000	6 580	7 498	8 540
	2006	7 907 407	1 678 000	2 413 591	3 344 000	6 240	7 177	8 240
	2007	8 315 144	1 802 000	2 490 136	3 332 000	5 880	6 815	7 910
	2008	8 736 932	1 985 000	2 561 254	3 242 000	5 620	6 644	7 820
	2009	9 142 258	2 090 000	2 615 420	3 244 000	5 270	6 342	7 590
	2010	9 508 372	2 140 000	2 716 508	3 398 000	4 930	6 037	7 320
	2011	9 830 695	2 219 000	2 859 336	3 649 000	4 650	5 784	7 150
	2012	10 113 648	2 229 000	2 910 711	3 730 000	4 480	5 687	7 190
	2013	10 355 030	2 246 000	2 958 829	3 834 000	4 400	5 736	7 440
	2014	10 554 882	2 150 000	2 916 371	3 844 000	4 490	6 062	8 160
	2015	10 715 657	2 030 000	2 903 950	4 013 000	4 600	6 410	8 940
	2016	10 832 520	1 888 000	2 887 385	4 336 000	4 670	6 810	9 990
	2017	10 910 774	1 847 000	3 030 835	4 719 000	4 700	7 156	11 000
	2018	10 975 924	1 787 000	3 059 985	4 947 000	4 490	6 961	11 000
	2019	11 062 114	1 745 000	3 111 318	5 102 000	4 450	7 194	12 000
	2020	11 193 729	1 752 000	3 211 331	5 412 000	4 370	7 431	13 600

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Togo	2000	4 924 406	1 638 000	2 195 221	2 930 000	5 140	5 462	5 810
	2001	5 062 571	1 716 000	2 237 356	2 844 000	5 120	5 427	5 780
	2002	5 197 040	1 796 000	2 309 443	2 909 000	5 230	5 560	5 920
	2003	5 330 629	1 905 000	2 418 416	3 015 000	5 540	5 897	6 280
	2004	5 467 770	2 054 000	2 546 882	3 147 000	6 070	6 473	6 910
	2005	5 611 643	2 055 000	2 588 578	3 211 000	6 370	6 808	7 280
	2006	5 762 881	1 996 000	2 567 929	3 245 000	6 170	6 601	7 070
	2007	5 920 360	1 939 000	2 502 376	3 199 000	5 580	5 987	6 410
	2008	6 083 417	1 779 000	2 305 409	2 945 000	4 580	4 912	5 270
	2009	6 250 840	1 623 000	2 096 254	2 668 000	3 860	4 142	4 450
	2010	6 421 674	1 591 000	2 045 765	2 608 000	3 640	3 917	4 220
	2011	6 595 939	1 624 000	2 089 932	2 649 000	3 620	3 917	4 240
	2012	6 773 807	1 843 000	2 311 995	2 873 000	4 030	4 389	4 780
	2013	6 954 721	2 072 000	2 553 510	3 117 000	4 580	5 042	5 540
	2014	7 137 997	2 125 000	2 605 134	3 184 000	4 700	5 210	5 770
	2015	7 323 162	2 079 000	2 581 206	3 162 000	4 520	5 058	5 650
	2016	7 509 952	1 919 000	2 405 650	2 976 000	3 840	4 298	4 830
	2017	7 698 476	1 645 000	2 106 005	2 640 000	3 280	3 695	4 170
	2018	7 889 095	1 504 000	1 932 188	2 468 000	3 150	3 589	4 110
	2019	8 082 359	1 387 000	1 852 017	2 417 000	3 100	3 584	4 170
	2020	8 278 737	1 288 000	1 894 656	2 662 000	2 960	3 589	4 400
Uganda	2000	23 650 159	8 864 000	11 522 961	14 680 000	43 500	45 764	48 100
	2001	24 388 974	9 599 000	12 388 974	15 880 000	49 200	51 831	54 600
	2002	25 167 261	9 609 000	12 587 470	16 040 000	48 100	50 654	53 400
	2003	25 980 547	9 713 000	12 577 824	16 120 000	43 100	45 326	47 800
	2004	26 821 300	9 286 000	12 064 883	15 440 000	35 400	37 194	39 200
	2005	27 684 590	9 299 000	12 005 292	15 370 000	27 600	28 954	30 400
	2006	28 571 475	9 288 000	12 037 459	15 350 000	24 300	25 471	26 700
	2007	29 486 335	9 494 000	12 249 023	15 610 000	23 700	24 820	26 100
	2008	30 431 734	10 070 000	12 719 269	15 820 000	26 100	27 478	28 900
	2009	31 411 096	10 690 000	13 288 506	16 370 000	28 100	29 622	31 200
	2010	32 428 164	10 570 000	13 277 279	16 390 000	26 200	27 679	29 200
	2011	33 476 772	10 420 000	13 212 603	16 450 000	23 100	24 423	25 800
	2012	34 558 698	10 200 000	13 013 284	16 370 000	19 200	20 233	21 400
	2013	35 694 516	9 079 000	11 862 873	15 290 000	15 600	16 421	17 300
	2014	36 911 530	8 090 000	10 862 413	14 320 000	14 800	15 581	16 500
	2015	38 225 440	6 793 000	9 690 714	13 220 000	15 200	16 198	17 300
	2016	39 649 176	7 947 000	11 226 154	14 840 000	17 600	19 158	21 000
	2017	41 166 588	8 019 000	12 140 161	16 870 000	19 200	21 315	23 900
	2018	42 729 036	7 357 000	11 224 558	17 940 000	16 000	17 652	19 700
	2019	44 269 584	7 697 000	11 629 246	18 180 000	15 900	17 766	20 200
	2020	45 741 000	8 583 000	12 982 097	20 420 000	16 500	21 699	30 900
United Republic of Tanzania	2000	33 499 179	8 738 000	11 387 493	14 640 000	39 100	40 887	42 900
	2001	34 385 848	8 810 000	11 292 969	14 320 000	36 800	38 471	40 300
	2002	35 334 794	8 217 000	10 686 866	13 640 000	32 200	33 657	35 200
	2003	36 337 778	7 868 000	10 309 562	13 270 000	29 300	30 612	32 000
	2004	37 379 762	7 704 000	9 983 978	12 650 000	26 200	27 362	28 600
	2005	38 450 326	7 405 000	9 550 230	12 090 000	24 000	25 049	26 200
	2006	39 548 662	6 895 000	8 966 193	11 360 000	22 400	23 341	24 400
	2007	40 681 414	6 128 000	8 080 394	10 510 000	21 300	22 162	23 100
	2008	41 853 946	5 354 000	7 159 787	9 357 000	21 000	21 803	22 700
	2009	43 073 834	4 797 000	6 508 624	8 626 000	20 800	21 608	22 500
	2010	44 346 534	4 507 000	6 092 023	8 050 000	20 700	21 475	22 400
	2011	45 673 516	4 304 000	5 820 349	7 722 000	20 300	21 130	22 100
	2012	47 053 030	4 334 000	5 864 639	7 734 000	19 900	20 707	21 700
	2013	48 483 134	4 847 000	6 521 880	8 640 000	20 600	21 522	22 600
	2014	49 960 560	5 329 000	7 239 731	9 612 000	20 900	22 012	23 300
	2015	51 482 634	5 353 000	7 223 235	9 516 000	21 100	22 380	24 000
	2016	53 049 230	5 146 000	6 964 441	9 156 000	21 500	22 999	24 900
	2017	54 660 342	5 013 000	6 754 419	8 936 000	21 400	23 021	25 200
	2018	56 313 440	4 747 000	6 471 822	8 671 000	21 600	23 376	25 900
	2019	58 005 458	4 488 000	6 487 332	8 972 000	21 800	23 742	26 600
	2020	59 734 214	4 495 000	7 178 459	10 890 000	23 100	25 972	32 200

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AFRICAN								
Zambia	2000	10 415 942	3 169 000	4 136 290	5 302 000	12 500	13 121	13 800
	2001	10 692 197	3 402 000	4 321 294	5 436 000	12 500	13 075	13 800
	2002	10 971 704	3 153 000	4 075 482	5 181 000	11 100	11 675	12 200
	2003	11 256 740	2 992 000	3 923 240	5 023 000	9 970	10 421	10 900
	2004	11 550 641	2 654 000	3 485 908	4 514 000	8 630	9 007	9 420
	2005	11 856 244	2 372 000	3 064 227	3 895 000	7 580	7 899	8 250
	2006	12 173 518	2 091 000	2 708 524	3 464 000	6 990	7 262	7 560
	2007	12 502 958	1 864 000	2 418 532	3 083 000	6 600	6 851	7 110
	2008	12 848 531	1 713 000	2 217 141	2 805 000	6 470	6 708	6 950
	2009	13 215 142	1 708 000	2 183 393	2 757 000	6 470	6 701	6 950
	2010	13 605 986	1 792 000	2 292 275	2 884 000	6 540	6 770	7 030
	2011	14 023 199	1 980 000	2 531 355	3 178 000	6 820	7 076	7 360
	2012	14 465 148	2 265 000	2 898 072	3 641 000	7 100	7 388	7 700
	2013	14 926 551	2 656 000	3 397 484	4 278 000	7 490	7 827	8 190
	2014	15 399 793	2 799 000	3 577 658	4 480 000	7 840	8 222	8 650
	2015	15 879 370	2 720 000	3 482 707	4 356 000	7 660	8 070	8 520
	2016	16 363 449	2 566 000	3 370 359	4 336 000	7 550	7 988	8 480
	2017	16 853 608	2 191 000	3 122 084	4 284 000	7 350	7 825	8 380
	2018	17 351 714	2 090 000	3 103 175	4 395 000	7 310	7 862	8 530
	2019	17 861 034	2 077 000	3 114 941	4 548 000	7 360	7 996	8 790
	2020	18 383 956	2 199 000	3 435 936	5 158 000	7 820	8 946	10 400
Zimbabwe	2000	9 355 799	291 000	1 057 512	2 497 000	51	2 707	8 330
	2001	9 389 205	281 000	1 061 288	2 497 000	50	2 716	8 530
	2002	9 413 133	279 000	1 063 993	2 472 000	51	2 723	8 280
	2003	9 435 122	279 000	1 066 479	2 532 000	50	2 730	8 560
	2004	9 464 802	266 000	1 069 833	2 492 000	50	2 738	8 510
	2005	9 509 517	273 000	1 074 888	2 519 000	50	2 751	8 550
	2006	9 571 565	281 000	1 081 901	2 580 000	51	2 769	8 540
	2007	9 650 642	710 000	1 690 025	2 951 000	110	4 326	10 600
	2008	9 747 994	182 000	728 426	1 410 000	36	1 864	4 960
	2009	9 864 069	407 000	889 197	1 505 000	57	2 276	5 340
	2010	9 998 533	599 000	1 097 776	1 735 000	75	2 810	6 240
	2011	10 153 338	471 000	717 620	993 000	53	1 837	3 740
	2012	10 327 222	406 000	590 910	795 000	44	1 512	2 980
	2013	10 512 448	613 000	861 512	1 126 000	67	2 205	4 260
	2014	10 698 542	805 000	1 090 112	1 396 000	86	2 790	5 310
	2015	10 878 022	720 000	1 061 804	1 443 000	79	2 718	5 440
	2016	11 047 866	498 000	755 407	1 046 000	55	1 933	3 910
	2017	11 210 282	830 000	1 332 055	1 909 000	96	3 410	7 100
	2018	11 369 510	392 000	634 718	899 000	45	1 624	3 350
	2019	11 532 240	470 000	782 740	1 125 000	54	2 003	4 230
	2020	11 703 470	692 000	1 152 901	1 649 000	79	2 951	6 220
AMERICAS								
Argentina[1,2,3]	2000	184 353	–	440	–	–	0	–
	2001	186 378	–	215	–	–	0	–
	2002	188 408	–	125	–	–	0	–
	2003	190 439	–	124	–	–	1	–
	2004	192 459	–	116	–	–	0	–
	2005	194 464	–	231	–	–	0	–
	2006	196 449	–	172	–	–	0	–
	2007	198 421	–	328	–	–	0	–
	2008	200 400	–	105	–	–	0	–
	2009	202 413	–	92	–	–	0	–
	2010	204 478	–	54	–	–	0	–
	2011	206 602	–	0	–	–	0	–
	2012	208 775	–	0	–	–	0	–
	2013	210 980	–	0	–	–	0	–
	2014	213 187	–	0	–	–	0	–
	2015	215 377	–	0	–	–	0	–
	2016	217 542	–	0	–	–	0	–
	2017	219 685	–	0	–	–	0	–
	2018	221 805	–	0	–	–	0	–
	2019	223 903	–	0	–	–	0	–
	2020	225 978	–	0	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AMERICAS								
Belize[1,2]	2000	170 643	–	1 486	–	–	0	–
	2001	175 996	–	1 162	–	–	0	–
	2002	181 047	–	1 134	–	–	0	–
	2003	185 905	–	1 324	–	–	0	–
	2004	190 796	–	1 066	–	–	1	–
	2005	195 820	–	1 549	–	–	0	–
	2006	201 023	–	844	–	–	1	–
	2007	206 331	–	845	–	–	0	–
	2008	211 707	–	540	–	–	0	–
	2009	217 111	–	256	–	–	0	–
	2010	222 500	–	150	–	–	0	–
	2011	227 862	–	72	–	–	0	–
	2012	233 220	–	33	–	–	0	–
	2013	238 537	–	20	–	–	0	–
	2014	243 822	–	19	–	–	0	–
	2015	249 038	–	9	–	–	0	–
	2016	254 195	–	4	–	–	0	–
	2017	259 284	–	7	–	–	0	–
	2018	264 318	–	3	–	–	0	–
	2019	269 342	–	0	–	–	0	–
	2020	274 358	–	0	–	–	0	–
Bolivia (Plurinational State of)	2000	3 819 116	34 000	45 647	58 000	7	24	44
	2001	3 892 599	17 000	22 330	28 000	3	9	18
	2002	3 966 356	15 000	19 768	25 000	3	9	16
	2003	4 040 303	22 000	27 568	34 000	4	12	21
	2004	4 114 353	16 000	20 206	25 000	3	9	16
	2005	4 188 417	21 000	27 296	33 000	4	12	22
	2006	4 262 433	20 000	25 742	32 000	4	14	25
	2007	4 336 376	15 000	19 799	24 000	3	11	20
	2008	4 410 333	10 000	13 210	16 000	2	6	12
	2009	4 484 432	10 000	13 344	16 000	2	6	11
	2010	4 558 747	15 000	18 659	23 000	3	10	17
	2011	4 633 309	7 600	9 680	12 000	1	4	7
	2012	4 708 040	7 800	10 048	12 000	1	4	7
	2013	4 782 759	8 300	10 906	14 000	1	6	12
	2014	4 857 225	8 400	10 994	14 000	1	4	8
	2015	4 931 271	7 300	9 315	11 000	1	3	6
	2016	5 004 806	5 900	7 510	9 200	0	2	5
	2017	5 077 861	4 800	6 195	7 600	0	2	4
	2018	5 150 579	5 700	7 239	8 900	0	2	4
	2019	5 223 148	9 900	12 654	16 000	1	4	8
	2020	5 295 703	13 000	16 506	20 000	2	6	11
Brazil[2]	2000	35 482 438	644 000	760 760	886 000	–	245	–
	2001	35 970 799	407 000	467 114	536 000	–	142	–
	2002	36 446 116	363 000	407 200	457 000	–	95	–
	2003	36 907 274	425 000	465 651	514 000	–	104	–
	2004	37 353 321	481 000	516 739	562 000	–	102	–
	2005	37 783 803	624 000	658 276	707 000	–	123	–
	2006	38 197 972	561 000	584 183	624 000	–	110	–
	2007	38 596 477	478 000	534 516	579 000	–	93	–
	2008	38 982 161	322 000	335 694	358 000	–	68	–
	2009	39 358 958	316 000	328 858	350 000	–	85	–
	2010	39 729 868	349 000	390 023	422 000	–	76	–
	2011	40 095 452	273 000	284 024	303 000	–	70	–
	2012	40 455 322	248 000	258 095	275 000	–	60	–
	2013	40 810 285	177 000	197 679	214 000	–	40	–
	2014	41 161 038	141 000	146 599	156 000	–	36	–
	2015	41 507 764	147 000	164 589	178 000	–	35	–
	2016	41 851 100	127 000	132 022	141 000	–	35	–
	2017	42 190 269	198 000	220 912	239 000	–	34	–
	2018	42 522 271	196 000	218 813	237 000	–	56	–
	2019	42 843 057	160 000	178 652	193 000	–	36	–
	2020	43 149 559	150 000	167 097	181 000	–	42	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AMERICAS								
Colombia[2]	2000	8 773 678	154 000	210 720	270 000	–	124	–
	2001	8 912 266	246 000	333 024	423 000	–	168	–
	2002	9 049 394	218 000	291 432	367 000	–	162	–
	2003	9 184 115	192 000	254 224	318 000	–	118	–
	2004	9 315 195	151 000	197 464	246 000	–	126	–
	2005	9 441 780	129 000	166 899	206 000	–	87	–
	2006	9 564 247	127 000	165 418	205 000	–	77	–
	2007	9 683 047	133 000	173 191	216 000	–	68	–
	2008	9 797 609	84 000	109 966	137 000	–	54	–
	2009	9 907 215	84 000	110 555	138 000	–	28	–
	2010	10 011 853	125 000	164 564	205 000	–	42	–
	2011	10 109 278	68 000	90 130	113 000	–	23	–
	2012	10 200 703	64 000	84 176	105 000	–	24	–
	2013	10 293 636	55 000	72 346	90 000	–	10	–
	2014	10 398 179	43 000	57 024	71 000	–	17	–
	2015	10 520 599	63 000	84 841	109 000	–	18	–
	2016	10 665 474	88 000	115 550	145 000	–	36	–
	2017	10 828 150	60 000	80 963	104 000	–	19	–
	2018	10 994 461	69 000	93 827	121 000	–	9	–
	2019	11 144 649	89 000	119 761	154 000	–	3	–
	2020	11 264 961	81 000	105 995	133 000	–	5	–
Costa Rica[1,2]	2000	1 386 829	–	1 879	–	–	0	–
	2001	1 411 925	–	1 363	–	–	0	–
	2002	1 435 322	–	1 021	–	–	0	–
	2003	1 457 418	–	718	–	–	0	–
	2004	1 478 804	–	1 289	–	–	0	–
	2005	1 499 926	–	3 541	–	–	0	–
	2006	1 520 897	–	2 903	–	–	0	–
	2007	1 541 619	–	1 223	–	–	0	–
	2008	1 562 093	–	966	–	–	0	–
	2009	1 582 258	–	262	–	–	1	–
	2010	1 602 079	–	110	–	–	0	–
	2011	1 621 580	–	10	–	–	0	–
	2012	1 640 801	–	6	–	–	0	–
	2013	1 659 738	–	0	–	–	0	–
	2014	1 678 386	–	0	–	–	0	–
	2015	1 696 731	–	0	–	–	0	–
	2016	1 714 767	–	4	–	–	0	–
	2017	1 732 484	–	12	–	–	0	–
	2018	1 749 805	–	70	–	–	0	–
	2019	1 766 646	–	95	–	–	0	–
	2020	1 782 939	–	90	–	–	0	–
Dominican Republic[2]	2000	4 666 170	1 300	1 524	1 800	–	6	–
	2001	4 736 280	1 100	1 315	1 600	–	17	–
	2002	4 805 890	1 400	1 685	2 000	–	11	–
	2003	4 874 931	1 600	1 983	2 400	–	12	–
	2004	4 943 303	2 500	3 046	3 600	–	16	–
	2005	5 010 953	4 000	4 950	5 900	–	16	–
	2006	5 077 833	3 700	4 535	5 400	–	10	–
	2007	5 144 028	2 900	3 478	4 100	–	17	–
	2008	5 209 699	1 900	2 365	2 800	–	11	–
	2009	5 275 057	1 700	2 115	2 500	–	14	–
	2010	5 340 264	2 600	3 202	3 800	–	15	–
	2011	5 405 317	1 700	2 088	2 500	–	10	–
	2012	5 470 147	1 000	1 232	1 500	–	8	–
	2013	5 534 763	500	613	730	–	5	–
	2014	5 599 185	480	566	660	–	4	–
	2015	5 663 352	660	778	900	–	3	–
	2016	5 727 282	720	851	990	–	1	–
	2017	5 790 831	360	420	490	–	1	–
	2018	5 853 645	450	534	620	–	1	–
	2019	5 915 232	1 400	1 592	1 800	–	4	–
	2020	5 975 242	870	1 019	1 200	–	2	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AMERICAS								
Ecuador[1,2]	2000	369 527	–	104 528	–	–	66	–
	2001	376 333	–	108 903	–	–	84	–
	2002	383 000	–	86 757	–	–	64	–
	2003	389 592	–	52 065	–	–	46	–
	2004	396 198	–	28 730	–	–	37	–
	2005	402 884	–	17 050	–	–	22	–
	2006	409 690	–	9 863	–	–	9	–
	2007	416 601	–	8 194	–	–	8	–
	2008	423 571	–	4 891	–	–	5	–
	2009	430 526	–	4 126	–	–	6	–
	2010	437 423	–	1 888	–	–	0	–
	2011	444 206	–	1 218	–	–	0	–
	2012	450 915	–	544	–	–	0	–
	2013	457 715	–	368	–	–	0	–
	2014	464 836	–	242	–	–	0	–
	2015	472 418	–	618	–	–	0	–
	2016	480 551	–	1 191	–	–	0	–
	2017	489 125	–	1 275	–	–	0	–
	2018	497 838	–	1 653	–	–	0	–
	2019	506 268	–	1 803	–	–	0	–
	2020	514 118	–	1 934	–	–	3	–
El Salvador[1,2,3]	2000	1 195 249	–	753	–	–	0	–
	2001	1 203 181	–	362	–	–	0	–
	2002	1 210 314	–	117	–	–	0	–
	2003	1 216 797	–	85	–	–	0	–
	2004	1 222 831	–	112	–	–	0	–
	2005	1 228 581	–	67	–	–	0	–
	2006	1 234 117	–	49	–	–	0	–
	2007	1 239 479	–	40	–	–	0	–
	2008	1 244 748	–	33	–	–	0	–
	2009	1 250 008	–	21	–	–	0	–
	2010	1 255 327	–	17	–	–	0	–
	2011	1 260 745	–	7	–	–	0	–
	2012	1 266 298	–	13	–	–	0	–
	2013	1 272 013	–	6	–	–	0	–
	2014	1 277 910	–	6	–	–	0	–
	2015	1 283 999	–	5	–	–	0	–
	2016	1 290 295	–	12	–	–	0	–
	2017	1 296 789	–	0	–	–	0	–
	2018	1 303 410	–	0	–	–	0	–
	2019	1 310 070	–	0	–	–	0	–
	2020	1 316 698	–	0	–	–	0	–
French Guiana	2000	90 184	3 900	4 428	5 300	0	8	15
	2001	94 057	4 000	4 554	5 400	0	9	16
	2002	99 037	3 800	4 348	5 100	0	7	13
	2003	103 463	4 000	4 540	5 400	0	9	16
	2004	107 889	3 200	3 580	4 200	0	7	12
	2005	112 315	3 600	4 015	4 700	0	5	9
	2006	116 188	4 200	4 796	5 600	0	5	10
	2007	119 508	5 000	5 647	6 600	0	5	9
	2008	122 828	3 500	3 884	4 500	0	4	6
	2009	126 147	3 600	4 051	4 700	0	3	7
	2010	128 914	1 700	2 092	2 600	0	4	7
	2011	131 680	1 300	1 413	1 600	0	2	4
	2012	135 000	940	1 054	1 200	0	2	3
	2013	137 766	910	1 025	1 200	0	1	3
	2014	141 086	480	541	620	0	0	1
	2015	144 406	410	462	530	–	0	–
	2016	148 279	240	268	310	–	0	–
	2017	152 152	610	685	790	–	0	–
	2018	156 578	570	640	740	–	0	–
	2019	161 004	220	248	290	–	0	–
	2020	165 430	140	163	190	–	0	–

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WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AMERICAS								
Guatemala	2000	8 795 379	56 000	63 676	76 000	10	27	45
	2001	9 002 376	37 000	42 680	51 000	7	18	30
	2002	9 216 708	37 000	42 213	50 000	7	20	33
	2003	9 436 861	32 000	36 810	44 000	6	16	27
	2004	9 660 655	30 000	34 124	40 000	5	14	24
	2005	9 886 453	41 000	46 537	54 000	7	19	32
	2006	10 113 679	32 000	36 610	43 000	6	15	25
	2007	10 342 650	16 000	17 992	21 000	2	6	11
	2008	10 573 726	7 500	8 421	9 800	1	3	5
	2009	10 807 624	7 400	8 285	9 600	1	3	5
	2010	11 044 796	7 800	9 468	12 000	1	3	6
	2011	11 285 142	7 100	7 968	9 200	1	2	5
	2012	11 528 212	5 600	6 262	7 300	0	2	3
	2013	11 773 597	6 500	7 282	8 400	0	2	4
	2014	12 020 770	5 100	5 764	6 600	0	2	3
	2015	12 269 280	5 800	6 482	7 500	0	2	4
	2016	12 518 897	5 200	5 857	6 800	0	2	3
	2017	12 769 455	4 300	4 832	5 600	0	1	3
	2018	13 020 750	3 100	3 541	4 100	0	1	2
	2019	13 272 607	2 200	2 428	2 800	0	0	1
	2020	13 524 819	1 100	1 241	1 400	–	0	–
Guyana	2000	746 718	28 000	33 628	40 000	3	50	86
	2001	745 206	31 000	37 974	45 000	4	52	91
	2002	744 789	25 000	30 656	37 000	3	42	74
	2003	745 142	32 000	38 681	46 000	4	53	92
	2004	745 737	33 000	40 416	49 000	5	51	89
	2005	746 156	45 000	54 583	65 000	7	69	120
	2006	746 335	24 000	27 629	32 000	3	37	63
	2007	746 477	13 000	15 697	18 000	1	19	32
	2008	746 815	14 000	16 365	19 000	1	23	39
	2009	747 718	14 000	17 877	22 000	1	28	48
	2010	749 430	24 000	29 631	36 000	3	51	90
	2011	752 029	32 000	38 863	46 000	4	72	130
	2012	755 388	36 000	43 572	52 000	5	76	130
	2013	759 281	43 000	57 459	79 000	7	90	170
	2014	763 371	17 000	22 310	31 000	2	27	53
	2015	767 433	14 000	18 030	25 000	2	22	41
	2016	771 363	14 000	19 317	26 000	1	24	46
	2017	775 218	19 000	25 167	34 000	3	33	63
	2018	779 007	23 000	30 769	42 000	4	38	74
	2019	782 775	22 000	26 307	31 000	3	30	50
	2020	786 559	19 000	22 159	26 000	2	28	47
Haiti	2000	7 561 729	42 000	72 509	117 000	5	185	420
	2001	7 691 283	42 000	73 751	120 000	5	188	430
	2002	7 821 130	43 000	74 996	121 000	5	191	430
	2003	7 951 534	44 000	76 247	124 000	5	195	440
	2004	8 082 844	44 000	77 506	126 000	5	198	450
	2005	8 215 255	45 000	78 775	127 000	5	201	460
	2006	8 348 816	47 000	81 199	129 000	5	207	470
	2007	8 483 323	44 000	73 292	116 000	5	187	420
	2008	8 618 438	53 000	89 554	140 000	6	229	510
	2009	8 753 770	48 000	83 939	137 000	5	214	480
	2010	8 888 919	48 000	85 235	138 000	6	218	490
	2011	9 023 827	50 000	81 483	127 000	6	208	460
	2012	9 158 378	40 000	65 545	101 000	4	167	370
	2013	9 292 168	38 000	62 551	96 000	4	160	350
	2014	9 424 693	22 000	33 119	45 000	2	84	170
	2015	9 555 609	21 000	32 185	44 000	2	82	160
	2016	9 684 651	24 000	36 279	49 000	2	92	190
	2017	9 811 866	22 000	33 122	45 000	2	84	170
	2018	9 937 674	11 000	16 000	22 000	1	40	81
	2019	10 062 660	12 000	17 703	24 000	1	45	91
	2020	10 187 251	25 000	38 078	51 000	2	97	200

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AMERICAS								
Honduras	2000	5 955 191	38 000	51 498	66 000	8	23	42
	2001	6 115 881	26 000	35 405	45 000	5	15	28
	2002	6 276 530	18 000	25 251	32 000	3	11	20
	2003	6 436 907	15 000	20 706	27 000	3	9	16
	2004	6 596 898	18 000	25 353	33 000	3	12	21
	2005	6 756 345	17 000	23 468	30 000	3	11	20
	2006	6 915 144	13 000	17 218	22 000	2	8	15
	2007	7 072 957	11 000	14 962	19 000	2	7	13
	2008	7 229 149	8 900	11 741	15 000	1	6	10
	2009	7 382 976	9 900	12 900	16 000	1	8	15
	2010	7 533 961	10 000	13 308	16 000	2	7	13
	2011	7 681 790	8 100	10 269	13 000	1	5	9
	2012	7 826 738	6 800	8 680	11 000	1	4	7
	2013	7 969 703	5 700	7 231	8 800	1	5	9
	2014	8 111 963	3 600	4 553	5 600	0	3	5
	2015	8 254 468	3 800	4 792	5 800	0	4	7
	2016	8 397 485	4 300	5 519	6 800	0	5	9
	2017	8 540 802	1 300	1 706	2 100	0	0	1
	2018	8 684 378	710	933	1 200	–	0	–
	2019	8 828 030	350	444	550	–	0	–
	2020	8 971 593	860	1 098	1 300	0	0	1
Mexico[1,2]	2000	2 096 676	–	7 390	–	–	0	–
	2001	2 126 320	–	4 996	–	–	0	–
	2002	2 155 717	–	4 624	–	–	0	–
	2003	2 185 317	–	3 819	–	–	0	–
	2004	2 215 716	–	3 406	–	–	0	–
	2005	2 247 310	–	2 967	–	–	0	–
	2006	2 280 275	–	2 514	–	–	0	–
	2007	2 314 414	–	2 361	–	–	0	–
	2008	2 349 283	–	2 357	–	–	0	–
	2009	2 384 234	–	2 703	–	–	0	–
	2010	2 418 771	–	1 226	–	–	0	–
	2011	2 452 743	–	1 124	–	–	0	–
	2012	2 486 212	–	833	–	–	0	–
	2013	2 519 135	–	495	–	–	0	–
	2014	2 551 528	–	656	–	–	0	–
	2015	2 583 394	–	517	–	–	0	–
	2016	2 614 667	–	551	–	–	0	–
	2017	2 645 279	–	736	–	–	0	–
	2018	2 675 244	–	803	–	–	0	–
	2019	2 704 601	–	618	–	–	0	–
	2020	2 733 374	–	356	–	–	0	–
Nicaragua[2]	2000	2 212 753	25 000	29 953	35 000	–	4	–
	2001	2 245 952	11 000	13 275	16 000	–	2	–
	2002	2 278 234	8 100	9 745	11 000	–	8	–
	2003	2 310 008	7 100	8 507	10 000	–	7	–
	2004	2 341 791	7 300	8 735	10 000	–	1	–
	2005	2 373 989	7 000	8 412	9 900	–	6	–
	2006	2 406 754	3 300	3 943	4 600	–	1	–
	2007	2 440 063	1 400	1 717	2 000	–	0	–
	2008	2 473 835	800	965	1 100	–	0	–
	2009	2 507 927	640	772	910	–	0	–
	2010	2 542 201	730	876	1 000	–	1	–
	2011	2 576 674	970	1 171	1 400	–	1	–
	2012	2 611 374	1 300	1 564	1 800	–	2	–
	2013	2 646 264	1 200	1 471	1 700	–	0	–
	2014	2 681 303	1 200	1 446	1 700	–	0	–
	2015	2 716 441	2 400	2 886	3 400	–	1	–
	2016	2 751 682	6 600	7 937	9 400	–	2	–
	2017	2 786 983	12 000	13 866	16 000	–	1	–
	2018	2 822 191	17 000	20 158	24 000	–	3	–
	2019	2 857 112	14 000	16 717	20 000	–	1	–
	2020	2 891 617	28 000	33 244	39 000	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AMERICAS								
Panama[2]	2000	2 931 635	1 000	1 091	1 200	–	1	–
	2001	2 989 011	940	977	1 000	–	1	–
	2002	3 046 625	2 300	2 363	2 500	–	2	–
	2003	3 104 537	4 600	4 739	5 100	–	4	–
	2004	3 162 873	5 200	5 365	5 700	–	2	–
	2005	3 221 756	3 700	3 861	4 100	–	1	–
	2006	3 281 206	1 700	1 751	1 900	–	1	–
	2007	3 341 184	1 300	1 349	1 400	–	1	–
	2008	3 401 681	750	783	830	–	1	–
	2009	3 462 639	790	819	870	–	0	–
	2010	3 524 048	420	440	470	–	1	–
	2011	3 585 758	360	372	400	–	0	–
	2012	3 647 825	860	888	950	–	1	–
	2013	3 710 526	710	740	790	–	0	–
	2014	3 774 245	960	1 005	1 100	–	0	–
	2015	3 839 236	550	575	610	–	0	–
	2016	3 905 585	780	809	860	–	0	–
	2017	3 973 006	760	801	860	–	0	–
	2018	4 040 827	710	789	850	–	0	–
	2019	4 108 133	1 600	1 663	1 800	–	0	–
	2020	4 174 236	2 200	2 306	2 500	–	0	–
Paraguay[1,2,3]	2000	191 635	–	6 853	–	–	0	–
	2001	195 423	–	2 710	–	–	0	–
	2002	199 150	–	2 778	–	–	0	–
	2003	202 787	–	1 392	–	–	0	–
	2004	206 300	–	694	–	–	0	–
	2005	209 667	–	376	–	–	0	–
	2006	212 875	–	823	–	–	0	–
	2007	215 943	–	1 341	–	–	0	–
	2008	218 926	–	341	–	–	0	–
	2009	221 902	–	80	–	–	0	–
	2010	224 928	–	20	–	–	0	–
	2011	228 023	–	1	–	–	0	–
	2012	231 174	–	0	–	–	0	–
	2013	234 369	–	0	–	–	0	–
	2014	237 582	–	0	–	–	0	–
	2015	240 794	–	0	–	–	0	–
	2016	244 003	–	0	–	–	0	–
	2017	247 214	–	0	–	–	0	–
	2018	250 418	–	0	–	–	0	–
	2019	253 607	–	0	–	–	0	–
	2020	256 771	–	0	–	–	0	–
Peru	2000	10 392 407	73 000	94 271	117 000	13	96	170
	2001	10 525 688	83 000	105 067	128 000	16	89	150
	2002	10 644 174	105 000	128 960	154 000	20	108	180
	2003	10 750 711	93 000	111 816	132 000	17	95	160
	2004	10 849 691	98 000	115 387	134 000	18	98	160
	2005	10 944 705	92 000	108 134	126 000	17	80	130
	2006	11 037 363	68 000	80 054	93 000	13	52	85
	2007	11 128 088	53 000	62 633	73 000	10	43	71
	2008	11 218 137	47 000	54 608	63 000	8	34	56
	2009	11 308 606	45 000	52 035	60 000	8	31	51
	2010	11 400 911	33 000	37 847	43 000	6	20	32
	2011	11 493 851	26 000	30 924	36 000	5	19	31
	2012	11 589 086	33 000	40 437	48 000	6	24	41
	2013	11 694 030	51 000	62 669	75 000	9	45	76
	2014	11 818 294	69 000	83 936	100 000	13	60	100
	2015	11 967 687	85 000	116 308	162 000	18	94	180
	2016	12 146 509	60 000	72 836	87 000	11	69	120
	2017	12 350 062	60 000	72 557	87 000	11	64	110
	2018	12 564 103	48 000	58 455	70 000	9	48	80
	2019	12 768 809	33 000	45 729	64 000	6	35	66
	2020	12 950 022	22 000	29 745	41 000	4	23	44

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
AMERICAS								
Suriname[1,2]	2000	69 558	–	11 361	–	–	24	–
	2001	70 389	–	16 003	–	–	23	–
	2002	71 225	–	12 837	–	–	15	–
	2003	72 068	–	10 982	–	–	18	–
	2004	72 916	–	8 378	–	–	7	–
	2005	73 770	–	9 131	–	–	1	–
	2006	74 631	–	3 289	–	–	1	–
	2007	75 501	–	1 104	–	–	1	–
	2008	76 378	–	2 086	–	–	0	–
	2009	77 263	–	2 499	–	–	0	–
	2010	78 151	–	1 771	–	–	1	–
	2011	79 045	–	795	–	–	1	–
	2012	79 942	–	569	–	–	0	–
	2013	80 835	–	729	–	–	1	–
	2014	81 719	–	401	–	–	1	–
	2015	82 584	–	81	–	–	0	–
	2016	83 433	–	76	–	–	0	–
	2017	84 262	–	19	–	–	1	–
	2018	85 073	–	29	–	–	0	–
	2019	85 867	–	95	–	–	0	–
	2020	86 645	–	147	–	–	0	–
Venezuela (Bolivarian Republic of)	2000	12 096 224	31 000	35 517	42 000	5	26	44
	2001	12 323 235	21 000	23 834	28 000	3	15	25
	2002	12 550 203	31 000	35 029	41 000	5	19	31
	2003	12 775 812	33 000	37 510	44 000	5	27	45
	2004	12 998 297	49 000	54 984	65 000	9	30	51
	2005	13 216 222	47 000	52 979	62 000	8	34	55
	2006	13 425 095	39 000	43 638	51 000	6	33	53
	2007	13 623 800	44 000	48 834	57 000	7	37	61
	2008	13 817 913	33 000	37 482	44 000	5	26	43
	2009	14 015 505	37 000	41 927	49 000	6	36	58
	2010	14 219 971	48 000	57 905	73 000	8	53	91
	2011	14 443 936	48 000	53 565	62 000	8	47	76
	2012	14 680 413	55 000	61 850	72 000	9	56	92
	2013	14 890 523	82 000	92 159	107 000	13	105	170
	2014	15 021 486	95 000	106 079	122 000	16	110	180
	2015	15 040 913	142 000	159 661	184 000	25	150	240
	2016	14 925 624	251 000	281 897	324 000	45	261	420
	2017	14 701 240	429 000	482 617	557 000	78	424	690
	2018	14 443 558	422 000	475 212	549 000	77	373	600
	2019	14 257 914	415 000	467 421	539 000	77	351	570
	2020	14 217 971	206 000	231 743	267 000	37	203	330
EASTERN MEDITERRANEAN								
Afghanistan	2000	16 017 398	843 000	1 312 939	2 022 000	210	965	2 030
	2001	16 654 885	849 000	1 312 939	2 007 000	210	965	2 020
	2002	17 420 902	916 000	1 382 972	2 106 000	230	1 133	2 210
	2003	18 253 452	810 000	1 242 906	1 916 000	210	798	1 540
	2004	19 059 579	480 000	716 954	1 072 000	120	350	670
	2005	19 774 570	315 000	535 477	860 000	86	259	520
	2006	20 374 865	221 000	418 216	717 000	64	222	470
	2007	20 889 368	238 000	452 626	776 000	72	236	500
	2008	21 368 611	211 000	402 909	709 000	61	198	410
	2009	21 887 000	149 000	274 981	455 000	43	139	290
	2010	22 496 483	166 000	292 015	459 000	48	165	320
	2011	23 214 801	200 000	362 319	571 000	56	192	380
	2012	24 019 501	122 000	220 653	356 000	30	92	190
	2013	24 873 724	143 000	279 634	446 000	41	129	260
	2014	25 722 550	221 000	319 142	443 000	53	152	280
	2015	26 526 347	253 000	368 235	514 000	63	174	320
	2016	27 273 591	532 000	733 205	985 000	120	351	620
	2017	27 977 406	608 000	798 871	1 022 000	150	378	660
	2018	28 652 489	485 000	633 500	810 000	110	292	500
	2019	29 322 964	319 000	413 480	525 000	65	170	300
	2020	30 006 352	195 000	253 158	321 000	41	110	190

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WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EASTERN MEDITERRANEAN								
Djibouti[1]	2000	538 125	1 400	1 832	2 300	0	4	9
	2001	549 705	1 400	1 872	2 300	0	4	9
	2002	560 150	1 500	1 907	2 300	0	4	9
	2003	569 668	1 500	1 940	2 400	0	4	9
	2004	578 637	1 500	1 970	2 400	0	5	9
	2005	587 373	1 500	2 000	2 500	0	5	9
	2006	595 851	1 600	2 029	2 500	0	5	9
	2007	604 027	1 600	2 057	2 500	0	5	10
	2008	612 205	1 600	2 084	2 600	0	5	10
	2009	620 798	–	2 686	–	0	6	10
	2010	630 077	–	1 010	–	0	2	4
	2011	640 184	1 700	2 180	2 700	0	5	10
	2012	651 032	1 700	2 217	2 700	0	5	10
	2013	662 401	–	1 684	–	0	4	6
	2014	673 958	–	9 439	–	0	24	37
	2015	685 425	–	9 473	–	0	24	37
	2016	696 763	–	13 822	–	1	30	48
	2017	707 999	–	14 671	–	0	25	39
	2018	719 115	–	24 845	–	2	43	67
	2019	730 089	–	49 402	–	5	97	150
	2020	740 922	–	72 332	–	9	126	200
Egypt[1,2]	2000	68 831 561	–	0	–	–	0	–
	2001	70 152 662	–	0	–	–	0	–
	2002	71 485 044	–	0	–	–	0	–
	2003	72 826 102	–	0	–	–	0	–
	2004	74 172 073	–	0	–	–	0	–
	2005	75 523 576	–	0	–	–	0	–
	2006	76 873 670	–	0	–	–	0	–
	2007	78 232 124	–	0	–	–	0	–
	2008	79 636 081	–	0	–	–	0	–
	2009	81 134 789	–	0	–	–	0	–
	2010	82 761 244	–	0	–	–	0	–
	2011	84 529 251	–	0	–	–	0	–
	2012	86 422 240	–	0	–	–	0	–
	2013	88 404 652	–	0	–	–	0	–
	2014	90 424 668	–	0	–	–	0	–
	2015	92 442 549	–	0	–	–	0	–
	2016	94 447 071	–	0	–	–	0	–
	2017	96 442 590	–	0	–	–	0	–
	2018	98 423 602	–	0	–	–	0	–
	2019	100 388 076	–	0	–	–	0	–
	2020	102 334 403	–	0	–	–	0	–
Iran (Islamic Republic of)[1,2]	2000	670 014	–	19 716	–	–	4	–
	2001	678 445	–	19 303	–	–	2	–
	2002	686 977	–	15 558	–	–	2	–
	2003	695 535	–	23 562	–	–	5	–
	2004	703 992	–	13 821	–	–	1	–
	2005	712 273	–	18 966	–	–	1	–
	2006	720 364	–	15 909	–	–	1	–
	2007	728 345	–	15 712	–	–	3	–
	2008	736 351	–	8 349	–	–	3	–
	2009	744 562	–	4 345	–	–	0	–
	2010	753 115	–	1 847	–	–	0	–
	2011	762 022	–	1 632	–	–	0	–
	2012	771 262	–	756	–	–	0	–
	2013	780 880	–	479	–	–	0	–
	2014	790 925	–	358	–	–	0	–
	2015	801 405	–	167	–	–	1	–
	2016	812 348	–	81	–	–	0	–
	2017	823 680	–	57	–	–	1	–
	2018	835 180	–	0	–	–	0	–
	2019	846 550	–	0	–	–	0	–
	2020	857 567	–	0	–	–	0	–

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WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EASTERN MEDITERRANEAN								
Iraq[1,2]	2000	3 054 686	–	1 860	–	–	0	–
	2001	3 147 063	–	1 265	–	–	0	–
	2002	3 241 149	–	952	–	–	0	–
	2003	3 333 785	–	347	–	–	0	–
	2004	3 420 798	–	155	–	–	0	–
	2005	3 499 896	–	47	–	–	0	–
	2006	3 568 256	–	24	–	–	0	–
	2007	3 628 461	–	3	–	–	0	–
	2008	3 690 146	–	6	–	–	0	–
	2009	3 766 510	–	0	–	–	0	–
	2010	3 866 457	–	0	–	–	0	–
	2011	3 994 289	–	0	–	–	0	–
	2012	4 145 701	–	0	–	–	0	–
	2013	4 310 417	–	0	–	–	0	–
	2014	4 473 553	–	0	–	–	0	–
	2015	4 624 394	–	0	–	–	0	–
	2016	4 759 382	–	0	–	–	0	–
	2017	4 881 862	–	0	–	–	0	–
	2018	4 996 368	–	0	–	–	0	–
	2019	5 110 272	–	0	–	–	0	–
	2020	5 228 925	–	0	–	–	0	–
Morocco[1,2,3]	2000	28 793 672	–	3	–	–	0	–
	2001	29 126 323	–	0	–	–	0	–
	2002	29 454 765	–	19	–	–	0	–
	2003	29 782 884	–	4	–	–	0	–
	2004	30 115 196	–	1	–	–	0	–
	2005	30 455 563	–	0	–	–	0	–
	2006	30 804 689	–	0	–	–	0	–
	2007	31 163 670	–	0	–	–	0	–
	2008	31 536 807	–	0	–	–	0	–
	2009	31 929 087	–	0	–	–	0	–
	2010	32 343 384	–	0	–	–	0	–
	2011	32 781 860	–	0	–	–	0	–
	2012	33 241 898	–	0	–	–	0	–
	2013	33 715 704	–	0	–	–	0	–
	2014	34 192 360	–	0	–	–	0	–
	2015	34 663 608	–	0	–	–	0	–
	2016	35 126 276	–	0	–	–	0	–
	2017	35 581 260	–	0	–	–	0	–
	2018	36 029 088	–	0	–	–	0	–
	2019	36 471 768	–	0	–	–	0	–
	2020	36 910 552	–	0	–	–	0	–
Oman[1,2]	2000	2 267 973	–	6	–	–	0	–
	2001	2 294 959	–	2	–	–	0	–
	2002	2 334 860	–	6	–	–	0	–
	2003	2 386 164	–	6	–	–	0	–
	2004	2 445 524	–	0	–	–	0	–
	2005	2 511 254	–	0	–	–	0	–
	2006	2 580 753	–	0	–	–	0	–
	2007	2 657 162	–	4	–	–	0	–
	2008	2 750 956	–	0	–	–	0	–
	2009	2 876 186	–	0	–	–	0	–
	2010	3 041 435	–	0	–	–	0	–
	2011	3 251 102	–	0	–	–	0	–
	2012	3 498 031	–	0	–	–	0	–
	2013	3 764 805	–	0	–	–	0	–
	2014	4 027 255	–	0	–	–	0	–
	2015	4 267 341	–	0	–	–	0	–
	2016	4 479 217	–	0	–	–	0	–
	2017	4 665 926	–	0	–	–	0	–
	2018	4 829 476	–	0	–	–	0	–
	2019	4 974 992	–	0	–	–	0	–
	2020	5 106 622	–	0	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EASTERN MEDITERRANEAN								
Pakistan	2000	139 939 408	363 000	929 292	2 220 000	110	995	2 880
	2001	143 512 840	432 000	1 037 774	2 386 000	130	1 144	3 310
	2002	147 023 801	352 000	966 325	2 368 000	110	1 001	3 010
	2003	150 507 621	396 000	924 733	2 194 000	110	991	2 900
	2004	154 018 597	383 000	683 580	1 344 000	100	643	1 550
	2005	157 596 481	375 000	845 170	2 016 000	110	923	2 720
	2006	161 252 281	356 000	851 104	2 073 000	110	882	2 630
	2007	164 973 809	354 000	835 398	2 049 000	110	879	2 680
	2008	168 749 848	280 000	763 800	1 984 000	91	679	2 120
	2009	172 560 988	441 000	1 015 691	2 258 000	130	1 000	2 800
	2010	176 394 157	646 000	1 445 704	3 085 000	180	1 616	4 200
	2011	180 243 576	919 000	1 905 938	3 751 000	270	1 814	4 400
	2012	184 116 966	779 000	1 652 576	3 332 000	230	1 703	4 320
	2013	188 030 412	747 000	1 419 230	2 742 000	210	1 197	2 870
	2014	192 006 322	719 000	1 373 352	2 633 000	210	981	2 270
	2015	196 058 630	522 000	992 605	2 035 000	150	780	1 950
	2016	200 192 018	646 000	1 000 765	1 697 000	160	823	1 750
	2017	204 394 687	589 000	819 944	1 253 000	130	641	1 250
	2018	208 643 736	546 000	705 529	981 000	120	511	920
	2019	212 907 531	507 000	640 380	858 000	100	544	960
	2020	217 161 456	427 000	542 960	724 000	91	454	800
Saudi Arabia[1,2]	2000	1 655 380	–	6 608	–	–	0	–
	2001	1 698 543	–	3 074	–	–	0	–
	2002	1 746 824	–	2 612	–	–	0	–
	2003	1 799 001	–	1 724	–	–	0	–
	2004	1 853 159	–	1 232	–	–	0	–
	2005	1 907 913	–	1 059	–	–	0	–
	2006	1 962 559	–	1 278	–	–	0	–
	2007	2 017 537	–	467	–	–	0	–
	2008	2 073 930	–	61	–	–	0	–
	2009	2 133 353	–	58	–	–	0	–
	2010	2 196 733	–	29	–	–	0	–
	2011	2 264 516	–	69	–	–	0	–
	2012	2 335 599	–	82	–	–	0	–
	2013	2 407 470	–	34	–	–	0	–
	2014	2 476 728	–	30	–	–	0	–
	2015	2 540 903	–	83	–	–	0	–
	2016	2 599 044	–	272	–	–	0	–
	2017	2 651 735	–	177	–	–	0	–
	2018	2 699 927	–	61	–	–	0	–
	2019	2 745 252	–	38	–	–	0	–
	2020	2 788 938	–	83	–	–	0	–
Somalia	2000	8 872 250	546 000	1 114 212	2 129 000	72	2 852	8 060
	2001	9 186 719	566 000	1 157 164	2 210 000	71	2 962	8 350
	2002	9 501 335	605 000	1 198 956	2 078 000	74	3 069	7 860
	2003	9 815 412	647 000	1 187 649	2 006 000	78	3 040	7 600
	2004	10 130 251	706 000	1 215 543	1 860 000	83	3 111	7 090
	2005	10 446 856	885 000	1 426 667	2 099 000	99	3 652	8 000
	2006	10 763 904	801 000	1 292 397	1 920 000	92	3 308	7 310
	2007	11 080 122	674 000	1 114 252	1 665 000	80	2 852	6 340
	2008	11 397 188	435 000	719 155	1 071 000	50	1 841	4 080
	2009	11 717 691	273 000	450 388	653 000	31	1 152	2 480
	2010	12 043 886	315 000	526 336	777 000	35	1 347	2 970
	2011	12 376 305	264 000	440 754	646 000	30	1 128	2 460
	2012	12 715 487	274 000	454 146	665 000	31	1 162	2 530
	2013	13 063 711	331 000	545 556	813 000	38	1 396	3 090
	2014	13 423 571	395 000	640 331	952 000	45	1 639	3 630
	2015	13 797 204	451 000	769 171	1 152 000	52	1 969	4 370
	2016	14 185 635	471 000	794 615	1 191 000	54	2 034	4 560
	2017	14 589 165	479 000	813 032	1 221 000	56	2 081	4 640
	2018	15 008 225	459 000	772 351	1 158 000	52	1 977	4 400
	2019	15 442 906	449 000	758 855	1 136 000	52	1 942	4 330
	2020	15 893 219	491 000	829 649	1 247 000	57	2 123	4 730

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EASTERN MEDITERRANEAN								
Sudan	2000	27 275 019	1 682 000	2 530 343	3 642 000	220	6 200	12 500
	2001	27 971 077	1 568 000	2 415 378	3 537 000	210	5 919	12 100
	2002	28 704 786	1 178 000	1 913 290	2 908 000	160	4 688	9 840
	2003	29 460 517	1 096 000	1 799 707	2 779 000	150	4 409	9 270
	2004	30 214 189	1 052 000	1 673 082	2 543 000	140	4 099	8 700
	2005	30 949 514	1 059 000	1 691 441	2 564 000	140	4 144	8 800
	2006	31 661 824	1 044 000	1 667 898	2 522 000	140	4 087	8 580
	2007	32 360 619	986 000	1 505 216	2 195 000	130	3 688	7 570
	2008	33 060 844	920 000	1 277 316	1 741 000	120	3 129	6 020
	2009	33 783 778	869 000	1 169 924	1 544 000	110	2 866	5 430
	2010	34 545 012	833 000	1 130 637	1 487 000	100	2 770	5 270
	2011	35 349 672	856 000	1 151 087	1 521 000	110	2 820	5 320
	2012	36 193 786	893 000	1 196 758	1 575 000	110	2 932	5 500
	2013	37 072 560	953 000	1 295 289	1 706 000	120	3 174	6 060
	2014	37 977 658	1 034 000	1 464 903	2 007 000	130	3 589	7 000
	2015	38 902 948	1 078 000	1 642 188	2 404 000	140	4 023	8 120
	2016	39 847 432	1 207 000	2 122 267	3 506 000	210	4 581	10 200
	2017	40 813 400	1 081 000	2 194 802	3 922 000	170	5 230	12 700
	2018	41 801 530	1 169 000	2 474 192	4 607 000	190	5 854	14 500
	2019	42 813 236	1 343 000	2 808 157	5 263 000	220	6 609	16 100
	2020	43 849 266	1 601 000	3 218 465	5 766 000	260	7 533	18 200
Syrian Arab Republic[1,2]	2000	16 410 847	–	6	–	–	0	–
	2001	16 766 555	–	63	–	–	0	–
	2002	17 084 628	–	15	–	–	0	–
	2003	17 415 214	–	2	–	–	0	–
	2004	17 827 827	–	1	–	–	0	–
	2005	18 361 178	–	0	–	–	0	–
	2006	19 059 257	–	0	–	–	0	–
	2007	19 878 257	–	0	–	–	0	–
	2008	20 664 037	–	0	–	–	0	–
	2009	21 205 873	–	0	–	–	0	–
	2010	21 362 541	–	0	–	–	0	–
	2011	21 081 814	–	0	–	–	0	–
	2012	20 438 861	–	0	–	–	0	–
	2013	19 578 466	–	0	–	–	0	–
	2014	18 710 711	–	0	–	–	0	–
	2015	17 997 411	–	0	–	–	0	–
	2016	17 465 567	–	0	–	–	0	–
	2017	17 095 669	–	0	–	–	0	–
	2018	16 945 062	–	0	–	–	0	–
	2019	17 070 132	–	0	–	–	0	–
	2020	17 500 657	–	0	–	–	0	–
United Arab Emirates[1,2,3]	2000	3 134 067	–	0	–	–	0	–
	2001	3 302 722	–	0	–	–	0	–
	2002	3 478 769	–	0	–	–	0	–
	2003	3 711 931	–	0	–	–	0	–
	2004	4 068 577	–	0	–	–	0	–
	2005	4 588 222	–	0	–	–	0	–
	2006	5 300 172	–	0	–	–	0	–
	2007	6 168 846	–	0	–	–	0	–
	2008	7 089 486	–	0	–	–	0	–
	2009	7 917 368	–	0	–	–	0	–
	2010	8 549 998	–	0	–	–	0	–
	2011	8 946 778	–	0	–	–	0	–
	2012	9 141 598	–	0	–	–	0	–
	2013	9 197 908	–	0	–	–	0	–
	2014	9 214 182	–	0	–	–	0	–
	2015	9 262 896	–	0	–	–	0	–
	2016	9 360 975	–	0	–	–	0	–
	2017	9 487 206	–	0	–	–	0	–
	2018	9 630 966	–	0	–	–	0	–
	2019	9 770 526	–	0	–	–	0	–
	2020	9 890 400	–	0	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EASTERN MEDITERRANEAN								
Yemen	2000	11 223 976	450 000	1 054 905	4 574 000	68	2 640	14 000
	2001	11 552 330	524 000	1 177 530	5 302 000	76	2 947	15 600
	2002	11 891 011	624 000	1 307 377	5 808 000	86	3 283	16 700
	2003	12 240 009	507 000	1 188 478	5 709 000	73	2 964	15 100
	2004	12 597 890	443 000	956 179	4 392 000	61	2 391	12 800
	2005	12 963 653	447 000	1 002 795	4 917 000	64	2 495	13 700
	2006	13 337 740	539 000	1 201 845	5 747 000	76	3 027	17 600
	2007	13 721 262	440 000	852 425	1 834 000	61	2 117	5 980
	2008	14 114 306	280 000	539 905	1 210 000	37	1 361	3 990
	2009	14 516 814	355 000	701 964	1 633 000	48	1 779	5 420
	2010	14 928 397	642 000	1 131 912	2 159 000	83	2 866	7 300
	2011	15 349 226	490 000	792 771	1 326 000	60	2 015	4 630
	2012	15 778 346	575 000	860 962	1 315 000	67	2 197	4 770
	2013	16 212 846	494 000	700 432	1 017 000	55	1 786	3 670
	2014	16 648 919	412 000	587 292	843 000	46	1 498	3 110
	2015	17 083 713	362 000	513 816	739 000	41	1 309	2 690
	2016	17 515 888	470 000	661 252	952 000	53	1 681	3 450
	2017	17 945 659	526 000	747 173	1 073 000	62	1 886	3 880
	2018	18 373 670	601 000	871 031	1 270 000	70	2 211	4 580
	2019	18 801 274	592 000	842 059	1 218 000	68	2 134	4 380
	2020	19 229 398	549 000	780 106	1 117 000	63	1 979	4 040
EUROPEAN								
Armenia[1,2,3]	2000	3 069 597	–	141	–	–	0	–
	2001	3 050 686	–	79	–	–	0	–
	2002	3 033 976	–	52	–	–	0	–
	2003	3 017 938	–	29	–	–	0	–
	2004	3 000 715	–	47	–	–	0	–
	2005	2 981 262	–	7	–	–	0	–
	2006	2 958 301	–	0	–	–	0	–
	2007	2 932 615	–	0	–	–	0	–
	2008	2 907 615	–	0	–	–	0	–
	2009	2 888 094	–	0	–	–	0	–
	2010	2 877 314	–	0	–	–	0	–
	2011	2 876 536	–	0	–	–	0	–
	2012	2 884 239	–	0	–	–	0	–
	2013	2 897 593	–	0	–	–	0	–
	2014	2 912 403	–	0	–	–	0	–
	2015	2 925 559	–	0	–	–	0	–
	2016	2 936 147	–	0	–	–	0	–
	2017	2 944 789	–	0	–	–	0	–
	2018	2 951 741	–	0	–	–	0	–
	2019	2 957 728	–	0	–	–	0	–
	2020	2 963 234	–	0	–	–	0	–
Azerbaijan[1,2]	2000	186 823	–	1 526	–	–	0	–
	2001	188 537	–	1 054	–	–	0	–
	2002	190 372	–	505	–	–	0	–
	2003	192 312	–	480	–	–	0	–
	2004	194 325	–	386	–	–	0	–
	2005	196 388	–	242	–	–	0	–
	2006	198 493	–	141	–	–	0	–
	2007	200 657	–	108	–	–	0	–
	2008	202 902	–	72	–	–	0	–
	2009	205 260	–	78	–	–	0	–
	2010	207 746	–	50	–	–	0	–
	2011	210 364	–	4	–	–	0	–
	2012	213 087	–	3	–	–	0	–
	2013	215 865	–	0	–	–	0	–
	2014	218 629	–	0	–	–	0	–
	2015	221 323	–	0	–	–	0	–
	2016	223 928	–	0	–	–	0	–
	2017	226 442	–	0	–	–	0	–
	2018	228 839	–	0	–	–	0	–
	2019	231 097	–	0	–	–	0	–
	2020	233 201	–	0	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EUROPEAN								
Georgia[1,2]	2000	43 621	–	245	–	–	0	–
	2001	42 969	–	438	–	–	0	–
	2002	42 585	–	474	–	–	0	–
	2003	42 389	–	316	–	–	0	–
	2004	42 258	–	257	–	–	0	–
	2005	42 101	–	155	–	–	0	–
	2006	41 897	–	59	–	–	0	–
	2007	41 668	–	24	–	–	0	–
	2008	41 426	–	6	–	–	0	–
	2009	41 194	–	1	–	–	0	–
	2010	40 990	–	0	–	–	0	–
	2011	40 810	–	0	–	–	0	–
	2012	40 640	–	0	–	–	0	–
	2013	40 487	–	0	–	–	0	–
	2014	40 353	–	0	–	–	0	–
	2015	40 241	–	0	–	–	0	–
	2016	40 154	–	0	–	–	0	–
	2017	40 087	–	0	–	–	0	–
	2018	40 029	–	0	–	–	0	–
	2019	39 967	–	0	–	–	0	–
	2020	39 891	–	0	–	–	0	–
Kazakhstan[1,2]	2000	14 922 724	–	0	–	–	0	–
	2001	14 910 207	–	0	–	–	0	–
	2002	14 976 184	–	0	–	–	0	–
	2003	15 100 045	–	0	–	–	0	–
	2004	15 250 016	–	0	–	–	0	–
	2005	15 402 803	–	0	–	–	0	–
	2006	15 551 263	–	0	–	–	0	–
	2007	15 702 112	–	0	–	–	0	–
	2008	15 862 126	–	0	–	–	0	–
	2009	16 043 015	–	0	–	–	0	–
	2010	16 252 273	–	0	–	–	0	–
	2011	16 490 669	–	0	–	–	0	–
	2012	16 751 523	–	0	–	–	0	–
	2013	17 026 118	–	0	–	–	0	–
	2014	17 302 619	–	0	–	–	0	–
	2015	17 572 010	–	0	–	–	0	–
	2016	17 830 902	–	0	–	–	0	–
	2017	18 080 023	–	0	–	–	0	–
	2018	18 319 616	–	0	–	–	0	–
	2019	18 551 428	–	0	–	–	0	–
	2020	18 776 707	–	0	–	–	0	–
Kyrgyzstan[1,2,3]	2000	3 838 155	–	7	–	–	0	–
	2001	3 871 014	–	15	–	–	0	–
	2002	3 893 352	–	2 725	–	–	0	–
	2003	3 910 559	–	461	–	–	0	–
	2004	3 930 416	–	91	–	–	0	–
	2005	3 958 765	–	225	–	–	0	–
	2006	3 997 015	–	318	–	–	0	–
	2007	4 043 819	–	96	–	–	0	–
	2008	4 098 875	–	18	–	–	0	–
	2009	4 161 072	–	1	–	–	0	–
	2010	4 229 392	–	3	–	–	0	–
	2011	4 303 983	–	0	–	–	0	–
	2012	4 384 834	–	0	–	–	0	–
	2013	4 470 423	–	0	–	–	0	–
	2014	4 558 726	–	0	–	–	0	–
	2015	4 648 118	–	0	–	–	0	–
	2016	4 737 975	–	0	–	–	0	–
	2017	4 827 987	–	0	–	–	0	–
	2018	4 917 139	–	0	–	–	0	–
	2019	5 004 363	–	0	–	–	0	–
	2020	5 088 868	–	0	–	–	0	–

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WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EUROPEAN								
Tajikistan[1,2]	2000	2 076 253	–	19 064	–	–	0	–
	2001	2 110 382	–	11 387	–	–	0	–
	2002	2 146 571	–	6 160	–	–	0	–
	2003	2 184 877	–	5 428	–	–	0	–
	2004	2 225 238	–	3 588	–	–	0	–
	2005	2 267 632	–	2 309	–	–	0	–
	2006	2 312 145	–	1 344	–	–	0	–
	2007	2 358 930	–	635	–	–	0	–
	2008	2 408 114	–	318	–	–	0	–
	2009	2 459 827	–	164	–	–	0	–
	2010	2 514 150	–	112	–	–	0	–
	2011	2 570 967	–	78	–	–	0	–
	2012	2 630 195	–	28	–	–	0	–
	2013	2 691 967	–	4	–	–	0	–
	2014	2 756 444	–	2	–	–	0	–
	2015	2 823 642	–	0	–	–	0	–
	2016	2 893 634	–	0	–	–	0	–
	2017	2 966 010	–	0	–	–	0	–
	2018	3 039 682	–	0	–	–	0	–
	2019	3 113 221	–	0	–	–	0	–
	2020	3 185 572	–	0	–	–	0	–
Turkey[1,2]	2000	4 110 612	–	11 432	–	–	0	–
	2001	4 172 495	–	10 812	–	–	0	–
	2002	4 234 448	–	10 224	–	–	0	–
	2003	4 295 811	–	9 222	–	–	0	–
	2004	4 355 710	–	5 302	–	–	0	–
	2005	4 413 725	–	2 084	–	–	0	–
	2006	4 469 192	–	796	–	–	0	–
	2007	4 522 820	–	313	–	–	0	–
	2008	4 577 210	–	166	–	–	0	–
	2009	4 635 891	–	38	–	–	0	–
	2010	4 701 254	–	0	–	–	0	–
	2011	4 773 811	–	0	–	–	0	–
	2012	4 852 318	–	0	–	–	0	–
	2013	4 935 154	–	0	–	–	0	–
	2014	5 019 902	–	0	–	–	0	–
	2015	5 104 412	–	0	–	–	0	–
	2016	5 188 811	–	0	–	–	0	–
	2017	5 272 570	–	0	–	–	0	–
	2018	5 352 105	–	0	–	–	0	–
	2019	5 422 923	–	0	–	–	0	–
	2020	5 482 039	–	0	–	–	0	–
Turkmenistan[1,2,3]	2000	293 548	–	24	–	–	0	–
	2001	296 665	–	8	–	–	0	–
	2002	299 651	–	18	–	–	0	–
	2003	302 623	–	7	–	–	0	–
	2004	305 720	–	3	–	–	0	–
	2005	309 052	–	1	–	–	0	–
	2006	312 657	–	1	–	–	0	–
	2007	316 559	–	0	–	–	0	–
	2008	320 824	–	0	–	–	0	–
	2009	325 516	–	0	–	–	0	–
	2010	330 668	–	0	–	–	0	–
	2011	336 314	–	0	–	–	0	–
	2012	342 413	–	0	–	–	0	–
	2013	348 814	–	0	–	–	0	–
	2014	355 311	–	0	–	–	0	–
	2015	361 743	–	0	–	–	0	–
	2016	368 054	–	0	–	–	0	–
	2017	374 248	–	0	–	–	0	–
	2018	380 308	–	0	–	–	0	–
	2019	386 236	–	0	–	–	0	–
	2020	392 027	–	0	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
EUROPEAN								
Uzbekistan[1,2,3]	2000	24 769	–	126	–	–	0	–
	2001	25 108	–	77	–	–	0	–
	2002	25 431	–	74	–	–	0	–
	2003	25 749	–	74	–	–	0	–
	2004	26 077	–	66	–	–	0	–
	2005	26 427	–	102	–	–	0	–
	2006	26 804	–	73	–	–	0	–
	2007	27 204	–	30	–	–	0	–
	2008	27 626	–	7	–	–	0	–
	2009	28 065	–	0	–	–	0	–
	2010	28 515	–	3	–	–	0	–
	2011	28 977	–	0	–	–	0	–
	2012	29 449	–	0	–	–	0	–
	2013	29 932	–	0	–	–	0	–
	2014	30 426	–	0	–	–	0	–
	2015	30 929	–	0	–	–	0	–
	2016	31 441	–	0	–	–	0	–
	2017	31 959	–	0	–	–	0	–
	2018	32 476	–	0	–	–	0	–
	2019	32 981	–	0	–	–	0	–
	2020	33 469	–	0	–	–	0	–
SOUTH-EAST ASIA								
Bangladesh	2000	13 727 050	42 000	94 432	150 000	8	199	440
	2001	13 988 438	43 000	96 230	152 000	8	202	440
	2002	14 245 368	42 000	97 997	156 000	8	206	450
	2003	14 494 139	43 000	99 709	157 000	8	209	460
	2004	14 730 151	44 000	101 332	164 000	8	213	470
	2005	14 950 487	46 000	102 848	164 000	8	216	480
	2006	15 153 253	41 000	68 539	103 000	6	139	290
	2007	15 340 271	77 000	126 937	185 000	13	263	540
	2008	15 517 025	96 000	121 043	150 000	12	264	480
	2009	15 691 292	68 000	80 603	94 000	9	158	270
	2010	15 868 787	59 000	69 307	80 000	6	166	290
	2011	16 051 340	54 000	63 432	73 000	5	155	270
	2012	16 237 645	31 000	35 375	40 000	3	85	150
	2013	16 426 435	28 000	31 594	36 000	2	77	130
	2014	16 615 254	60 000	66 274	74 000	6	160	270
	2015	16 802 238	41 000	45 478	50 000	4	105	180
	2016	16 987 281	29 000	31 621	35 000	2	72	120
	2017	17 170 973	30 000	33 331	37 000	2	73	120
	2018	17 352 838	11 000	12 397	14 000	0	26	45
	2019	17 532 354	18 000	21 202	25 000	1	47	83
	2020	17 709 052	6 400	7 545	8 700	0	15	26
Bhutan[1,2]	2000	437 350	–	5 935	–	–	15	–
	2001	446 695	–	5 982	–	–	14	–
	2002	455 858	–	6 511	–	–	11	–
	2003	464 601	–	3 806	–	–	14	–
	2004	472 718	–	2 670	–	–	7	–
	2005	480 070	–	1 825	–	–	5	–
	2006	486 478	–	1 868	–	–	7	–
	2007	492 006	–	793	–	–	2	–
	2008	496 992	–	329	–	–	2	–
	2009	501 963	–	1 057	–	–	4	–
	2010	507 271	–	436	–	–	2	–
	2011	513 039	–	194	–	–	1	–
	2012	519 170	–	82	–	–	1	–
	2013	525 573	–	15	–	–	0	–
	2014	532 099	–	19	–	–	0	–
	2015	538 634	–	34	–	–	0	–
	2016	545 162	–	15	–	–	0	–
	2017	551 716	–	11	–	–	0	–
	2018	558 253	–	6	–	–	0	–
	2019	564 689	–	2	–	–	0	–
	2020	570 992	–	22	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
SOUTH-EAST ASIA								
Democratic People's Republic of Korea[1,2]	2000	8 953 346	–	90 582	–	–	0	–
	2001	9 032 966	–	115 615	–	–	0	–
	2002	9 113 589	–	98 852	–	–	0	–
	2003	9 192 849	–	16 538	–	–	0	–
	2004	9 267 160	–	15 827	–	–	0	–
	2005	9 334 099	–	6 728	–	–	0	–
	2006	9 392 944	–	6 913	–	–	0	–
	2007	9 445 059	–	4 795	–	–	0	–
	2008	9 492 624	–	16 611	–	–	0	–
	2009	9 538 778	–	14 632	–	–	0	–
	2010	9 585 831	–	13 520	–	–	0	–
	2011	9 634 466	–	16 760	–	–	0	–
	2012	9 684 153	–	21 850	–	–	0	–
	2013	9 734 471	–	14 407	–	–	0	–
	2014	9 784 567	–	10 535	–	–	0	–
	2015	9 833 782	–	7 022	–	–	0	–
	2016	9 882 137	–	5 033	–	–	0	–
	2017	9 929 834	–	4 603	–	–	0	–
	2018	9 976 610	–	3 698	–	–	0	–
	2019	10 022 121	–	1 869	–	–	0	–
	2020	10 066 111	–	1 819	–	–	0	–
India	2000	987 264 165	15 360 000	19 659 998	25 710 000	2 740	29 512	52 900
	2001	1 004 480 209	15 840 000	20 081 581	26 020 000	2 850	28 679	51 100
	2002	1 021 595 666	14 670 000	18 937 732	24 640 000	2 680	27 270	48 700
	2003	1 038 607 248	15 750 000	20 237 386	25 990 000	2 870	27 862	49 100
	2004	1 055 520 127	17 310 000	22 451 735	29 450 000	3 250	31 217	56 200
	2005	1 072 326 769	18 220 000	24 267 362	33 290 000	3 450	32 599	60 100
	2006	1 089 030 372	14 620 000	19 848 564	27 790 000	2 790	27 859	51 900
	2007	1 105 590 990	14 200 000	19 189 779	27 320 000	2 700	27 747	52 400
	2008	1 121 905 943	14 500 000	20 092 638	29 290 000	2 780	29 894	57 100
	2009	1 137 843 607	14 820 000	20 643 216	30 030 000	2 720	32 006	62 600
	2010	1 153 312 308	14 890 000	20 219 804	28 630 000	2 730	30 522	57 700
	2011	1 168 268 867	12 770 000	17 286 688	24 340 000	2 370	25 646	47 800
	2012	1 182 744 981	10 340 000	13 978 446	19 700 000	1 990	20 372	38 700
	2013	1 196 818 869	8 202 000	10 982 324	15 200 000	1 480	16 741	31 600
	2014	1 210 609 238	8 393 000	11 123 516	15 320 000	1 380	20 103	38 200
	2015	1 224 206 387	8 962 000	11 852 773	16 090 000	1 470	21 694	40 900
	2016	1 237 628 916	8 897 000	12 431 896	18 160 000	1 500	22 437	44 300
	2017	1 250 859 601	6 826 000	9 339 370	13 290 000	1 190	16 296	31 500
	2018	1 263 908 968	4 656 000	6 768 155	9 506 000	940	9 664	18 400
	2019	1 276 780 904	3 697 000	5 548 478	7 891 000	770	7 701	14 700
	2020	1 289 475 946	2 738 000	4 148 253	5 971 000	510	7 341	14 500
Indonesia	2000	211 513 816	1 020 000	1 238 663	1 529 000	180	1 682	3 070
	2001	214 427 416	1 037 000	1 255 726	1 546 000	180	1 705	3 120
	2002	217 357 816	1 048 000	1 272 887	1 569 000	180	1 729	3 170
	2003	220 309 464	1 063 000	1 290 172	1 590 000	190	1 752	3 210
	2004	223 285 648	1 062 000	1 180 838	1 318 000	180	1 484	2 390
	2005	226 289 464	1 162 000	1 289 533	1 443 000	190	1 789	2 890
	2006	229 318 248	1 351 000	1 505 353	1 685 000	220	2 126	3 450
	2007	232 374 240	1 121 000	1 360 826	1 675 000	190	1 848	3 380
	2008	235 469 752	1 134 000	1 378 954	1 702 000	200	1 873	3 420
	2009	238 620 544	1 153 000	1 397 405	1 732 000	200	1 898	3 460
	2010	241 834 240	1 943 000	2 163 008	2 424 000	290	3 485	5 700
	2011	245 116 000	1 767 000	1 967 619	2 204 000	260	3 123	5 090
	2012	248 451 712	1 753 000	1 951 821	2 180 000	270	3 081	5 020
	2013	251 805 312	1 493 000	1 661 300	1 855 000	230	2 656	4 330
	2014	255 128 088	1 138 000	1 263 267	1 412 000	170	2 058	3 360
	2015	258 383 224	1 016 000	1 128 930	1 259 000	150	1 793	2 910
	2016	261 556 400	1 061 000	1 181 016	1 323 000	150	2 056	3 370
	2017	264 650 968	738 000	808 348	887 000	110	1 419	2 300
	2018	267 670 528	544 000	596 956	658 000	79	1 043	1 700
	2019	270 625 584	602 000	659 480	725 000	84	1 188	1 930
	2020	273 523 616	718 000	784 854	864 000	98	1 443	2 350

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
SOUTH-EAST ASIA								
Myanmar	2000	27 806 631	943 000	1 356 462	2 000 000	160	2 744	5 660
	2001	28 107 446	956 000	1 371 136	2 009 000	150	2 775	5 780
	2002	28 391 369	965 000	1 384 987	2 037 000	160	2 802	5 750
	2003	28 657 265	973 000	1 397 958	2 061 000	160	2 828	5 790
	2004	28 904 615	983 000	1 410 024	2 089 000	160	2 853	5 880
	2005	29 134 019	997 000	1 421 215	2 126 000	170	2 875	5 890
	2006	29 342 994	651 000	1 017 913	1 567 000	110	2 041	4 370
	2007	29 533 711	943 000	1 283 157	1 847 000	150	2 555	5 100
	2008	29 717 127	1 160 000	1 573 810	2 277 000	180	3 222	6 360
	2009	29 908 014	1 106 000	1 492 378	2 148 000	170	3 023	6 010
	2010	30 116 600	1 381 000	2 017 346	3 096 000	190	4 849	10 400
	2011	30 348 592	1 020 000	1 326 603	1 762 000	130	3 214	6 100
	2012	30 600 405	1 251 000	1 754 334	2 565 000	210	3 412	6 950
	2013	30 861 549	455 000	611 838	847 000	74	1 169	2 290
	2014	31 116 493	281 000	383 705	531 000	46	729	1 440
	2015	31 354 512	220 000	271 877	327 000	34	482	850
	2016	31 571 437	131 000	162 032	195 000	21	274	480
	2017	31 772 210	98 000	120 755	145 000	15	209	370
	2018	31 966 116	88 000	108 681	131 000	14	164	290
	2019	32 166 754	64 000	78 640	95 000	11	101	170
	2020	32 383 620	67 000	82 434	99 000	12	77	130
Nepal	2000	6 949 622	27 000	47 986	79 000	7	25	51
	2001	7 067 479	22 000	55 778	119 000	6	28	69
	2002	7 177 354	42 000	85 217	155 000	12	62	140
	2003	7 280 477	30 000	72 856	151 000	9	46	120
	2004	7 378 725	15 000	34 773	76 000	4	24	66
	2005	7 473 113	15 000	36 030	85 000	4	26	74
	2006	7 566 637	14 000	35 567	81 000	4	32	94
	2007	7 658 337	18 000	42 145	90 000	4	39	100
	2008	7 740 775	13 000	31 003	74 000	3	25	70
	2009	7 803 751	12 000	25 643	58 000	3	21	60
	2010	7 841 393	15 000	30 196	63 000	3	27	69
	2011	7 849 525	9 700	18 512	39 000	2	12	35
	2012	7 834 413	8 400	13 662	28 000	2	10	24
	2013	7 813 407	6 900	10 164	17 000	1	6	14
	2014	7 810 268	3 000	4 886	9 800	0	3	8
	2015	7 841 923	2 500	4 370	9 200	0	2	7
	2016	7 914 028	2 300	3 353	5 800	0	2	4
	2017	8 021 214	2 200	2 690	3 500	0	0	1
	2018	8 155 623	2 000	2 736	3 900	0	1	1
	2019	8 304 537	370	464	590	–	0	–
	2020	8 457 832	200	245	310	–	0	–
Sri Lanka[1,2,3]	2000	4 318 849	–	210 039	–	–	77	–
	2001	4 349 697	–	66 522	–	–	52	–
	2002	4 384 369	–	41 411	–	–	30	–
	2003	4 421 528	–	10 510	–	–	4	–
	2004	4 459 045	–	3 720	–	–	1	–
	2005	4 495 347	–	1 640	–	–	0	–
	2006	4 530 074	–	591	–	–	1	–
	2007	4 563 670	–	198	–	–	1	–
	2008	4 596 316	–	649	–	–	0	–
	2009	4 628 406	–	531	–	–	0	–
	2010	4 660 199	–	684	–	–	0	–
	2011	4 691 654	–	124	–	–	0	–
	2012	4 722 497	–	23	–	–	0	–
	2013	4 752 502	–	0	–	–	0	–
	2014	4 781 357	–	0	–	–	0	–
	2015	4 808 845	–	0	–	–	0	–
	2016	4 834 870	–	0	–	–	0	–
	2017	4 859 446	–	0	–	–	0	–
	2018	4 882 614	–	0	–	–	0	–
	2019	4 904 458	–	0	–	–	0	–
	2020	4 925 047	–	0	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
SOUTH-EAST ASIA								
Thailand[1,2]	2000	11 945 892	–	78 561	–	–	625	–
	2001	12 057 196	–	63 528	–	–	424	–
	2002	12 157 749	–	44 555	–	–	361	–
	2003	12 248 982	–	37 355	–	–	204	–
	2004	12 333 510	–	26 690	–	–	230	–
	2005	12 413 376	–	29 782	–	–	161	–
	2006	12 488 587	–	30 294	–	–	113	–
	2007	12 558 708	–	33 178	–	–	97	–
	2008	12 624 918	–	28 569	–	–	101	–
	2009	12 688 650	–	29 462	–	–	70	–
	2010	12 750 928	–	32 480	–	–	80	–
	2011	12 812 287	–	24 897	–	–	43	–
	2012	12 872 552	–	46 895	–	–	37	–
	2013	12 931 104	–	41 602	–	–	47	–
	2014	12 986 935	–	41 218	–	–	38	–
	2015	13 039 267	–	8 022	–	–	33	–
	2016	13 087 996	–	7 428	–	–	27	–
	2017	13 133 254	–	5 694	–	–	15	–
	2018	13 174 743	–	4 077	–	–	15	–
	2019	13 212 150	–	3 198	–	–	13	–
	2020	13 245 244	–	3 007	–	–	3	–
Timor-Leste	2000	831 754	55 000	126 328	286 000	9	241	750
	2001	847 600	56 000	128 735	292 000	9	245	740
	2002	867 807	69 000	104 357	142 000	11	199	380
	2003	890 765	57 000	67 524	79 000	7	125	220
	2004	914 070	140 000	234 045	328 000	26	449	890
	2005	935 929	106 000	153 748	208 000	17	304	580
	2006	955 968	102 000	164 285	235 000	18	326	650
	2007	974 732	82 000	114 693	151 000	13	226	430
	2008	992 640	88 000	134 166	185 000	14	271	530
	2009	1 010 376	74 000	103 246	137 000	11	198	370
	2010	1 028 463	72 000	102 580	137 000	11	198	380
	2011	1 046 931	26 000	32 765	41 000	3	69	130
	2012	1 065 599	6 500	7 740	9 100	0	10	17
	2013	1 084 678	1 400	1 692	2 000	0	2	3
	2014	1 104 471	480	568	660	0	0	1
	2015	1 125 125	93	110	130	–	0	–
	2016	1 146 752	94	112	130	–	0	–
	2017	1 169 297	18	22	25	–	0	–
	2018	1 192 542	–	0	–	–	0	–
	2019	1 216 191	–	0	–	–	0	–
	2020	1 240 007	3	4	4	–	0	–
WESTERN PACIFIC								
Cambodia	2000	8 596 064	414 000	669 109	985 000	61	1 582	3 270
	2001	8 772 982	283 000	388 681	521 000	38	904	1 730
	2002	8 937 268	256 000	349 008	463 000	34	803	1 520
	2003	9 091 755	366 000	464 899	585 000	48	1 062	1 940
	2004	9 240 480	328 000	403 094	492 000	44	895	1 590
	2005	9 386 783	329 000	388 706	458 000	48	705	1 210
	2006	9 531 298	341 000	437 975	578 000	50	897	1 680
	2007	9 674 325	140 000	191 165	276 000	21	394	780
	2008	9 818 509	162 000	214 883	292 000	21	497	960
	2009	9 966 856	332 000	426 267	547 000	50	853	1 560
	2010	10 121 448	291 000	353 293	429 000	44	644	1 120
	2011	10 283 547	320 000	368 041	425 000	47	641	1 080
	2012	10 452 589	226 000	260 016	300 000	36	383	640
	2013	10 626 470	146 000	168 806	196 000	24	231	380
	2014	10 801 977	207 000	240 449	282 000	31	399	670
	2015	10 976 603	189 000	218 837	256 000	28	374	630
	2016	11 149 762	107 000	124 137	145 000	16	204	340
	2017	11 321 696	175 000	202 696	237 000	27	336	570
	2018	11 491 692	235 000	272 272	317 000	43	265	440
	2019	11 659 117	121 000	140 077	164 000	22	102	170
	2020	11 823 489	60 000	69 136*	81 000	10	43	71

* After the closure of data analysis for the report, Cambodia updated the number of indigenous cases from 15 891 to 9 964. This estimate has still to be reviewed.

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
WESTERN PACIFIC								
China[1,2,3]	2000	542 675 955	–	8 025	–	–	31	–
	2001	546 292 480	–	21 237	–	–	27	–
	2002	549 751 407	–	25 520	–	–	42	–
	2003	553 091 065	–	28 491	–	–	52	–
	2004	556 358 427	–	27 197	–	–	31	–
	2005	559 590 377	–	21 936	–	–	48	–
	2006	562 800 567	–	35 383	–	–	37	–
	2007	565 993 199	–	29 304	–	–	18	–
	2008	569 183 474	–	16 650	–	–	23	–
	2009	572 384 457	–	9 287	–	–	10	–
	2010	575 602 489	–	4 990	–	–	19	–
	2011	578 839 498	–	1 308	–	–	33	–
	2012	582 085 796	–	244	–	–	0	–
	2013	585 319 566	–	83	–	–	0	–
	2014	588 510 377	–	53	–	–	0	–
	2015	591 629 054	–	39	–	–	0	–
	2016	594 669 360	–	1	–	–	0	–
	2017	597 615 770	–	0	–	–	0	–
	2018	600 417 964	–	0	–	–	0	–
	2019	603 014 836	–	0	–	–	0	–
	2020	605 360 910	–	0	–	–	0	–
Lao People's Democratic Republic	2000	2 770 134	71 000	89 755	111 000	7	221	400
	2001	2 814 822	48 000	62 084	79 000	5	152	280
	2002	2 858 356	37 000	50 404	66 000	3	124	240
	2003	2 901 748	32 000	45 710	62 000	3	110	220
	2004	2 946 268	28 000	40 333	56 000	3	100	200
	2005	2 992 826	23 000	35 002	51 000	2	86	180
	2006	3 041 946	31 000	48 965	75 000	3	123	260
	2007	3 093 395	29 000	45 688	67 000	3	115	240
	2008	3 146 303	28 000	41 446	59 000	3	104	210
	2009	3 199 373	33 000	47 466	66 000	3	120	240
	2010	3 251 692	31 000	43 766	59 000	3	109	220
	2011	3 302 891	22 000	30 366	40 000	2	73	140
	2012	3 353 345	58 000	79 939	106 000	7	174	340
	2013	3 403 701	50 000	68 570	91 000	7	125	240
	2014	3 454 934	64 000	87 770	116 000	11	134	250
	2015	3 507 695	45 000	62 489	83 000	8	80	150
	2016	3 562 168	19 000	26 862	35 000	3	32	60
	2017	3 617 940	11 000	14 609	19 000	1	21	40
	2018	3 674 379	11 000	15 654	21 000	1	23	45
	2019	3 730 554	8 400	11 590	15 000	1	11	22
	2020	3 785 762	4 100	5 674	7 500	0	7	14
Malaysia[1,2]	2000	927 770	–	12 705	–	–	35	–
	2001	948 364	–	12 780	–	–	46	–
	2002	968 335	–	11 019	–	–	38	–
	2003	987 952	–	6 338	–	–	21	–
	2004	1 007 625	–	6 154	–	–	35	–
	2005	1 027 624	–	5 569	–	–	33	–
	2006	1 048 078	–	5 294	–	–	21	–
	2007	1 068 814	–	4 048	–	–	15	–
	2008	1 089 440	–	6 071	–	–	20	–
	2009	1 109 401	–	5 955	–	–	23	–
	2010	1 128 321	–	5 194	–	–	13	–
	2011	1 146 038	–	3 954	–	–	12	–
	2012	1 162 727	–	3 662	–	–	12	–
	2013	1 178 756	–	1 028	–	–	10	–
	2014	1 194 664	–	596	–	–	4	–
	2015	1 210 838	–	242	–	–	4	–
	2016	1 227 386	–	266	–	–	2	–
	2017	1 244 186	–	85	–	–	0	–
	2018	1 261 121	–	0	–	–	0	–
	2019	1 277 991	–	0	–	–	0	–
	2020	1 294 639	–	0	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
WESTERN PACIFIC								
Papua New Guinea	2000	5 847 590	484 000	1 462 249	2 670 000	110	3 142	7 650
	2001	5 974 627	495 000	1 443 554	2 585 000	120	3 075	7 390
	2002	6 098 621	379 000	1 235 844	2 252 000	97	2 635	6 500
	2003	6 223 378	425 000	1 333 205	2 436 000	110	2 816	6 880
	2004	6 354 247	612 000	1 708 217	3 030 000	150	3 517	8 480
	2005	6 494 902	470 000	1 413 497	2 578 000	120	2 796	6 910
	2006	6 646 891	516 000	1 481 681	2 663 000	140	2 924	7 140
	2007	6 808 503	417 000	1 251 261	2 283 000	100	2 675	6 650
	2008	6 976 200	362 000	1 180 316	2 147 000	98	2 498	6 140
	2009	7 144 774	601 000	1 563 409	2 705 000	130	3 367	8 060
	2010	7 310 512	398 000	1 079 284	1 936 000	88	2 343	5 640
	2011	7 472 196	337 000	899 054	1 604 000	69	2 030	4 910
	2012	7 631 003	402 000	1 232 566	2 528 000	90	2 694	7 090
	2013	7 788 388	782 000	1 420 220	2 230 000	110	3 452	7 690
	2014	7 946 733	937 000	1 613 869	2 511 000	170	3 134	6 750
	2015	8 107 772	574 000	884 727	1 238 000	94	1 857	3 720
	2016	8 271 766	817 000	1 208 966	1 664 000	120	2 557	5 040
	2017	8 438 038	795 000	1 230 223	1 746 000	130	2 502	5 050
	2018	8 606 324	851 000	1 301 773	1 838 000	150	2 562	5 170
	2019	8 776 119	783 000	1 124 906	1 488 000	120	2 250	4 340
	2020	8 947 027	1 009 000	1 470 120	1 978 000	160	2 962	5 750
Philippines	2000	45 292 927	60 000	79 974	104 000	6	204	390
	2001	46 269 230	42 000	56 147	73 000	4	143	270
	2002	47 252 061	53 000	70 585	91 000	5	180	340
	2003	48 231 599	76 000	100 493	128 000	8	257	480
	2004	49 194 798	67 000	91 225	119 000	7	233	450
	2005	50 133 100	60 000	83 163	109 000	8	167	320
	2006	51 040 472	72 000	102 993	137 000	11	203	390
	2007	51 921 338	77 000	112 751	152 000	12	217	420
	2008	52 790 413	49 000	74 621	102 000	8	143	280
	2009	53 668 594	40 000	58 824	79 000	6	116	230
	2010	54 570 267	37 000	53 512	71 000	5	113	220
	2011	55 501 351	17 000	23 918	31 000	2	47	91
	2012	56 455 261	14 000	19 171	25 000	2	35	67
	2013	57 418 667	13 000	17 518	23 000	1	36	68
	2014	58 371 998	10 000	14 318	18 000	0	29	58
	2015	59 301 219	20 000	27 901	37 000	2	62	120
	2016	60 201 724	12 000	17 313	23 000	1	37	74
	2017	61 078 112	12 000	16 548	22 000	1	35	70
	2018	61 936 727	7 700	10 900	15 000	0	24	48
	2019	62 787 645	9 500	13 536	18 000	0	31	61
	2020	63 638 123	23 000	43 023	182 000	3	97	470
Republic of Korea[1,2]	2000	3 316 546	–	4 183	–	–	0	–
	2001	3 339 435	–	2 556	–	–	0	–
	2002	3 359 968	–	1 799	–	–	0	–
	2003	3 378 263	–	1 171	–	–	0	–
	2004	3 394 540	–	864	–	–	0	–
	2005	3 409 074	–	1 369	–	–	0	–
	2006	3 421 631	–	2 051	–	–	0	–
	2007	3 432 437	–	2 227	–	–	1	–
	2008	3 442 772	–	1 063	–	–	0	–
	2009	3 454 321	–	898	–	–	1	–
	2010	3 468 194	–	1 267	–	–	1	–
	2011	3 485 030	–	505	–	–	2	–
	2012	3 504 244	–	394	–	–	0	–
	2013	3 524 200	–	383	–	–	0	–
	2014	3 542 553	–	557	–	–	0	–
	2015	3 557 616	–	627	–	–	0	–
	2016	3 568 841	–	602	–	–	0	–
	2017	3 576 748	–	436	–	–	0	–
	2018	3 582 018	–	501	–	–	0	–
	2019	3 585 772	–	485	–	–	0	–
	2020	3 588 842	–	356	–	–	0	–

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
WESTERN PACIFIC								
Solomon Islands	2000	408 538	132 000	254 582	423 000	28	476	1 070
	2001	419 709	155 000	285 929	465 000	33	521	1 150
	2002	431 079	155 000	280 109	451 000	31	513	1 150
	2003	442 545	166 000	239 181	346 000	27	456	920
	2004	453 963	184 000	337 823	543 000	37	652	1 450
	2005	465 218	153 000	286 015	464 000	31	547	1 230
	2006	476 275	148 000	281 888	467 000	30	549	1 240
	2007	487 211	111 000	155 491	223 000	17	310	630
	2008	498 332	66 000	93 119	134 000	10	182	360
	2009	510 030	54 000	75 305	108 000	8	142	290
	2010	522 582	66 000	91 425	131 000	10	163	330
	2011	536 106	43 000	62 676	92 000	7	108	220
	2012	550 505	39 000	52 221	73 000	6	89	180
	2013	565 615	40 000	53 689	75 000	6	83	160
	2014	581 208	25 000	30 450	38 000	3	48	87
	2015	597 101	33 000	39 811	49 000	5	57	99
	2016	613 243	72 000	84 179	101 000	11	103	170
	2017	629 669	80 000	103 587	141 000	14	134	250
	2018	646 327	73 000	86 680	104 000	12	109	180
	2019	663 122	109 000	141 111	189 000	20	161	300
	2020	680 009	99 000	114 019	135 000	17	124	200
Vanuatu[2]	2000	184 964	13 000	23 167	37 000	2	34	75
	2001	189 209	13 000	18 702	27 000	1	24	49
	2002	193 927	25 000	36 655	54 000	4	52	100
	2003	198 960	28 000	42 687	63 000	5	68	140
	2004	204 123	27 000	40 904	61 000	5	61	120
	2005	209 282	17 000	25 624	39 000	3	35	71
	2006	214 379	14 000	22 943	35 000	2	30	63
	2007	219 464	15 000	27 312	119 000	3	36	170
	2008	224 700	13 000	26 771	118 000	2	37	190
	2009	230 244	8 100	14 887	25 000	1	22	51
	2010	236 216	15 000	20 972	29 000	2	27	52
	2011	242 658	8 900	11 631	16 000	1	14	27
	2012	249 505	6 400	8 394	11 000	–	0	–
	2013	256 637	4 100	5 326	7 200	–	0	–
	2014	263 888	1 900	2 427	3 300	–	0	–
	2015	271 128	680	789	920	–	0	–
	2016	278 326	3 200	4 177	5 600	–	0	–
	2017	285 499	1 700	2 266	3 000	–	0	–
	2018	292 675	890	1 167	1 600	–	0	–
	2019	299 882	800	1 047	1 400	–	0	–
	2020	307 150	700	910	1 200	–	0	–
Viet Nam	2000	58 893 103	158 000	201 414	266 000	22	421	790
	2001	59 506 334	148 000	185 145	241 000	21	380	700
	2002	60 089 950	105 000	131 451	172 000	15	271	500
	2003	60 655 409	78 000	96 592	124 000	11	197	360
	2004	61 216 381	47 000	56 559	72 000	6	115	210
	2005	61 783 751	34 000	40 604	51 000	4	79	140
	2006	62 362 205	37 000	43 620	54 000	4	92	160
	2007	62 953 293	24 000	28 022	34 000	2	53	92
	2008	63 560 457	16 000	17 911	21 000	1	37	64
	2009	64 186 031	21 000	22 853	26 000	1	47	81
	2010	64 831 191	21 000	22 959	26 000	2	45	76
	2011	65 497 232	19 000	20 206	23 000	2	36	60
	2012	66 183 027	22 000	23 838	27 000	2	41	68
	2013	66 883 664	19 000	20 760	23 000	2	34	56
	2014	67 592 103	18 000	19 060	21 000	2	29	47
	2015	68 301 988	10 000	11 283	13 000	1	16	25
	2016	69 011 962	4 600	5 024	5 600	0	7	12
	2017	69 719 636	5 100	5 485	6 100	0	9	15
	2018	70 416 327	3 500	3 777	4 200	0	6	10
	2019	71 091 518	3 400	3 742	4 200	0	5	9
	2020	71 737 471	1 500	1 657	1 800	0	2	4

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
REGIONAL SUMMARY								
African	2000	561 491 220	192 000 000	206 651 695	223 000 000	813 000	839 720	871 000
	2001	576 919 091	196 000 000	212 231 714	230 000 000	809 000	837 574	873 000
	2002	592 809 433	193 000 000	208 976 813	227 000 000	770 000	796 770	832 000
	2003	609 224 535	195 000 000	211 052 186	231 000 000	744 000	773 527	818 000
	2004	626 241 488	194 000 000	212 124 635	239 000 000	718 000	749 963	818 000
	2005	643 915 606	192 000 000	209 290 648	232 000 000	695 000	723 264	772 000
	2006	662 275 145	191 000 000	208 989 708	232 000 000	686 000	714 573	761 000
	2007	681 309 516	191 000 000	208 562 683	230 000 000	670 000	697 946	741 000
	2008	700 984 911	192 000 000	208 274 978	228 000 000	652 000	678 129	715 000
	2009	721 246 235	194 000 000	211 750 041	234 000 000	640 000	671 207	723 000
	2010	742 051 594	194 000 000	211 880 625	235 000 000	613 000	645 874	702 000
	2011	763 387 435	193 000 000	209 217 528	230 000 000	579 000	607 628	652 000
	2012	785 261 042	192 000 000	208 620 533	228 000 000	544 000	575 258	620 000
	2013	807 674 868	191 000 000	207 354 188	227 000 000	523 000	555 751	602 000
	2014	830 636 714	187 000 000	203 974 170	223 000 000	503 000	534 225	581 000
	2015	854 148 154	187 000 000	204 062 673	223 000 000	495 000	527 099	577 000
	2016	878 208 893	189 000 000	204 946 219	224 000 000	497 000	528 332	582 000
	2017	902 801 345	196 000 000	213 163 989	233 000 000	510 000	542 464	607 000
	2018	927 906 329	194 000 000	211 276 810	232 000 000	500 000	533 041	605 000
	2019	953 437 537	194 000 000	212 509 355	233 000 000	498 000	534 201	616 000
	2020	979 364 855	205 000 000	227 995 691	256 000 000	560 000	602 020	738 000
Americas	2000	109 188 092	1 391 000	1 539 912	1 699 000	665	909	1 169
	2001	110 990 578	1 169 000	1 297 014	1 432 000	597	832	1 092
	2002	112 769 369	1 077 000	1 183 039	1 298 000	513	764	1 022
	2003	114 521 921	1 066 000	1 159 491	1 262 000	480	726	984
	2004	116 248 867	1 069 000	1 146 696	1 235 000	462	711	985
	2005	117 950 571	1 202 000	1 273 097	1 358 000	439	687	960
	2006	119 623 022	1 032 000	1 097 173	1 174 000	346	581	843
	2007	121 266 287	908 000	988 543	1 074 000	293	503	738
	2008	122 889 430	644 000	696 357	760 000	224	470	747
	2009	124 504 289	634 000	687 516	753 000	230	463	737
	2010	126 117 540	741 000	818 486	901 000	247	502	793
	2011	127 738 849	570 000	615 177	671 000	205	464	727
	2012	129 363 963	545 000	585 401	634 000	211	430	652
	2013	130 968 623	531 000	575 749	629 000	232	470	709
	2014	132 521 808	444 000	475 260	509 000	193	348	485
	2015	134 002 794	552 000	602 134	665 000	227	414	579
	2016	135 398 190	637 000	688 490	747 000	264	529	749
	2017	136 722 017	878 000	945 892	1 031 000	290	664	958
	2018	138 017 933	862 000	929 468	1 013 000	271	571	815
	2019	139 345 434	826 000	893 930	981 000	231	509	738
	2020	140 745 844	604 000	652 921	708 000	185	409	579
Eastern Mediterranean	2000	328 684 376	5 500 000	6 971 722	11 500 000	4 800	13 660	28 500
	2001	336 594 828	5 600 000	7 126 364	12 000 000	5 000	13 943	29 800
	2002	344 615 001	5 200 000	6 789 989	12 000 000	5 000	13 180	27 400
	2003	352 797 295	4 900 000	6 371 058	11 100 000	4 600	12 211	26 000
	2004	361 206 289	4 100 000	5 262 518	9 200 000	3 600	10 600	22 100
	2005	369 878 322	4 200 000	5 523 622	9 500 000	4 100	11 479	24 600
	2006	378 856 185	4 100 000	5 450 700	10 200 000	4 000	11 532	26 500
	2007	388 103 609	3 700 000	4 778 160	6 600 000	3 700	9 780	16 800
	2008	397 480 796	2 900 000	3 713 585	5 200 000	2 400	7 216	12 300
	2009	406 794 797	2 800 000	3 620 037	5 300 000	2 500	6 942	12 000
	2010	415 912 919	3 400 000	4 529 490	6 500 000	3 400	8 766	15 100
	2011	424 785 396	3 500 000	4 656 750	6 700 000	3 200	7 974	12 900
	2012	433 470 308	3 300 000	4 388 150	6 200 000	3 100	8 091	13 100
	2013	442 075 956	3 400 000	4 242 338	5 800 000	2 900	7 686	12 200
	2014	450 763 360	3 500 000	4 394 847	5 900 000	2 800	7 883	12 700
	2015	459 654 774	3 400 000	4 295 738	5 700 000	2 700	8 280	13 800
	2016	468 761 207	4 200 000	5 326 279	7 000 000	3 300	9 500	16 200
	2017	478 058 244	4 100 000	5 388 727	7 300 000	3 300	10 242	18 700
	2018	487 588 434	4 100 000	5 481 509	7 700 000	3 100	10 888	20 500
	2019	497 395 568	4 000 000	5 512 371	8 000 000	3 100	11 496	21 700
	2020	507 498 677	4 000 000	5 696 753	8 400 000	3 100	12 325	23 600

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
REGIONAL SUMMARY								
European	2000	28 566 102	–	32 565	–	–	0	–
	2001	28 668 063	–	23 870	–	–	0	–
	2002	28 842 570	–	20 232	–	–	0	–
	2003	29 072 303	–	16 017	–	–	0	–
	2004	29 330 475	–	9 740	–	–	0	–
	2005	29 598 155	–	5 125	–	–	0	–
	2006	29 867 767	–	2 732	–	–	0	–
	2007	30 146 384	–	1 206	–	–	0	–
	2008	30 446 718	–	587	–	–	0	–
	2009	30 787 934	–	282	–	–	0	–
	2010	31 182 302	–	168	–	–	0	–
	2011	31 632 431	–	82	–	–	0	–
	2012	32 128 698	–	31	–	–	0	–
	2013	32 656 353	–	4	–	–	0	–
	2014	33 194 813	–	2	–	–	0	–
	2015	33 727 977	–	0	–	–	0	–
	2016	34 251 046	–	0	–	–	0	–
	2017	34 764 115	–	0	–	–	0	–
	2018	35 261 935	–	0	–	–	0	–
	2019	35 739 944	–	0	–	–	0	–
	2020	36 195 008	–	0	–	–	0	–
South-East Asia	2000	1 273 748 475	18 600 000	22 908 986	29 000 000	7 000	35 120	59 000
	2001	1 294 805 142	19 000 000	23 240 833	29 200 000	7 000	34 124	57 000
	2002	1 315 746 945	17 800 000	22 074 506	27 900 000	7 000	32 670	55 000
	2003	1 336 567 318	18 700 000	23 233 814	28 900 000	7 000	33 044	55 000
	2004	1 357 265 769	20 300 000	25 461 654	32 400 000	8 000	36 478	62 000
	2005	1 377 832 673	21 300 000	27 310 711	36 100 000	8 000	37 975	66 000
	2006	1 398 265 555	17 500 000	22 679 887	30 500 000	7 000	32 644	58 000
	2007	1 418 531 724	17 100 000	22 156 501	29 800 000	7 000	32 778	58 000
	2008	1 438 554 112	17 800 000	23 377 772	32 400 000	8 000	35 652	64 000
	2009	1 458 235 381	18 000 000	23 788 173	33 200 000	7 000	37 378	69 000
	2010	1 477 506 020	19 400 000	24 649 361	32 800 000	9 000	39 329	68 000
	2011	1 496 332 701	16 200 000	20 737 594	27 800 000	7 000	32 263	56 000
	2012	1 514 733 127	14 200 000	17 810 228	23 700 000	7 000	27 008	46 000
	2013	1 532 753 900	10 500 000	13 354 936	17 600 000	4 000	20 698	36 000
	2014	1 550 468 770	10 200 000	12 893 988	17 100 000	3 000	23 091	42 000
	2015	1 567 933 937	10 400 000	13 318 616	17 700 000	3 000	24 109	43 000
	2016	1 585 154 979	10 200 000	13 822 506	19 400 000	3 000	24 868	46 000
	2017	1 602 118 513	7 800 000	10 314 824	14 200 000	2 000	18 012	33 000
	2018	1 618 838 835	5 400 000	7 496 706	10 200 000	2 000	10 913	19 000
	2019	1 635 329 742	4 500 000	6 313 333	8 600 000	2 000	9 050	16 000
	2020	1 651 597 467	3 600 000	5 028 183	6 800 000	1 000	8 879	16 000
Western Pacific	2000	668 913 591	1 772 000	2 805 163	4 044 000	1 900	6 146	11 100
	2001	674 527 192	1 529 000	2 476 815	3 621 000	1 600	5 272	9 900
	2002	679 940 972	1 322 000	2 192 394	3 251 000	1 500	4 658	8 700
	2003	685 202 674	1 441 000	2 358 767	3 506 000	1 600	5 039	9 300
	2004	690 370 852	1 577 000	2 712 370	4 086 000	1 600	5 639	10 700
	2005	695 492 937	1 347 000	2 301 485	3 466 000	1 300	4 496	8 700
	2006	700 583 742	1 510 000	2 462 793	3 646 000	1 400	4 876	9 200
	2007	705 651 979	1 022 000	1 847 269	2 890 000	1 000	3 834	7 900
	2008	710 730 600	886 000	1 672 851	2 691 000	800	3 541	7 300
	2009	715 854 081	1 264 000	2 225 151	3 463 000	900	4 701	9 500
	2010	721 042 912	984 000	1 676 662	2 537 000	800	3 477	6 800
	2011	726 306 547	860 000	1 421 659	2 133 000	600	2 996	6 000
	2012	731 628 002	854 000	1 680 445	2 935 000	600	3 428	7 900
	2013	736 965 664	1 119 000	1 756 383	2 557 000	500	3 971	8 100
	2014	742 260 435	1 340 000	2 009 549	2 922 000	600	3 777	7 400
	2015	747 461 014	938 000	1 246 745	1 622 000	400	2 450	4 400
	2016	752 554 538	1 077 000	1 471 527	1 930 000	400	2 942	5 500
	2017	757 527 294	1 145 000	1 575 935	2 098 000	500	3 037	5 600
	2018	762 325 554	1 241 000	1 692 724	2 240 000	500	2 989	5 600
	2019	766 886 556	1 091 000	1 436 494	1 806 000	400	2 560	4 700
	2020	771 163 422	1 247 000	1 704 895	2 236 000	400	3 235	6 100

ANNEX 5 – F. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND ESTIMATED MALARIA CASES AND DEATHS, 2000–2020

WHO region Country/area	Year	Population denominator for incidence and mortality rate	Cases			Deaths		
			Lower	Point	Upper	Lower	Point	Upper
REGIONAL SUMMARY								
Total	2000	2 970 591 856	226 000 000	240 910 043	260 000 000	854 000	895 555	942 000
	2001	3 022 504 894	231 000 000	246 396 610	267 000 000	851 000	891 745	941 000
	2002	3 074 724 290	225 000 000	241 236 973	261 000 000	808 000	848 042	896 000
	2003	3 127 386 046	228 000 000	244 191 333	266 000 000	783 000	824 547	877 000
	2004	3 180 663 740	227 000 000	246 717 613	277 000 000	756 000	803 391	877 000
	2005	3 234 668 264	228 000 000	245 704 688	271 000 000	733 000	777 901	838 000
	2006	3 289 471 416	222 000 000	240 682 993	265 000 000	722 000	764 206	823 000
	2007	3 345 009 499	220 000 000	238 334 362	262 000 000	703 000	744 841	797 000
	2008	3 401 086 567	220 000 000	237 736 130	259 000 000	683 000	725 008	773 000
	2009	3 457 422 717	223 000 000	242 071 200	266 000 000	673 000	720 691	784 000
	2010	3 513 813 287	225 000 000	243 554 792	269 000 000	650 000	697 948	764 000
	2011	3 570 183 359	219 000 000	236 648 790	259 000 000	611 000	651 325	703 000
	2012	3 626 585 140	216 000 000	233 084 788	254 000 000	578 000	614 215	664 000
	2013	3 683 095 364	211 000 000	227 283 598	247 000 000	553 000	588 576	640 000
	2014	3 739 845 900	206 000 000	223 747 816	243 000 000	532 000	569 324	620 000
	2015	3 796 928 650	207 000 000	223 525 906	243 000 000	524 000	562 352	619 000
	2016	3 854 328 853	210 000 000	226 255 021	246 000 000	527 000	566 171	627 000
	2017	3 911 991 528	214 000 000	231 389 367	251 000 000	537 000	574 419	643 000
	2018	3 969 939 020	209 000 000	226 877 217	247 000 000	521 000	558 402	633 000
	2019	4 028 134 781	208 000 000	226 665 483	248 000 000	521 000	557 816	642 000
	2020	4 086 565 273	218 000 000	241 078 443	269 000 000	583 000	626 868	765 000

Data as of 18 November 2021

"–" refers to not applicable.

[1] The number of indigenous malaria cases registered by the national malaria programmes (NMPs) is reported here without further adjustments.

[2] The number of indigenous malaria deaths registered by the NMPs is reported here without further adjustments.

[3] Certified malaria free countries are included in this listing for historical purposes.

[4] South Sudan became an independent state on 9 July 2011 and a Member State of WHO on 27 September 2011. South Sudan and Sudan have distinct epidemiological profiles comprising high transmission and low transmission areas respectively. For this reason, data up to June 2011 from the Sudanese high transmission areas (10 southern states, which correspond to South Sudan) and low transmission areas (15 northern states which correspond to contemporary Sudan) are reported separately.

Note: Population denominator for incidence and mortality rate is based on the United Nations population, times the proportion of the population at risk at baseline.

ANNEX 5 – G. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND REPORTED MALARIA CASES BY PLACE OF CARE, 2020

WHO region Country/area	Population			
	UN population	At risk (low + high)	At risk (high)	Number of people living in active foci
AFRICAN				
Angola	32 866 268	32 866 268	32 866 268	–
Benin	12 123 198	12 123 198	12 123 198	–
Botswana	2 351 625	1 559 080	99 050	–
Burkina Faso	20 903 278	20 903 278	20 903 278	–
Burundi	11 890 781	11 890 781	11 890 781	–
Cabo Verde	555 988	144 556	0	170 236
Cameroon	26 545 864	26 545 864	18 847 563	–
Central African Republic	4 829 764	4 829 764	4 829 764	–
Chad	16 425 859	16 245 995	11 063 637	–
Comoros	869 595	869 595	413 753	440 086
Congo	5 518 092	5 518 092	5 518 092	–
Côte d'Ivoire	26 378 275	26 378 275	26 378 275	–
Democratic Republic of the Congo	89 561 400	89 561 400	86 874 558	–
Equatorial Guinea	1 402 985	1 402 985	1 402 985	–
Eritrea	3 546 427	3 546 427	2 517 963	–
Eswatini	1 160 164	324 845	0	–
Ethiopia	114 963 596	78 175 245	31 270 098	–
Gabon	2 225 728	2 225 728	2 225 728	–
Gambia	2 416 664	2 416 664	2 416 664	–
Ghana	31 072 945	31 072 945	31 072 945	–
Guinea	13 132 792	13 132 792	13 132 792	–
Guinea-Bissau	1 967 998	1 967 998	1 967 998	–
Kenya	53 771 298	53 771 298	37 744 763	–
Liberia	5 057 677	5 057 677	5 057 677	–
Madagascar	27 691 019	27 691 019	24 303 854	–
Malawi	19 129 955	19 129 955	19 129 955	–
Mali	20 250 834	20 250 834	18 459 040	–
Mauritania	4 649 660	4 649 660	2 997 543	–
Mayotte	273 000	60 060	13 650	–
Mozambique	31 255 435	31 255 435	31 255 435	–
Namibia*	2 540 916	2 016 852	1 172 912	–
Niger	24 206 636	24 206 636	24 206 636	–
Nigeria	206 139 584	206 139 584	157 445 291	–
Rwanda	12 952 209	12 952 209	12 952 209	–
Sao Tome and Principe	219 161	219 161	219 161	–
Senegal	16 743 930	16 743 930	16 647 318	–
Sierra Leone	7 976 985	7 976 985	7 976 985	–
South Africa*	59 308 690	5 930 869	2 372 348	–
South Sudan[1]	11 193 729	11 193 729	11 193 729	–
Togo	8 278 737	8 278 737	8 278 737	–
Uganda	45 741 000	45 741 000	45 741 000	–
United Republic of Tanzania[2]	59 734 214	59 734 214	59 734 214	–
Mainland	58 044 078	58 044 078	58 044 078	–
Zanzibar	1 690 136	1 690 136	1 030 983	–
Zambia	18 383 956	18 383 956	18 383 956	–
Zimbabwe	14 862 927	11 703 470	4 253 175	–
AMERICAS				
Belize	397 621	274 358	0	0
Bolivia (Plurinational State of)	11 673 029	5 295 703	291 592	–
Brazil	212 559 408	43 149 559	4 888 866	–
Colombia	50 882 884	11 264 961	5 112 712	8 403 089
Costa Rica*	5 094 114	1 782 939	50 941	172 953
Dominican Republic	10 847 904	5 975 242	153 498	–
Ecuador	17 643 060	514 118	161 258	473 072
French Guiana	299 000	165 430	27 598	–
Guatemala*	17 915 567	13 524 819	2 444 221	–
Guyana*	786 559	786 559	85 845	–
Haiti	11 402 533	10 187 251	2 763 860	–
Honduras*	9 904 608	8 971 593	2 524 486	321 733

Public sector		Private sector		Community level	
Presumed	Confirmed	Presumed	Confirmed	Presumed	Confirmed
551 963 [4]	6 599 327			4 820	0
28 976	1 767 511	86 883	415 570	0	333 384
0	950	0	3		
691 558	10 126 766	271 086	307 240	4 714	166 334
7 323	4 233 729	4 913	484 642	0	1 732
0	10	0	0		
41 953	1 554 714	42 673	1 091 433	0	244 046
207 222	1 503 280	32 612	237 690		
346 070	1 220 957	0	16 264	0	306 973
0	3 512	0	739	0	295
12 154	91 538				
0	4 265 868	0	320 529	0	394 243
2 369 350	20 941 917			0	1 648 730
1 715	45 234			0	28 807
0	208	0	117		
98 400	1 449 828 [6]	6 076	293 927		
73 841	53 659				
0	73 762	0	824	0	1 215
239 688	2 981 733	99 169	881 671	93 086	1 584 159
0	1 524 375	0	110 906	0	373 695
2 724 978	3 155 994	491 221	365 706	0	137 470
0	1 876 791	0	73 680		
30 577	6 092 884			0	1 046 181
653 884	2 356 722	6 729	59 475	52 772	250 069
132 284	12 425				
9 432	9 916 754			2 892	1 401 931
0	13 091 [6]			0	545
0	4 217 310	0	75 852	0	84 776
2 760 449	16 466 699	494 366	1 679 979	0	178 562
0	665 966	0	362 146	0	1 015 280
0	1 721			0	223
3 492	320 724	1 430	4 829	2 749	119 760
384 173	559 568	46 007	103 574	68 211	61 864
0	8 126				
1 143 449 [4]	207 152				454 770
799 480	10 332 774	346 424	1 603 776		2 260 107
36 249	5 717 884	1 544	260 029		
36 249	5 704 329	1 544	259 396		
0	13 555	0	633		
577 089	7 069 325			0	1 051 890
0	244 217	0	6 376	0	196 788
0	0				
0	12 187				
0	145 188 [5]				
0	76 236 [6]				
0	140	0	1		
0	829 [6]				
0	1 914	0	1	0	86
0	154				
0	1 058				
0	17 230 [6]				
0	13 305	0	3 120	0	6 562
0	420	0	3	0	490

ANNEX 5 – G. POPULATION DENOMINATOR FOR CASE INCIDENCE AND MORTALITY RATE, AND REPORTED MALARIA CASES BY PLACE OF CARE, 2020

WHO region Country/area	Population			
	UN population	At risk (low + high)	At risk (high)	Number of people living in active foci
AMERICAS				
Mexico	128 932 748	2 733 374	128 933	1 752 213
Nicaragua	6 624 554	2 891 617	568 585	637 401
Panama	4 314 768	4 174 236	181 824	52 822
Peru	32 971 846	12 950 022	1 650 571	–
Suriname	586 634	86 645	24 908	1 592
Venezuela (Bolivarian Republic of)	28 435 943	14 217 971	5 897 188	–
EASTERN MEDITERRANEAN				
Afghanistan	38 928 338	30 006 352	10 599 408	–
Djibouti*	988 002	740 922	346 868	–
Iran (Islamic Republic of)*	83 992 948	857 567	0	322 936
Pakistan	220 892 328	217 161 456	63 875 434	–
Saudi Arabia*	34 813 867	2 788 938	0	176 418
Somalia	15 893 219	15 893 219	8 089 172	–
Sudan	43 849 266	43 849 266	38 105 012	–
Yemen	29 825 968	19 229 398	11 474 646	–
SOUTH-EAST ASIA				
Bangladesh	164 689 408	17 709 052	2 080 027	–
Bhutan	771 612	570 992	100 310	15 359
Democratic People's Republic of Korea	25 778 815	10 066 111	1 447 996	2 054 108
India	1 380 004 224	1 289 475 946	167 408 312	–
Indonesia[3]	273 523 616	273 523 616	17 489 100	–
Myanmar*	54 409 792	32 383 620	8 602 732	–
Nepal	29 136 808	8 457 832	1 522 981	112 806
Thailand[3]	69 799 984	13 245 244	1 545 372	222 361
Timor-Leste*	1 318 442	1 240 007	446 524	10 449
WESTERN PACIFIC				
Cambodia	16 718 971	11 823 489	8 046 172	–
Lao People's Democratic Republic	7 275 556	3 785 762	3 785 763	14 284
Malaysia[3]	32 365 998	1 294 639	970 980	9 765
Papua New Guinea	8 947 027	8 947 027	8 410 205	–
Philippines	109 581 092	63 638 123	7 467 951	485 849
Republic of Korea	51 269 184	3 588 842	0	–
Solomon Islands	686 878	680 009	680 009	–
Vanuatu	307 150	307 150	266 990	187 974
Viet Nam*	97 338 592	71 737 471	6 616 591	313 000
REGIONAL SUMMARY				
African	1 073 070 838	976 789 045	811 023 924	610 322
Americas	551 272 780	138 946 397	26 956 887	11 814 875
Eastern Mediterranean	469 183 936	330 527 118	132 490 540	499 354
South-East Asia	1 999 432 701	1 646 672 420	200 643 354	2 415 083
Western Pacific	324 490 448	165 802 512	36 244 661	1 010 872
Total	**4 417 450 703**	**3 258 737 492**	**1 207 359 367**	**16 350 506**

RDT: rapid diagnostic test; UN: United Nations; WHO: World Health Organization.

"–" refers to not applicable or data not available.

* Confirmed cases are corrected for double counting of microscopy and RDTs in the public sector unless further specified by the country.

[1] In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf).

[2] Where national data for the United Republic of Tanzania are unavailable, refer to Mainland and Zanzibar.

Public sector		Private sector		Community level	
Presumed	Confirmed	Presumed	Confirmed	Presumed	Confirmed
0	368 [4]	0	1		
6 233	20 928	0	254	0	4 348
0	1 267	0	5	0	931
0	15 847				
0	244 [6]				
0	273 126 [6]				
52	66 380	19	4 125	79	34 790
0	72 332	0	1 203		
0	1 051 [5]				
536	246 373	52	125 455		
0	3 658 [5]	0	0		
0	27 333 [4]				
1 714 105	1 679 488			0	18 906
0	108 568	0	45 037	0	10 461
0	940	0	18	0	5 172
0	54 [5]				
0	1 819 [6]				
0	186 532 [6]				
0	218 928	0	22 009	0	13 118
0	10 704	0	864		47 268
183	375	61	54	0	1
0	2 922	0	135	0	883
0	14 [5]				
0	10 040			0	5 851
0	2 302	0	218	0	978
0	2 839 [5]				
182 719	750 254				
0	2 608	0	189	0	3 323
4 [5]	386 [5]				
13 193	77 637				
0	406			0	101
0	1 422 [4]	109	0	202	
13 934 810	127 729 322	1 931 064	8 710 480	229 244	13 010 445
6 233	580 441	0	3 385	0	12 417
1 714 693	2 205 183	71	176 391	79	64 157
183	422 288	61	23 080	0	66 442
195 916	847 894	109	407	202	10 253
15 851 835	**131 785 128**	**1 931 305**	**8 913 743**	**229 525**	**13 163 714**

Data as of 30 November 2021

[3] Figures include all imported or non-human malaria cases, none of them being indigenous malaria cases.

[4] Figures reported for the public sector include cases detected at the community level.

[5] Figures reported for the public sector include cases detected in the private sector.

[6] Figures reported for the public sector include cases detected at the community level and in the private sector.

Note: After the closure of data analysis for the report, Cambodia updated the number of confirmed cases in the public sector from 10 040 to 4 113. This estimate has still to be reviewed.

ANNEX 5 – H. REPORTED MALARIA CASES BY METHOD OF CONFIRMATION, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Algeria[1,2,3]	Suspected cases	12 224	11 974	15 790	12 762	8 690	8 000	6 628	6 469	10 081	8 620	11 197
	Presumed and confirmed	408	191	887	603	266	747	432	453	1 242	1 014	2 726
	Microscopy examined	12 224	11 974	15 790	12 762	8 690	8 000	6 628	6 469	10 081	8 620	11 197
	Microscopy positive	408	191	887	603	266	747	432	453	1 242	1 014	2 726
	RDT examined											
	RDT positive											
	Imported cases	396	187	828	587	260	727	420	446	1 241	1 014	2 725
Angola	Suspected cases	4 591 529	4 469 357	4 849 418	5 273 305	6 134 471	6 839 963	7 649 902	11 050 353	10 870 446	14 341 390	13 232 340
	Presumed and confirmed	3 687 574	3 501 953	3 031 546	3 144 100	3 180 021	3 254 270	4 301 146	4 500 221	5 928 260	7 530 788	7 156 110
	Microscopy examined	1 947 349	1 765 933	2 245 223	3 025 258	3 398 029	3 345 693	4 183 727	7 493 969	5 066 780	5 643 654	5 216 938
	Microscopy positive	1 324 264	1 147 473	1 056 563	1 462 941	1 431 313	1 396 773	2 058 128	2 199 810	2 442 500	2 557 385	2 359 788
	RDT examined	639 476	833 753	1 069 483	1 103 815	1 855 400	3 009 305	2 959 282	2 931 055	5 025 981	8 221 926	7 456 619
	RDT positive	358 606	484 809	440 271	536 927	867 666	1 372 532	1 736 125	1 675 082	2 708 075	4 497 593	4 239 539
Benin	Suspected cases		1 928 016	2 431 902	2 091 263	2 930 569	2 733 611	2 184 524	2 705 456	2 880 743	3 958 782	3 572 959
	Presumed and confirmed	1 873 015	1 786 864	2 069 728	1 717 115	2 122 011	2 042 684	1 667 005	1 968 532	2 255 946	3 084 525*	2 632 324
	Microscopy examined		88 134	243 008	291 479	155 205	296 264	267 405	267 492	349 191	432 001	359 137
	Microscopy positive		68 745		99 368	108 714	108 061	104 601	208 823	258 519	294 518	242 780
	RDT examined		475 986	825 005	1 173 271	1 962 591	2 116 289	1 860 904	2 403 344	2 251 418	3 338 134	3 086 562
	RDT positive		354 223	705 839	991 234	1 200 524	1 613 565	1 506 189	1 725 089	1 717 293	2 601 360	2 273 685
Botswana[2]	Suspected cases						1 298	12 986	12 605	13 979	16 564	9 148
	Presumed and confirmed	12 196	1 141	308	506	1 485	346	725	1 911	585	272	953
	Microscopy examined							5 178	5 223	872	707	
	Microscopy positive	1 046	432									
	RDT examined						1 284	7 806	7 380	13 107	15 857	9 148
	RDT positive			193	456	1 346	332	723	1 909	585	272	953
	Imported cases				30	30	48	64	62	51	103	69
Burkina Faso	Suspected cases	6 037 806	5 446 870	7 852 299	7 857 296	9 272 755	9 783 385	12 006 793	14 811 872	14 931 136	18 116 942	15 357 249
	Presumed and confirmed	5 723 481	5 024 697	6 970 700	7 146 026	8 278 408	8 286 453	9 799 818	12 255 671	11 991 146	6 475 027*	11 567 698*
	Microscopy examined	177 879	400 005	223 372	183 971	198 947	222 190	191 208	133 101	157 824	270 289	203 529
	Microscopy positive	88 540	83 857	90 089	82 875	83 259	92 589	80 077	46 411	56 989	52 582	81 017
	RDT examined	940 985	450 281	4 516 273	4 296 350	6 224 055	8 290 188	11 795 178	12 980 360	13 061 136	15 997 219	13 680 757
	RDT positive	715 999	344 256	3 767 957	3 686 176	5 345 396	6 922 857	9 699 334	10 510 849	10 221 981	5 824 844	10 519 323
Burundi	Suspected cases	5 590 736	4 780 117	4 270 100	7 507 441	7 831 895	8 761 333	13 022 128	13 956 707	8 734 322	16 214 258	8 571 445
	Presumed and confirmed	4 255 301	3 307 158	2 600 286	4 567 428	4 987 388	5 512 414	8 902 503	9 259 694	5 149 436	9 983 843	4 732 339
	Microscopy examined	2 825 558	2 859 720	2 659 372	4 123 012	4 471 998	3 254 670	3 941 251	3 814 355	1 542 232	3 858 517	1 786 568
	Microscopy positive	1 599 908	1 485 332	1 484 676	2 366 134	2 718 391	1 964 862	2 520 622	2 269 831	1 148 316	1 759 011	756 441
	RDT examined	273 324	188 476	1 177 132	2 995 339	3 098 808	5 422 959	8 971 550	9 678 610	7 009 165	12 331 431	6 772 641
	RDT positive	163 539	89 905	682 014	1 812 204	2 007 908	3 463 848	6 272 554	6 526 121	3 818 195	8 200 522	3 963 662
Cabo Verde[2,3]	Suspected cases		26 508	8 715	10 621	6 894	3 117	8 393	3 857	16 623	13 463	5 751
	Presumed and confirmed	47	36	36	46	46	28	75	446	21	40^	10
	Microscopy examined			8 715	10 621	6 894	3 117	8 393	3 857	16 623	5 596	1 246
	Microscopy positive	47		36	46	46	28	75	446	21	40	10
	RDT examined		26 508								7 867	4 399
	RDT positive		36								40	0
	Imported cases		29	35	24	20	21	27	23	18	39	10
Cameroon	Suspected cases		3 134 048	3 031 461	4 132 326	3 709 906	3 378 923	4 665 318	5 098 975	5 036 256	4 743 338	4 567 624
	Presumed and confirmed	1 845 691	1 899 928	1 728 723	2 285 412	1 369 518	2 381 592	2 615 750	3 607 898	3 550 183	3 011 133	2 974 819
	Microscopy examined		1 110 308	1 182 610	1 236 306	1 086 095	1 024 306	1 373 802	627 709	658 017	1 527 436	1 304 972
	Microscopy positive						592 351	810 367	390 130	428 888	1 097 615	956 647
	RDT examined		141 686	186 784	653 189	1 254 293	1 166 306	3 151 919	3 108 156	3 085 689	2 716 410	2 840 269
	RDT positive		17 874	66 656	42 581		600 930	1 665 786	1 854 658	1 828 745	1 722 188	1 933 546
Central African Republic	Suspected cases			518 761	546 095	625 301	1 218 246	2 095 095	1 533 258	1 367 986	3 393 641	2 730 158
	Presumed and confirmed	66 484	221 980	500 806	454 532	495 238	953 535	1 607 079	1 296 277	995 157	2 708 497*	1 980 804
	Microscopy examined				63 695	55 943	139 241	189 481	112 007	163 370	265 673	237 910
	Microscopy positive				36 943	41 436	106 524	144 924	28 855	117 267	196 413	177 742
	RDT examined			105 521	191 569	369 208	724 303	1 537 852	536 887	1 181 578	2 781 622	2 181 204
	RDT positive			87 566	126 758	253 652	492 309	1 094 393	383 058	854 852	2 220 547	1 563 228
Chad	Suspected cases	743 471	595 226	722 654	749 258	1 737 195	1 641 285	2 032 301	2 943 595	1 941 489	2 779 742	2 955 271
	Presumed and confirmed	544 243	528 454	660 575	1 272 841	1 513 772	1 490 556	1 402 215	1 962 372	1 364 706	1 910 518	1 890 264*
	Microscopy examined	89 749		69 789				1 063 293	1 584 525	190 006	211 816	250 117
	Microscopy positive	75 342	86 348	7 710	206 082	160 260	149 574	720 765	1 064 354	137 501	152 127	193 816
	RDT examined	309 927	114 122		621 469	1 137 455	937 775	861 561	1 359 070	1 751 483	2 260 256	1 873 598
	RDT positive	125 106	94 778		548 483	753 772	637 472	574 003	898 018	1 227 205	1 480 402	1 350 378

ANNEX 5 – H. REPORTED MALARIA CASES BY METHOD OF CONFIRMATION, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Comoros[2]	Suspected cases	159 976	135 248	168 043	185 779	103 545	117 762	116 692	229 445	119 592		175 364
	Presumed and confirmed	103 670	76 661	65 139	62 565	2 465	2 101	1 734	3 896	19 682	17 697	4 546*
	Microscopy examined	87 595	63 217	125 030	154 824	93 444	89 634	71 902	130 134	90 956		133 024
	Microscopy positive	35 199	22 278	45 507	46 130	1 987	963	559	1 325	9 197		3 339
	RDT examined	5 249	20 226	27 714	21 546	9 839	27 911	44 523	99 311	24 567		42 340
	RDT positive	1 339	2 578	4 333	7 026	216	921	908	2 571	6 416		1 207
	Imported cases										98	0
Congo	Suspected cases				209 169	290 346	300 592	466 254	322 916	385 729	594 237	146 262
	Presumed and confirmed	446 656	277 263	120 319	183 026	248 159	264 574	374 252	297 652	324 615	545 796	103 692
	Microscopy examined				69 375	88 764	87 547	202 922	153 203	178 017	166 278	80 110
	Microscopy positive		37 744	120 319	43 232	54 523	51 529	134 612	127 939	116 903	117 837	55 348
	RDT examined					19 746		60 927				53 998
	RDT positive					11 800		37 235				36 190
Côte d'Ivoire	Suspected cases		2 607 856	3 423 623	6 003 033	6 418 571	5 216 344	5 560 136	7 262 684	6 706 148	8 280 575	7 992 806
	Presumed and confirmed	1 721 461	2 588 004	2 795 919	4 725 798	4 658 774	3 606 725	3 754 504	4 149 665	5 189 974	5 950 336	4 980 640
	Microscopy examined		49 828	195 546	395 914	568 562	811 426	975 507	1 221 845	1 132 659	1 447 694	1 437 608
	Microscopy positive	62 726	29 976	107 563	215 104	306 926	478 870	579 566	588 969	696 124	918 371	932 627
	RDT examined			1 572 785	3 405 647	4 904 066	4 174 097	4 584 629	5 923 555	5 042 040	6 152 962	4 837 781
	RDT positive			1 033 064	2 309 222	3 405 905	2 897 034	3 174 938	3 445 812	4 070 353	5 016 807	4 048 013
Democratic Republic of the Congo	Suspected cases	10 568 756	12 018 784	11 993 189	14 877 406	15 064 146	17 617 219	23 443 227	23 195 284	23 833 694	32 067 354	32 954 188
	Presumed and confirmed	9 252 959	9 442 144	9 128 398	11 368 481	10 288 519	12 538 805	16 888 006	16 888 842	18 208 440	20 480 310^	24 959 997
	Microscopy examined	3 678 849	4 226 533	4 329 318	4 126 129	3 533 165	2 877 585	2 810 067	1 981 621	1 926 455	2 152 433	2 067 978
	Microscopy positive	2 374 930	2 700 818	2 656 864	2 611 478	2 126 554	1 902 640	1 847 143	1 291 717	995 577	1 128 371	1 214 424
	RDT examined	54 728	2 912 088	3 327 071	6 102 683	11 530 981	14 739 634	20 566 284	21 117 823	20 671 006	26 963 687	28 054 832
	RDT positive	42 850	1 861 163	2 134 734	4 108 409	8 161 965	10 636 165	14 973 987	15 501 285	15 976 630	20 480 310	21 376 223
Equatorial Guinea	Suspected cases	83 639	40 704	45 792	59 358	57 129	68 058	318 779	91 217	43 533	94 656	
	Presumed and confirmed	78 095	37 267	20 890	28 438	20 417	15 142	147 714	15 725	10 926	43 897	
	Microscopy examined	42 585	23 004	33 245	27 039	47 322	21 831	239 938	13 127	8 395	43 417	
	Microscopy positive	39 636	20 601	13 196	11 235	17 685	8 564	125 623	6 800	4 135	14 787	
	RDT examined	16 772	2 899	6 826	20 286	9 807	46 227	78 841	78 090	33 174	33 246	
	RDT positive	14 177	1 865	1 973	5 170	2 732	6 578	22 091	8 925	4 827	11 117	
Eritrea	Suspected cases	96 792	97 479	138 982	134 183	186 358	155 782	139 798	205 836	253 687	452 673	346 565
	Presumed and confirmed	53 750	39 567	42 178	34 678	55 491	32 974	80 450	55 588	48 326	93 878	75 756
	Microscopy examined	79 024	67 190	84 861	81 541	63 766	59 268	83 599	74 962	70 465	116 666	101 966
	Microscopy positive	13 894	15 308	11 557	10 890	10 993	8 332	24 251	14 519	10 325	18 117	17 936
	RDT examined		25 570	33 758	39 281	117 635	91 576		129 291	181 336	336 007	241 982
	RDT positive	22 088	19 540	10 258	10 427	39 541	19 704		39 486	36 115	75 761	56 105
Eswatini[2]	Suspected cases							1 249	3 212	9 837	34 866	27 979
	Presumed and confirmed	1 722	797	626	962	711	475	317	1 127	957	577+	325*
	Microscopy examined							1 249	371	1 526	15 434	8 047
	Microscopy positive	87	130	345	488	711	43	141	68	957	212	121
	RDT examined								2 841	8 311	19 432	19 932
	RDT positive	181	419	217	474		452	458	1 594		243	204
	Imported cases		170	153	234	322	157	67	687	271	338	82
Ethiopia	Suspected cases	5 420 110	5 487 972	5 962 646	9 243 894	7 457 765	5 987 580	6 611 801	6 471 958	5 913 799	6 708 222	15 019 204
	Presumed and confirmed	4 107 396	3 549 613	3 876 745	3 316 013	2 513 863	2 174 707	1 962 996	1 755 748	1 206 891	1 015 792	1 848 231
	Microscopy examined	2 509 543	3 418 719	3 778 479	8 573 335	7 062 717	5 679 932	6 367 309	6 246 949	5 668 995	6 596 925	7 400 644
	Microscopy positive	1 196 829	1 480 360	1 692 578	2 645 454	2 118 815	1 867 059	1 718 504	1 530 739	962 087	904 495	1 743 755
	RDT examined											
	RDT positive											
Gabon	Suspected cases	233 770		238 483	256 531	256 183	285 489	202 989	212 092	1 022 022	214 286	206 908
	Presumed and confirmed	185 105	178 822	188 089	185 196	185 996	217 287	161 508	157 639	797 278	142 917	127 500
	Microscopy examined	54 714		66 018	90 185	90 275	79 308	62 658	70 820	264 676	75 819	80 266
	Microscopy positive	12 816		18 694	26 432	27 687	20 390	22 419	28 297	88 112	31 184	33 349
	RDT examined	7 887		4 129	10 132	11 812	12 761	2 738	18 877	71 787	47 712	48 330
	RDT positive	1 120		1 059	2 550	4 213	3 477	1 496	6 947	23 607	21 998	20 310
Gambia	Suspected cases	492 062		862 442	889 494	603 424	908 082	874 690	656 212	706 868	602 947	537 205
	Presumed and confirmed	194 009	268 020	313 469	281 550	168 256	255 403	164 421	83 668	88 654	53 386	75 801
	Microscopy examined	290 842	172 241	156 580	236 329	286 111	272 604	165 793	77 491	171 668	150 585	198 658
	Microscopy positive	52 245	71 588	29 325	65 666	66 253	49 649	26 397	11 343	14 510	10 982	22 226
	RDT examined	123 564		705 862	614 128	317 313	626 423	707 215	573 093	533 994	452 362	338 547
	RDT positive	64 108	196 432	284 144	176 847	102 003	196 699	136 342	66 697	72 938	42 404	53 575

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Ghana	Suspected cases	5 107 626	5 121 411	12 656 535	8 507 245	10 748 502	15 946 366	15 742 112	19 069 870	15 542 218	11 977 117	10 433 887
	Presumed and confirmed	3 900 311	4 207 941	10 754 320	7 259 892	8 566 002	11 678 306	11 451 328	13 472 089	11 154 400	6 703 687	5 879 506
	Microscopy examined	2 031 674	1 172 838	4 219 097	1 394 249	1 987 959	2 023 581	2 594 918	2 495 536	2 659 067	3 004 989	3 088 665
	Microscopy positive	1 029 384	624 756	2 971 699	721 898	970 448	934 304	1 189 012	1 089 799	1 105 348	1 160 426	1 401 009
	RDT examined	247 278	781 892	1 438 284	1 496 746	3 610 453	7 901 575	7 124 845	10 105 400	6 660 205	8 383 708	6 820 524
	RDT positive	42 253	416 504	783 467	921 744	2 445 464	4 722 792	4 239 967	5 913 356	3 826 106	4 954 841	4 046 554
Guinea	Suspected cases		1 276 057				1 254 937	1 503 035	2 134 543	2 608 481	3 733 346	3 431 504
	Presumed and confirmed	1 117 182	1 189 016	1 261 951	775 341	1 595 828	895 016	992 146	1 335 323	1 246 598	2 143 225	2 008 976
	Microscopy examined		43 549			116 767	78 377	79 233	99 083	131 715	184 697	191 421
	Microscopy positive	20 936	5 450	191 421	63 353	82 818	52 211	53 805	64 211	77 119	112 966	117 568
	RDT examined		139 066				1 092 523	1 423 802	2 035 460	2 445 164	3 498 748	3 205 353
	RDT positive		90 124	148 837	147 904	577 389	758 768	938 341	1 271 112	1 137 877	2 030 259	1 891 408
Guinea-Bissau	Suspected cases	195 006	300 233	237 398	238 580	330 533	413 727	398 429	498 879	469 640	497 916	
	Presumed and confirmed	140 143	174 986	129 684	132 176	102 945	150 085	156 523	152 619	171 075	160 907	
	Microscopy examined	48 799	57 698	61 048	58 909	106 882	123 810	146 708	157 970	149 423	151 262	
	Microscopy positive	30 239	21 320	23 547	17 733	35 546	45 789	53 014	53 770	45 564	45 675	
	RDT examined	56 455	139 531	97 047	102 079	218 130	289 917	251 669	340 909	320 217	341 365	
	RDT positive	20 152	50 662	26 834	36 851	61 878	104 296	103 457	98 849	125 511	115 232	
Kenya	Suspected cases	7 557 454	13 127 058	12 883 521	14 742 401	15 204 056	16 037 285	16 290 286	15 362 146	18 435 472	8 911 133	14 060 361
	Presumed and confirmed	6 071 583	11 120 812	9 335 951	9 790 796	9 698 529	8 219 230	8 647 072	8 462 076	10 875 734	5 019 389*	6 875 369*
	Microscopy examined	2 384 402	3 009 051	4 836 617	6 606 885	7 444 865	7 772 329	6 167 609	5 952 353	4 282 912		6 591 588
	Microscopy positive	898 531	1 002 805	1 426 719	2 060 608	2 415 950	1 025 508	1 569 045	2 215 665	827 947	4 656 702	1 646 648
	RDT examined			164 424	719 849	912 217	2 087 003	4 540 401	4 554 743	5 594 916	514 579	4 179 731
	RDT positive			26 752	314 521	435 605	1 015 769	1 495 751	1 391 361	1 490 143	362 687	2 012 522
Liberia	Suspected cases	3 087 659	2 896 874	2 441 800	2 202 213	2 450 878	2 403 783	3 105 390	2 034 027		1 726 913	
	Presumed and confirmed	2 675 816	2 488 331	1 805 546	1 483 676	1 083 513	1 835 238	2 343 410	1 366 176		1 041 800	
	Microscopy examined	335 973	728 443	772 362	818 352	1 318 801	509 062	649 096	715 643		640 901	
	Microscopy positive	212 927	577 641	507 967	496 269	302 708	305 981	381 781	425 639		325 658	
	RDT examined	998 043	1 601 259	1 276 521	1 144 405	929 788	1 001 194	1 304 021	1 045 323		960 057	
	RDT positive	709 246	1 343 518	904 662	747 951	578 516	635 730	809 356	667 476		590 187	
Madagascar[2]	Suspected cases	719 967	805 701	1 066 564	1 156 468	1 357 857	2 386 641	2 567 451	2 610 069	2 439 906	2 866 191	3 829 230
	Presumed and confirmed	293 910	255 814	456 795	472 644	688 852	1 366 205	1 216 077	1 163 807	1 078 140	984 304	1 950 471
	Microscopy examined	24 393	34 813	38 453	42 573	37 362	39 604	33 085	34 265	43 759	40 619	30 406
	Microscopy positive	2 173	3 447	3 667	4 947	3 853	4 748	3 734	5 134	7 400	5 932	5 075
	RDT examined	604 114	739 572	974 216	1 074 701	1 102 567	1 920 489	2 004 313	2 397 849	2 290 797	2 685 182	3 798 824
	RDT positive	200 277	221 051	399 233	428 503	467 071	934 909	682 290	980 718	965 390	964 896	1 945 396
	Imported cases					712	1 167					
Malawi	Suspected cases		5 734 906	6 528 505	5 787 441	7 703 651	8 518 905	9 239 462	10 530 601	11 513 684	10 994 966	12 645 404
	Presumed and confirmed	6 851 108	5 338 701	4 922 596	3 906 838	5 065 703	4 933 416	5 165 386	5 936 348	5 865 476	5 205 920	7 169 642
	Microscopy examined		119 996	406 907	132 475	198 534	216 643	240 212	127 752	129 575	103 754	166 959
	Microscopy positive		50 526	283 138	44 501	77 635	75 923	96 538	46 099	34 735	30 328	81 201
	RDT examined		580 708	2 763 986	3 029 020	5 344 724	7 030 084	8 661 237	9 413 944	11 384 109	10 861 320	12 439 185
	RDT positive		253 973	1 281 846	1 236 391	2 827 675	3 585 315	4 730 835	4 901 344	5 830 741	5 153 779	7 057 864
Mali	Suspected cases	3 351 419	2 628 593		3 076 029	3 246 800	4 692 412	3 778 535	3 624 885	3 725 896	5 232 430	4 382 988
	Presumed and confirmed	2 191 285	1 961 070	2 204 724[+]	2 510 534	2 593 880[+]	3 543 576	2 465 914	2 456 639	2 614 104	3 607 237	3 379 651
	Microscopy examined								397 723	437 903	594 303	736 392
	Microscopy positive			97 995	190 337	219 637	243 151	235 212	276 673	301 880	468 011	541 755
	RDT examined	1 399 921	974 558		2 072 435	2 692 773	3 603 344	3 623 719	3 047 741	3 019 364	4 252 425	2 927 529
	RDT positive	239 787	307 035	788 487	1 316 603	1 820 216	2 211 357	2 075 886	2 000 545	2 043 595	2 753 524	2 124 511
Mauritania	Suspected cases	239 795	191 726	209 955	190 446	203 991	233 362	192 980	214 087	221 121	155 658	160 032
	Presumed and confirmed	234 041	182 909	206 685	182 947	172 326	195 740	171 348	182 677	175 841	135 120	144 709
	Microscopy examined	5 449	3 752	1 865	5 510							
	Microscopy positive	909	1 130	255	957							
	RDT examined	2 299	7 991	3 293	3 576	47 500	60 253	50 788	51 515	75 889	35 407	27 748
	RDT positive	1 085	1 796	1 633	630	15 835	22 631	29 156	20 105	30 609	14 869	12 425
Mayotte[2]	Suspected cases	2 023	1 214	1 463								
	Presumed and confirmed	396	92	72	82	15	11	28	19	47		
	Microscopy examined	2 023	1 214	1 463								
	Microscopy positive	396	92	72	82	15	11	28	19	47		
	RDT examined											
	RDT positive											
	Imported cases	236	51	47	71	14	10	10	10	44		

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Mozambique	Suspected cases	6 097 263	7 059 112	6 265 567	8 565 263	12 612 456	15 057 398	17 490 954	17 463 976	18 791 446	21 180 727	19 516 184
	Presumed and confirmed	3 381 371	3 344 413	3 296 332	4 261 529	7 452 733	8 306 986	10 373 341	9 981 277	10 339 330	11 781 516	11 331 009
	Microscopy examined	1 950 933	2 504 720	2 546 213	2 058 998	2 295 823	2 313 129	1 886 154	1 699 589	1 909 051	1 669 097	1 293 955
	Microscopy positive	644 568	1 093 742	886 143	774 891	1 009 496	735 750	674 697	700 282	743 435	608 016	473 160
	RDT examined	2 287 536	2 966 853	2 276 298	5 526 908	10 271 075	12 660 097	14 922 332	15 675 711	16 847 537	19 465 040	18 209 904
	RDT positive	878 009	663 132	967 133	2 507 281	6 397 679	7 487 064	9 016 176	9 192 319	9 561 037	11 126 910	10 845 525
Namibia[2]	Suspected cases	39 855	74 407	10 844	34 002	186 972	209 083	310 192	618 291	396 037	313 141	272 609
	Presumed and confirmed	25 889	14 071^	3 163	4 775^	15 692^	12 050^	24 869^	66 141^	36 451^	3 440^	13 636^
	Microscopy examined	14 522	13 262	7 875	1 507	1 894	1 471	1 778	1 778	1 215	511	809
	Microscopy positive	556	335	194	136	222	118	329	364	289	301	168
	RDT examined		48 599		32 495	185 078	207 612	308 414	616 513	394 822	295 367	258 145
	RDT positive		1 525		4 775	15 692	12 050	24 869	66 141	36 451	3 428	13 636
	Imported cases						2 888	3 980	11 874	4 021	1 064	1 305
Niger	Suspected cases	11 231 308	5 315 185	7 818 305	5 584 223	7 100 212	4 671 411	7 347 200	4 013 178	4 810 919	5 582 958	6 343 569
	Presumed and confirmed	4 231 896	4 401 099	6 398 943	4 333 905	5 247 235	3 937 742	5 166 336	2 761 268	3 358 058	3 771 451	4 377 938
	Microscopy examined	165 514	130 658	1 781 505	1 799 299	2 872 710	295 229	3 198 194	203 583	213 795	303 115	337 657
	Microscopy positive	49 285	68 529	1 119 929	1 176 711	1 953 279	206 660	2 120 515	125 856	121 657	211 783	223 601
	RDT examined	7 476 672	1 622 013	1 967 117	1 824 610	2 944 035	2 830 548	3 240 780	3 809 595	4 285 516	5 279 843	5 915 007
	RDT positive	593 489	770 056	1 209 331	1 196 880	2 010 489	2 185 448	2 137 595	2 635 412	2 924 793	3 559 668	4 154 337
Nigeria	Suspected cases		5 221 656	11 789 970	21 659 831	20 558 467	20 243 915	29 113 322	25 106 551	25 381 459	29 489 245	27 370 934
	Presumed and confirmed	3 873 463	4 306 945	6 938 519	12 830 911	17 257 495	16 702 261	23 956 669	20 219 268	20 482 380	23 376 793	21 580 055
	Microscopy examined		672 185	1 953 399	1 633 960	1 681 469	839 849	901 141	1 055 444	1 428 731	3 298 156	3 086 039
	Microscopy positive	523 513				1 233 654	556 871	618 363	749 118	1 023 273	2 476 514	2 312 163
	RDT examined	45 924	242 526	2 898 052	7 194 960	10 191 825	10 770 388	17 853 794	16 919 717	18 018 372	22 621 211	21 030 080
	RDT positive	27 674				7 338 668	7 511 712	12 979 919	12 338 760	13 524 751	17 330 401	16 013 077
Rwanda	Suspected cases	2 883 666	1 802 382	3 095 386	3 064 585	4 178 206	6 093 114	7 502 174	11 186 029	9 666 424	8 829 176	6 879 911
	Presumed and confirmed	669 322	273 293	483 470	962 618	1 623 176	2 505 794	3 380 568	5 940 533	4 231 883	3 612 822	2 043 392
	Microscopy examined	2 708 973	1 602 271	2 904 793	2 862 877	4 010 202	5 811 267	6 603 261	6 637 571	5 501 455	4 576 495	3 181 252
	Microscopy positive	638 669	208 858	422 224	879 316	1 541 189	2 354 400	2 916 902	2 927 780	1 657 793	1 144 762	493 480
	RDT examined	174 693	200 111	190 593	201 708	168 004	281 847	898 913	4 548 458	4 164 969	4 252 681	3 698 659
	RDT positive	30 653	64 435	61 246	83 302	81 987	151 394	463 666	3 012 753	2 574 090	2 468 060	1 549 912
Sao Tome and Principe[2]	Suspected cases	58 355	117 279	126 897	108 634	91 445	84 348	121 409	96 612	169 883	202 207	195 365
	Presumed and confirmed	2 740	8 442	12 550	9 243	1 754	2 058	2 238	2 241	2 940	2 742	1 944
	Microscopy examined	48 366	83 355	103 773	73 866	33 355	11 941	3 682	2 146	13 186	4 071	30 265
	Microscopy positive	2 233	6 373	10 706	6 352	569	140	33	109	148	306	1 544
	RDT examined	9 989	33 924	23 124	34 768	58 090	72 407	117 727	94 466	156 697	198 136	165 100
	RDT positive	507	2 069	1 844	2 891	1 185	1 918	2 205	2 132	2 792	2 436	400
	Imported cases						2	0	2	3	10	11
Senegal[2]	Suspected cases	721 687	633 380	666 101	867 157	727 918	1 421 221	1 559 058	2 035 733	2 096 124	2 270 914	2 206 842
	Presumed and confirmed	390 515	328 276	390 618	476 147	294 229	502 084	356 276	398 417	536 745	359 246	452 984
	Microscopy examined	661 503	579 223	555 724	757 697	702 601	26 556	38 748	21 639	12 881	36 564	13 641
	Microscopy positive	330 331	274 119	280 241	366 687	268 912	17 846	9 918	10 463	3 997	9 352	3 881
	RDT examined						1 384 834	1 513 574	2 011 383	2 077 442	1 969 296	2 185 530
	RDT positive						474 407	339 622	385 243	526 947	345 356	441 432
	Imported cases						0	0	0	292	45	0
Sierra Leone	Suspected cases	2 327 928	1 150 747	2 579 296	2 576 550	2 647 375	2 337 297	2 996 959	2 935 447	2 895 596	4 169 146	1 860 018
	Presumed and confirmed	934 028	856 332	1 945 859	1 715 851	1 898 852	1 569 606	1 845 727	1 741 512	1 781 855	1 837 353	1 223 397
	Microscopy examined	718 473	46 280	194 787	185 403	66 277	75 025	120 917	10 910	20 155	140 768	149 100
	Microscopy positive	218 473	25 511	104 533	76 077	39 414	37 820	60 458	5 717	8 719	35 055	71 001
	RDT examined	1 609 455	886 994	1 975 972	2 377 254	2 056 722	2 176 042	2 805 621	2 834 261	2 827 417	3 990 491	1 212 527
	RDT positive	715 555	613 348	1 432 789	1 625 881	1 335 062	1 445 556	1 714 848	1 645 519	1 725 112	2 372 450	654 005
South Africa[2]	Suspected cases	276 669	382 434	151 344	603 726	540 913	43 515	63 277	56 257			98 562
	Presumed and confirmed	8 060	9 866	6 621	8 645	11 705	4 959	4 323	29 615	10 789	13 833	8 126^
	Microscopy examined		178 387	121 291	364 021	300 291	13 917	20 653				4 654
	Microscopy positive	3 787	5 986	1 632	2 572	4 101	785	1 219	9 592	2 666	477	622
	RDT examined	276 669	204 047	30 053	239 705	240 622	29 598	42 624	56 257			11 982
	RDT positive	4 273	3 880	4 989	6 073	7 604	4 174	3 104	20 023	8 123	13 356	8 126
	Imported cases						3 568	3 075	6 234	5 742	8 890	3 663
South Sudan[4]	Suspected cases					2 492 473	3 814 332	566 043	5 391 360	6 405 779	5 258 306	1 457 255
	Presumed and confirmed	900 283	1 473 653	1 125 039	1 855 501	2 433 991	3 789 475	555 957	4 054 795	4 697 506	4 064 662	1 805 371*+
	Microscopy examined					27 321	22 721	6 954	800 067	1 204	4 689	33 656
	Microscopy positive	900 283	112 024	225 371	262 520	18 344	11 272	2 357	335 642	634	1 237	16 535
	RDT examined					102 538	26 507	10 751	2 024 503	1 805 912	3 092 697	280 150
	RDT positive					53 033	13 099	5 262	1 152 363	98 209	1 902 505	192 095

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Togo	Suspected cases	2 035 303	906 276	1 590 266	1 550 804	2 255 010	2 356 048	2 577 029	2 747 984	3 009 800	3 531 375	
	Presumed and confirmed	1 441 199	519 452	909 129	965 832	1 524 339	1 610 711	1 746 334	1 756 582	2 002 877	2 406 091	
	Microscopy examined	478 354	502 977	579 507	560 538	621 119	643 815	501 516	482 664	446 404	492 629	
	Microscopy positive	206 071	224 619	260 535	272 984	310 207	317 578	231 919	209 626	229 267	269 526	
	RDT examined	1 134 779	390 611	1 010 759	990 266	1 633 891	1 712 233	2 075 513	2 265 320	2 563 396	3 038 746	
	RDT positive	812 958	282 145	648 594	692 848	1 214 132	1 293 133	1 514 415	1 546 956	1 773 610	2 136 565	
Uganda	Suspected cases	15 294 306	12 340 717	16 845 771	26 145 615	19 201 136	22 952 246	27 257 784	22 319 643	17 111 650	25 756 835	27 434 176
	Presumed and confirmed	13 217 617	11 991 843	13 591 932	16 541 563	13 724 345	13 696 889	14 008 604	11 667 831	8 522 824	15 592 793	15 342 561
	Microscopy examined	3 705 284	385 928	3 466 571	3 718 588	2 048 185	3 684 722	4 492 090	5 515 931	1 606 330	4 691 859	4 284 114
	Microscopy positive	1 628 595	134 726	1 413 149	1 502 362	578 289	1 248 576	1 542 091	1 694 441	458 909	1 622 576	1 647 933
	RDT examined		194 819	2 449 526	7 387 826	7 060 545	12 983 382	18 492 939	16 803 712	12 741 670	19 454 545	22 004 158
	RDT positive		97 147	1 249 109		3 053 650	6 164 171	8 193 758	9 973 390	5 300 265	12 359 786	12 548 724
United Republic of Tanzania[2]	Suspected cases	15 452 268	15 442 493	14 659 506	15 177 829	25 197 621	20 829 480	17 881 657	20 276 522	22 784 288	20 981 250	22 354 568
	Presumed and confirmed	12 893 899	10 165 442	8 478 109	8 587 676	7 403 797	8 406 179	6 623 965	5 988 136	6 219 125	6 003 332	6 015 706
	Microscopy examined	3 701 608	5 800 195	7 077 411	6 888 029	727 130	673 223	1 386 389	2 888 538	3 015 052	1 840 897	1 696 487
	Microscopy positive	1 277 388	1 813 654	1 772 736	1 481 759	572 289	412 702	1 262 679	916 742	831 903	366 673	296 052
	RDT examined	136123[$]	1 628 092	1 091 615	1 256 762	17 746 946	16 652 731	15 633 676	17 144 755	19 603 825	18 861 368	20 620 288
	RDT positive	1 974[$]	337 582	214 893	72 879	107 963	4 489 951	4 499 694	4 828 165	5 221 811	5 546 911	5 681 861
	Imported cases				719[$]	1 583[$]	2 550[$]			1 754[$]	3 286[$]	4 314[$]
Mainland	Suspected cases	15 180 191	14 986 775	14 122 756	14 649 872	24 880 179	20 451 119	17 526 829	19 930 496	22 440 865	20 570 343	22 009 560
	Presumed and confirmed	12 819 556	10 160 953	8 474 952	8 585 128	7 399 316	8 400 537	6 617 261	5 982 270	6 215 115	5 996 369	6 001 518
	Microscopy examined	3 637 659	5 656 907	6 931 025	6 804 085	592 320	532 118	1 285 720	2 826 948	2 937 666	1 768 635	1 627 724
	Microscopy positive	1 277 024	1 813 179	1 772 062	1 481 275	571 598	411 741	1 261 650	915 887	830 668	364 890	293 049
	RDT examined		1 315 662	701 477	813 103	17 566 750	16 416 675	15 379 517	16 861 141	19 338 466	18 711 960	20 344 044
	RDT positive		333 568	212 636	71 169	106 609	4 486 470	4 494 019	4 823 976	5 219 714	5 541 731	5 670 676
Zanzibar	Suspected cases	272 077	455 718	536 750	527 957	317 442	378 361	354 828	346 026	343 423	427 029	462 342
	Presumed and confirmed	74 343	4 489	3 157	2 548	4 481	5 642	6 704	5 866	4 010	6 963	14 188*
	Microscopy examined	63 949	143 288	146 386	83 944	134 810	141 105	100 669	61 590	77 386	72 262	68 763
	Microscopy positive	364	475	674	484	691	961	1 029	855	1 235	1 783	3 003
	RDT examined	136 123	312 430	390 138	443 659	180 196	236 056	254 159	283 614	265 359	149 408	276 245
	RDT positive	1 974	4 014	2 257	1 710	1 354	3 481	5 675	4 189	2 097	5 180	11 185
	Imported cases				719	1 583	2 550			1 754	3 286	4 314
Zambia	Suspected cases					7 859 740	8 116 962	9 627 862	10 952 323	10 055 407	11 340 409	15 491 235
	Presumed and confirmed	4 229 839	4 607 908	4 695 400	5 465 122	5 972 933	5 094 123	5 976 192	6 054 679	5 195 723	5 360 020	8 698 304
	Microscopy examined									180 697	275 323	398 195
	Microscopy positive									49 855	78 474	128 291
	RDT examined					5 964 354	7 207 500	8 502 989	10 403 283	9 718 666	10 852 416	14 513 049
	RDT positive					4 077 547	4 184 661	4 851 319	5 505 639	4 989 824	5 068 876	7 992 924
Zimbabwe[2]	Suspected cases	912 618	480 011	727 174	1 115 005	1 478 357	1 638 438	1 400 095	1 831 823	1 293 392	1 324 299	1 389 065
	Presumed and confirmed	648 965^	319 935	276 963	422 633	572 944	482 379	384 029	767 069	264 018	308 173	447 381
	Microscopy examined		10 004							2 771		
	Microscopy positive	249 379										
	RDT examined	513 032	470 007	727 174	1 115 005	1 453 689	1 638 438	1 330 069	1 533 030	1 290 621	1 297 197	1 356 433
	RDT positive	249 379	319 935	276 963	422 633	548 276	482 379	314 003	468 276	264 018	308 173	447 381
	Imported cases						180	358	768	672		
AMERICAS												
Argentina[1,2]	Suspected cases	2 547	7 872	7 027	4 913	5 691	3 862	3 479	2 114	345		
	Presumed and confirmed	109	28	16	11	15	11	7	18^	23	0	0
	Microscopy examined	2 547	7 872	7 027	4 913	5 691	3 862	3 479	2 114	345		
	Microscopy positive	109	28	16	11	15	11	7	18	23	0	0
	RDT examined											
	RDT positive								2			
	Imported cases	55	28	16	11	15	11	7	18	23		
Belize[2,3]	Suspected cases	27 366	22 996	20 789	25 351	24 122	26 367	20 936	26 995	17 642	19 731	10 825
	Presumed and confirmed	150	79	37	26	19	13^	5	9^	7	2	0
	Microscopy examined	27 366	22 996	20 789	25 351	24 122	26 367	20 936	26 995	17 642	19 731	10 711
	Microscopy positive	150	79	37	26	19	13	5	9	7	2	0
	RDT examined											114
	RDT positive						5		3			0
	Imported cases		7	4	4	0	4	1	2	4	2	0

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMERICAS												
Bolivia (Plurinational State of)[2]	Suspected cases	140 857	150 662	132 904	144 049	124 900	159 167	155 407	151 697	139 938	137 473	136 795
	Presumed and confirmed	13 769	7 143	7 415	7 342	7 401	6 907	5 553	4 587	5 354	9 357	12 187
	Microscopy examined	133 463	143 272	121 944	133 260	124 900	159 167	155 407	151 697	139 938	110 028	
	Microscopy positive	12 252	6 108	6 293	6 272	7 401	6 907	5 553	4 334	5 261	8 118	8 507
	RDT examined	7 394	7 390	10 960	10 789						27 445	
	RDT positive	1 517	1 035	1 122	1 070				253	93	1 239	3 680
	Imported cases						33	11	15	12	19	7
Brazil[2]	Suspected cases	2 711 432	2 477 821	2 349 341	1 893 018	1 756 460	1 590 403	1 364 912	1 696 063	1 800 465	1 591 308	1 232 321
	Presumed and confirmed	334 667	267 146	242 758	178 546⁺	142 744^	146 161^	129 244	194 425	194 573	157 454	145 188
	Microscopy examined	2 711 432	2 476 335	2 325 775	1 873 518	1 744 640	1 573 538	1 341 639	1 656 685	1 754 244	1 539 938	1 163 048
	Microscopy positive	334 667	266 713	237 978	174 048	142 744	139 844	124 210	184 876	181 967	146 868	127 403
	RDT examined		1 486	23 566	19 500	11 820	16 865	23 273	39 378	46 221	51 370	69 273
	RDT positive		433	4 780	3 719	1 384	3 318	5 034	9 549	12 606	10 586	17 785
	Imported cases				8 923	4 856	4 932	5 067	4 867	6 816	4 158	1 807
Colombia[2]	Suspected cases	521 342	418 032	416 767	327 055	403 532	328 434	296 091	254 380	208 538	295 406	212 399
	Presumed and confirmed	117 650	64 436⁺	60 179	51 722⁺	40 768	55 866⁺	83 227⁺	54 102⁺	63 143⁺	80 415⁺	76 236*⁺
	Microscopy examined	521 342	396 861	346 599	284 332	325 713	316 451	242 973	244 732	195 286	283 471	202 736
	Microscopy positive	117 637	60 121	50 938	44 293	36 166	48 059	57 515	38 349	42 810	47 806	40 155
	RDT examined		21 171	70 168	42 723	77 819	11 983	53 118	9 648	13 252	11 935	9 663
	RDT positive	13	4 188	9 241	7 403	4 602	3 535	5 655	5 056	3 407	3 703	3 541
	Imported cases						7 785	618	1 297	1 948	2 306	457
Costa Rica[2,3]	Suspected cases	15 599	10 690	7 485	16 774	4 420	7 376	5 162	9 683	9 700	10 631	7 847
	Presumed and confirmed	114	17	8	6	6	8^	13^	25^	108^	145	141^
	Microscopy examined	15 599	10 690	7 485	16 774	4 420	7 373	5 160	9 680	9 000	10 631	4 200
	Microscopy positive	114	17	8	6	6	8	13	25	108	145	141
	RDT examined									700		3 647
	RDT positive						3	2	3	44		93
	Imported cases	4	6	1	4	5	8	9	13	38	45	34
Dominican Republic[2]	Suspected cases	495 637	477 555	506 583	502 683	416 729	324 916	73 779	314 385	118 270	198 366	67 396
	Presumed and confirmed	2 482^	1 616	952	579	496	661^	755⁺	398^	484^	1 314^	829*
	Microscopy examined	469 052	421 405	415 808	431 683	362 304	317 257	51 329	226 988	33 420	143 366	59 826
	Microscopy positive	2 480	1 616	952	579	496	661	484	398	322	1 314	829
	RDT examined	26 585	56 150	90 775	71 000	54 425	7 659	22 450	87 397	84 850	55 000	7 570
	RDT positive	932					129	80	74	221	1 313	
	Imported cases				106	37	30	65	57	51	23	3
Ecuador[2]	Suspected cases	488 830	460 785	459 157	397 628	370 825	261 824	311 920	306 894	244 777	177 742	163 990
	Presumed and confirmed	1 888	1 232	558	378	242	686^	1 424⁺	1 380^	1 806	1 909	2 001
	Microscopy examined	481 030	460 785	459 157	397 628	370 825	261 824	311 920	306 894	237 995	177 742	163 607
	Microscopy positive	1 888	1 232	558	378	242	686	1 191	1 380	1 589	1 428	1 618
	RDT examined	7 800								6 782		383
	RDT positive						6	5	6	217	481	383
	Imported cases		14	14	10		59	233	105	153	106	67
El Salvador[1,2]	Suspected cases	115 256	100 884	124 885	103 748	106 915	89 267	81 904	70 022	52 217	89 992	18 868
	Presumed and confirmed	26	15^	20	7	8	9	14	4	2^	3	0
	Microscopy examined	115 256	100 883	124 885	103 748	106 915	89 267	81 904	70 022	52 216	89 992	18 868
	Microscopy positive	26	15	20	7	8	9	14	4	2	3	0
	RDT examined		1									
	RDT positive		1							1		
	Imported cases	9	8	7	1	2	4	1	3	2	3	0
French Guiana[2]	Suspected cases	14 373	14 429	13 638	22 327	14 651	11 558	9 430				6 238
	Presumed and confirmed	1 632^	1 209^	900^	875⁺	448	434	258	597	546	212	154⁺
	Microscopy examined	14 373	14 429	13 638	22 327	14 651	11 558	9 430				6 238
	Microscopy positive	1 085	720	523	321	242	297	173	468	546	212	120
	RDT examined											
	RDT positive	944	704	499	551	206	137	85	129			33
	Imported cases						60	41	43		36	14
Guatemala[2]	Suspected cases	237 075	195 080	186 645	153 731	300 989	301 746	408 394	542 483	514 133	488 514	335 660
	Presumed and confirmed	7 384⁺	6 817	5 346	6 214	4 931	5 540^	5 001⁺	4 124^	3 021^	2 072^	1 058^
	Microscopy examined	235 075	195 080	186 645	153 731	250 964	295 246	333 535	372 158	438 833	427 239	319 660
	Microscopy positive	7 198	6 817	5 346	6 214	4 931	5 538	4 854	3 744	3 021	2 072	1 058
	RDT examined	2 000				50 025	6 500	74 859	170 325	75 300	61 275	16 000
	RDT positive						1 298	1	2 078	1 748	1 309	292
	Imported cases					2	2	1	3	3	3	0

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMERICAS												
Guyana[2]	Suspected cases	212 863	201 728	196 622	205 903	142 843	132 941	117 483	100 308	101 346	103 836	76 612
	Presumed and confirmed	22 935	29 471^	31 601^	31 479	12 354	9 984	11 108^	13 936^	17 038^	18 826	17 230^
	Microscopy examined	212 863	201 693	196 622	205 903	142 843	132 941	110 891	100 105	95 986	85 736	49 496
	Microscopy positive	22 935	29 471	31 601	31 479	12 354	9 984	10 906	13 734	15 607	13 840	8 932
	RDT examined		35					6 592	203	5 360	18 100	27 116
	RDT positive		35	55				1 724	242	3 570	4 986	10 025
	Imported cases							411				
Haiti	Suspected cases	270 427	184 934	167 772	171 409	261 403	330 603	459 959	364 351	312 804	266 675	245 202
	Presumed and confirmed	84 153	34 350	27 866	26 543	17 696	17 583^	21 430^	19 135^	8 828^	10 687	22 987
	Microscopy examined	270 427	184 934	167 726	165 823	134 766	69 659	61 428	62 539	59 803	35 144	7 855
	Microscopy positive	84 153	34 350	27 866	26 543	10 893	5 224	4 342	2 119	1 586	765	1 446
	RDT examined			46	5 586	126 637	260 944	398 531	301 812	253 001	231 531	226 374
	RDT positive					6 803	12 702	23 325	18 309	8 232	9 922	21 541
Honduras[2]	Suspected cases	156 961	156 451	159 165	144 673	152 847	155 782	188 581	174 030	174 336	161 624	10 350
	Presumed and confirmed	9 745	7 618^	6 439^	5 364^	3 380^	3 555^	4 097^	1 283^	653^	391^	913^
	Microscopy examined	152 961	152 451	155 165	144 436	151 420	150 854	167 836	148 160	142 780	142 870	
	Microscopy positive	9 745	7 618	6 439	5 364	3 380	3 555	4 097	1 283	653	391	913
	RDT examined	4 000	4 000	4 000	237	1 427	4 928	20 745	25 870	31 556	18 754	10 350
	RDT positive		45	10	64	102	79	657	263	454	193	539
	Imported cases					2	0	3	17	21	61	98
Mexico[2]	Suspected cases	1 192 081	1 035 424	1 025 659	1 017 508	900 578	867 860	798 574	644 180	548 247	531 632	242 200
	Presumed and confirmed	1 233	1 130	842	499	666	551^	596^	765^	826	641^	369
	Microscopy examined	1 192 081	1 035 424	1 025 659	1 017 508	900 578	867 853	798 568	644 174	548 247	531 471	242 200
	Microscopy positive	1 233	1 130	842	499	666	551	596	765	826	641	369
	RDT examined										161	
	RDT positive						7	6	6		3	
	Imported cases	7	6	9	4	10	34	45	29	23	22	10
Nicaragua[2]	Suspected cases	554 414	536 105	552 722	539 022	605 357	604 418	554 415	663 132	875 982	1 029 288	947 451
	Presumed and confirmed	692	925	1 235	1 196	1 163	2 308	6 284	10 952	15 934	13 226	31 763
	Microscopy examined	535 914	521 904	536 278	519 993	605 357	604 418	553 615	660 452	831 077	1 001 225	884 821
	Microscopy positive	692	925	1 235	1 196	1 163	2 308	6 284	10 952	15 934	12 337	18 799
	RDT examined	18 500	14 201	16 444	19 029			800	2 680	44 905	28 063	56 397
	RDT positive										889	6 731
	Imported cases				34	21	29	17	3	17	26	25
Panama[2]	Suspected cases	141 038	116 588	107 711	93 624	80 701	64 511	50 772	39 099	24 524	22 171	14 809
	Presumed and confirmed	418	354	844	705	874	562^	811^	689	715^	1 597	2 203
	Microscopy examined	141 038	116 588	107 711	93 624	80 701	64 511	50 772	38 270	23 383	18 217	7 027
	Microscopy positive	418	354	844	705	874	562	811	689	715	1 209	1 358
	RDT examined								829	1 141	3 954	7 782
	RDT positive						3	5		424	388	2 109
	Imported cases				9	10	16	42	40	31	17	13
Paraguay[1,2]	Suspected cases	62 178	48 611	31 499	24 806	24 832	6 697	3 193	9 281			
	Presumed and confirmed	29	10	15	11	8	8^	10^	5	0	0	0
	Microscopy examined	62 178	48 611	31 499	24 806	24 832	6 687	3 192	8 014			
	Microscopy positive	29	10	15	11	8	8	10	5	0	0	0
	RDT examined						10		1 267			
	RDT positive						1	1				
	Imported cases	9	9	15	11	8	8	10	5	0	0	0
Peru[2]	Suspected cases	744 650	702 952	759 285	864 648	866 047	884 113	566 230	402 623	464 785	243 240	
	Presumed and confirmed	31 545^	25 005^	31 436	48 719	65 252	66 609^	56 623	55 367^	45 619^	24 324	15 847+
	Microscopy examined	744 627	702 894	758 723	863 790	864 413	865 980	566 230	388 699	304 785	243 240	
	Microscopy positive	31 545	25 005	31 436	48 719	65 252	66 609	56 623	55 367	45 619	24 324	15 822
	RDT examined	23	58	562	858	1 634	18 133		13 924	160 000		
	RDT positive	1	34				463		2 325	1 000		
	Imported cases							48	57	176	159	25
Suriname[2]	Suspected cases	17 902	16 160	22 134	19 736	33 097	15 236	23 444	22 302	19 836	20 743	28 100
	Presumed and confirmed	1 771+	795+	569+	729	401	376	327+	551^	235	215	244
	Microscopy examined	16 533	15 135	17 464	13 693	17 608	15 083	14 946	12 536	11 799	13 702	13 798
	Microscopy positive	1 574	751	306	530	98	345	315	412	218	209	238
	RDT examined	1 369	1 025	4 670	6 043	15 489	153	8 498	9 766	8 037	7 041	14 043
	RDT positive	190	20	248	199	303	31	11	160	17	6	6
	Imported cases				204		295	251	414	199	111	88

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMERICAS												
Venezuela (Bolivarian Republic of)[2]	Suspected cases	400 495	382 303	410 663	476 764	522 617	625 174	852 556	1 144 635	699 130	1 104 736	725 591
	Presumed and confirmed	45 155	45 824	52 803	80 320	91 918	137 996	301 466	525 897	522 059*+	492 753+	273 126+
	Microscopy examined	400 495	382 303	410 663	476 764	522 617	625 174	852 556	1 144 635	699 130	1 040 683	655 707
	Microscopy positive	45 155	45 824	52 803	80 320	91 918	137 996	301 466	525 897	404 924	398 285	197 466
	RDT examined											69 884
	RDT positive									48 117	64 053	69 884
	Imported cases				1 677	1 210	1 594	1 948	2 941	2 125	1 848	1 356
EASTERN MEDITERRANEAN												
Afghanistan	Suspected cases	865 181	936 252	847 933	817 606	881 515	939 964	1 055 368	1 143 511	1 240 523	1 008 487	943 267
	Presumed and confirmed	392 864	482 748	391 365	326 593	317 608	383 008	436 017	413 536	299 863	174 894	105 445
	Microscopy examined	524 523	531 053	511 408	507 145	514 466	538 789	598 556	611 904	665 200	561 160	449 875
	Microscopy positive	69 397	77 549	54 840	46 114	83 920	103 377	151 528	194 866	104 960	71 389	38 923
	RDT examined	17 592			36 833	155 919	138 026	262 028	431 157	524 149	446 293	389 994
	RDT positive	401			6 851	22 558	16 482	89 705	118 220	143 729	102 471	66 372
Djibouti	Suspected cases		354		7 189	39 284	10 586	19 492	75 594	104 800	214 101	310 397
	Presumed and confirmed	1 010	230	27	1 684	9 439	9 557	13 822	14 810	25 319	49 402	73 535^
	Microscopy examined		124	1 410	7 189	39 284	10 502	19 492	24 504			42 250
	Microscopy positive	1 010		22	1 684	9 439	1 764	2 280	1 283			11 633
	RDT examined								51 090	104 800	214 101	268 147
	RDT positive			3			7 709	11 542	13 527	25 319	49 402	73 535
Iran (Islamic Republic of)[2,3]	Suspected cases	614 817	530 470	479 655	385 172	468 513	610 337	418 125	383 397	541 975	556 125	388 232
	Presumed and confirmed	3 031	3 239	1 629	1 374	1 243	799	705	939	625^	1 190^	1 051^
	Microscopy examined	614 817	530 470	479 655	385 172	468 513	610 337	418 125	383 397	477 914	454 322	334 861
	Microscopy positive	3 031	3 239	1 629	1 374	1 243	799	705	939	625	1 190	1 046
	RDT examined									64 061	101 803	53 371
	RDT positive									436	1 089	516
	Imported cases	1 184	1 529	842	853	867	632	611	868	602	1 107	878
Pakistan	Suspected cases	8 601 835	8 418 570	8 902 947	7 752 797	8 514 341	8 885 456	8 141 124	8 200 899	7 226 725	8 157 351	7 172 956
	Presumed and confirmed	4 281 356	4 065 802	4 285 449	3 472 727	3 666 257	3 776 244	2 121 958	2 209 708	1 069 052	413 533	372 416
	Microscopy examined	4 281 346	4 168 648	4 497 330	3 933 321	4 343 418	4 619 980	5 046 870	4 539 869	4 324 570	4 855 044	3 607 265
	Microscopy positive	220 870	287 592	250 526	196 078	193 952	137 401	154 541	132 580	119 099	125 804	83 859
	RDT examined	279 724	518 709	410 949	628 504	779 815	691 245	1 296 762	1 821 139	2 207 613	3 302 307	3 564 489
	RDT positive	19 721	46 997	40 255	85 677	81 197	64 612	169 925	237 237	255 411	287 729	287 969
Saudi Arabia[2]	Suspected cases	944 723	1 062 827	1 186 179	1 309 783	1 249 752	1 306 700	1 267 933	1 073 998	1 015 953	2 237 412	803 048
	Presumed and confirmed	1 941	2 788	3 406	2 513	2 305	2 620	5 382	3 151	2 711	2 152^	3 658
	Microscopy examined	944 723	1 062 827	1 186 179	1 309 783	1 249 752	1 306 700	1 267 933	1 073 998	1 015 953	1 118 706	403 972
	Microscopy positive	1 941	2 788	3 406	2 513	2 305	2 620	5 382	3 151	2 711	2 152	3 658
	RDT examined										1 118 706	399 076
	RDT positive										2 152	3 205
	Imported cases	1 912	2 719	3 324	2 479	2 254	2 537	5 110	2 974	2 517	2 029	3 453
Somalia	Suspected cases	223 981	99 403	53 658	69 192	79 653	119 008	205 753	228 912	253 220	418 117	337 965
	Presumed and confirmed	24 833	41 167	23 202	9 135	26 174	39 169	58 021	37 156	31 030	65 375^	27 333
	Microscopy examined	20 593	26 351								59 494	
	Microscopy positive	5 629	1 627								11 615	
	RDT examined	203 388	35 236	37 273	67 464	64 480	100 792	183 360	226 894	253 211	332 935	337 965
	RDT positive	19 204	1 724	6 817	7 407	11 001	20 953	35 628	35 138	31 021	39 687	27 333
Sudan	Suspected cases	2 398 239	2 929 578	2 438 467	2 197 563		4 101 841	4 199 740	3 691 112	9 760 505	7 642 050	8 211 933
	Presumed and confirmed	1 465 496	1 214 004	964 698	989 946	1 207 771	1 102 186	897 194	1 642 058	3 616 920	3 568 941	3 412 499*
	Microscopy examined						3 586 482	3 236 118	2 426 329	6 668 355	4 797 856	5 568 277
	Microscopy positive	625 365	506 806	526 931	592 383	579 038	586 827	378 308	588 100	1 251 544	1 408 242	1 262 841
	RDT examined	1 653 300	2 222 380	2 000 700	1 800 000	788 281		632 443	422 841	1 113 247	1 027 264	929 551
	RDT positive	95 192				489 468		187 707	212 016	386 473	343 769	435 553
Yemen	Suspected cases	835 018	804 401	888 952	927 821	821 618	711 680	1 217 602	1 659 798	779 312	1 283 681	1 280 190
	Presumed and confirmed	198 963	142 152	165 687	149 451	122 812	104 831	145 627	143 333	233 143	216 763	164 066
	Microscopy examined	645 463	645 093	685 406	723 691	643 994	561 644	960 860	1 070 020	419 415	841 358	791 049
	Microscopy positive	78 269	60 751	71 300	63 484	51 768	42 052	45 886	28 936	64 233	104 350	97 008
	RDT examined	97 289	108 110	150 218	157 457	141 519	121 464	210 815	589 778	284 654	391 459	450 541
	RDT positive	28 428	30 203	41 059	39 294	34 939	34 207	53 814	114 397	93 667	61 549	67 058

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EUROPEAN												
Armenia[1,2]	Suspected cases	31 026					1 213	465	350	320		121
	Presumed and confirmed	1		4	0	1	2	2	2	6		3
	Microscopy examined	31 026					1 213	465	350	320		121
	Microscopy positive	1		4		1	2	2	2	6		3
	RDT examined											
	RDT positive											
	Imported cases	1	0	4	0	1	2	2	2	6		3
Azerbaijan[2,3]	Suspected cases	456 652	449 168	497 040	432 810	399 925	405 416	465 860	373 562	358 009		
	Presumed and confirmed	52	8	4	4	2	1	1	1	2	0	
	Microscopy examined	456 652	449 168	497 040	432 810	399 925	405 416	465 860	373 562	358 009		
	Microscopy positive	52	8	4	4	2	1	1	1	2	0	
	RDT examined											
	RDT positive											
	Imported cases	2	4	1	4	2	1	1	1	2	0	
Georgia[2,3]	Suspected cases	2 368	2 032	1 046	192	440	294	318	416	286	335	237
	Presumed and confirmed	0	5	4	7	5	5	7	8	9	8	4
	Microscopy examined	2 368	2 032	1 046	192	440	294	318	416	286	335	237
	Microscopy positive	0	5	4	7	5	5	7	8	9	8	4
	RDT examined											
	RDT positive											
	Imported cases	0	5	4	7	5	5	7	8	9	8	4
Kyrgyzstan[2,3]	Suspected cases	30 190	27 850	18 268	54 249	35 600	75 688	62 537	8 459	7 709	46 384	18 717
	Presumed and confirmed	6	5	3	4	0	1	6	2	0	1	0
	Microscopy examined	30 190	27 850	18 268	54 249	35 600	75 688	62 537	8 459	7 709	46 384	18 717
	Microscopy positive	6	5	3	4	0	1	6	2	0	1	0
	RDT examined						0	0	0			
	RDT positive						0	0	0			
	Imported cases	3	5	3	4	0	1	6	2			
Tajikistan[2,3]	Suspected cases	173 523	173 367	209 239	213 916	200 241	188 341	233 336	232 502	232 502	209 830	159 124
	Presumed and confirmed	116	100	39	14	7	4	1	3	1	3	0
	Microscopy examined	173 523	173 367	209 239	213 916	200 241	188 341	198 766	191 284	191 284	207 821	159 124
	Microscopy positive	116	100	39	14	7	4	1	3	1	3	0
	RDT examined							34 570	41 218	41 218	2 009	
	RDT positive											
	Imported cases	4	22	11	10	5	4	1	3	1	3	0
Turkey[2,3]	Suspected cases	507 841	421 295	337 830	255 125	189 854	211 740	144 499	115 557			
	Presumed and confirmed	81	128	376	251	249	221	208	214			
	Microscopy examined	507 841	421 295	337 830	255 125	189 854	211 740	144 499	115 557			
	Microscopy positive	81	128	376	251	249	221	208	214			
	RDT examined											
	RDT positive											
	Imported cases	81	128	376	251	249	221	208	214			
Turkmenistan[1,2]	Suspected cases	81 784					83 675	85 536	84 264	85 722		
	Presumed and confirmed	0	0	0	0	0	0	0	0	0		
	Microscopy examined	81 784					83 675	85 536	84 264	85 722		
	Microscopy positive											
	RDT examined											
	RDT positive											
	Imported cases	0	0	0	0	0	0	0	0	0		
Uzbekistan[1,2]	Suspected cases	921 364	886 243	805 761	908 301	812 347	800 912	797 472	655 112	699 495	669 373	552 458
	Presumed and confirmed	5	1	1	3	1	0	0	0	0	1	2
	Microscopy examined	921 364	886 243	805 761	908 301	812 347	800 912	797 472	655 112	699 495	669 373	552 458
	Microscopy positive	5	1	1	3	1					1	2
	RDT examined											
	RDT positive											
	Imported cases	2	1	1	3	1	0	0	0	0	1	2
SOUTH-EAST ASIA												
Bangladesh[2]	Suspected cases	467 767	390 930	372 806	418 755	630 181	786 830	993 589	986 442	1 300 691	1 507 230	1 416 473
	Presumed and confirmed	62 378	52 601	29 518	26 891	57 480	39 719	27 737	29 247	10 523	17 225	6 130
	Microscopy examined	308 326	270 253	253 887	290 496	418 519	527 659	573 540	613 304	800 251	750 657	611 307
	Microscopy positive	20 519	20 232	9 901	7 303	13 628	6 621	3 217	3 325	1 135	1 311	262
	RDT examined	152 936	119 849	118 919	128 259	211 662	259 171	420 049	373 138	500 440	756 573	805 166
	RDT positive	35 354	31 541	19 617	19 588	43 852	33 098	24 520	25 922	9 388	15 914	5 868
	Imported cases						129	109	19	41	6	2

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SOUTH-EAST ASIA												
Bhutan[2]	Suspected cases	54 760	44 494	42 512	31 632	33 586	74 087	118 841	42 135	133 498	119 975	31 522
	Presumed and confirmed	487	207	82	45	48	104	74	51	54	42^	54
	Microscopy examined	54 709	44 481	42 512	31 632	33 586	26 149	23 442	22 885	19 778	18 973	6 246
	Microscopy positive	436	194	82	45	48	84	59	51	49	38	46
	RDT examined						47 938	95 399	19 250	113 720	101 002	25 276
	RDT positive						20	15		5	37	8
	Imported cases			0	23	34	70	56	38	34	30	9
Democratic People's Republic of Korea[2]	Suspected cases	27 019	27 857	40 925	72 719	38 878	91 007	205 807	189 357	685 704	461 998	357 778
	Presumed and confirmed	15 392	18 104	23 537	15 673	11 212	7 409	5 113	4 626	3 698	1 869	1 819
	Microscopy examined	25 147	26 513	39 238	71 453	38 201	29 272	22 747	16 835	28 654	3 255	3 681
	Microscopy positive	13 520	16 760	21 850	14 407	10 535	7 010	4 890	4 463	3 446	886	1 162
	RDT examined						61 348	182 980	172 499	657 050	458 743	354 097
	RDT positive						12	143	140	252	983	657
	Imported cases						0	0	0	0	0	0
India	Suspected cases	119 279 429	119 470 044	109 044 798	127 891 198	138 628 331	140 841 230	144 539 608	125 977 799	124 613 482	134 230 349	97 177 024
	Presumed and confirmed	1 599 986	1 310 656	1 067 824	881 730	1 102 205	1 169 261	1 087 285	844 558	429 928	338 494	186 532
	Microscopy examined	108 679 429	108 969 660	109 044 798	113 109 094	124 066 331	121 141 970	124 933 348	110 769 742	111 123 775	113 969 785	73 294 320
	Microscopy positive	1 599 986	1 310 656	1 067 824	881 730	1 102 205	1 169 261	1 087 285	306 768	230 432	132 750	65 468
	RDT examined	10 600 000	10 500 384	13 125 480	14 782 104	14 562 000	19 699 260	19 606 260	15 208 057	13 489 707	20 260 564	23 882 706
	RDT positive								537 790	199 496	205 744	121 064
Indonesia[2,5]	Suspected cases	1 591 179	1 212 799	1 900 725	1 708 161	1 550 296	1 567 450	1 457 858	1 441 679	1 700 094	2 491 516	1 940 676
	Presumed and confirmed	465 764	422 447	417 819	343 527	252 027	217 025	218 450	261 617	222 136	250 644	254 055
	Microscopy examined	1 335 445	962 090	1 429 139	1 447 980	1 300 835	1 224 504	1 092 093	1 045 994	1 322 026	1 899 437	1 367 987
	Microscopy positive	465 764	422 447	417 819	343 527	252 027	217 025	218 450	261 617	190 573	212 995	192 769
	RDT examined	255 734	250 709	471 586	260 181	249 461	342 946	365 765	395 685	378 068	592 079	516 167
	RDT positive									31 563	37 649	61 286
	Imported cases									11	61	38
Myanmar[2]	Suspected cases	1 277 568	1 210 465	1 424 004	1 300 556	1 567 095	2 657 555	3 185 245	3 368 697	3 717 875	3 717 875	3 685 682
	Presumed and confirmed	693 124	567 452	481 242	333 871	205 658	182 616	110 146	85 019	76 518+	56 640*	58 836^
	Microscopy examined	275 374	312 689	265 135	138 473	151 258	98 014	122 078	107 242	50 902	50 902	57 950
	Microscopy positive	103 285	91 752	75 220	26 509	12 010	6 453	6 717	4 648	2 577	1 050	2 167
	RDT examined	729 878	795 618	1 158 831	1 162 083	1 415 837	2 559 541	3 063 167	3 261 455	3 125 632	3 666 973	3 627 732
	RDT positive	317 523	373 542	405 984	307 362	193 648	176 163	103 429	80 371	73 941	55 590	57 009
	Imported cases											11
Nepal[2]	Suspected cases	213 353	188 702	276 752	168 687	200 631	131 654	146 705	263 510	256 020	224 726	158 776
	Presumed and confirmed	96 383	71 752	71 410	37 336	26 526	19 896	10 687	4 059	2 930	1 438	674
	Microscopy examined	102 977	95 011	152 780	100 336	127 130	63 946	84 595	163 323	160 904	92 367	31 304
	Microscopy positive	3 115	1 910	1 659	1 197	1 469	1 112	1 009	1 293	1 158	102	29
	RDT examined	17 887	25 353	55 792	32 989	48 444	49 649	52 432	97 870	93 378	131 631	127 228
	RDT positive	779	1 504	1 571	777		725		449	34	608	401
	Imported cases		1 079	1 026		637	521	502	670	539	579	357
Sri Lanka[1,2,3]	Suspected cases	1 001 107	985 060	957 155	1 249 846	1 078 884	1 157 366	1 090 743	1 104 333	1 149 897	1 185 659	820 210
	Presumed and confirmed	736	175	93	95	49	36	41	57	48	53	30
	Microscopy examined	1 001 107	985 060	948 250	1 236 580	1 069 817	1 142 466	1 072 396	1 089 290	1 129 070	1 164 914	810 205
	Microscopy positive	736	175	74	93	45	35	40	38	48	51	30
	RDT examined			8 905	13 266	9 067	14 900	18 347	15 043	20 827	20 745	10 005
	RDT positive			19	2	4	1	1	19	0	2	0
	Imported cases	52	51	70	95	49	36	41	57	48	53	30
Thailand[2,5]	Suspected cases	1 777 977	1 450 885	1 272 324	1 927 585	1 833 061	1 537 430	1 619 174	1 268 976	976 482	937 053	800 012
	Presumed and confirmed	32 480	24 897	46 895	41 602	41 218	24 155	17 800	11 440	6 750	5 421	3 940
	Microscopy examined	1 695 980	1 354 215	1 130 757	1 830 090	1 756 528	1 358 953	1 302 834	1 117 648	908 540	856 893	716 060
	Microscopy positive	22 969	14 478	32 569	33 302	37 921	14 750	11 301	7 154	5 171	4 170	2 792
	RDT examined	81 997	96 670	141 567	97 495	76 533	178 477	316 340	151 328	67 942	80 160	83 952
	RDT positive	9 511	10 419	14 326	8 300	3 297	9 405	6 499	4 286	1 579	1 251	1 148
	Imported cases						9 890	5 724	4 020	1 618	1 342	798
Timor-Leste[2,3]	Suspected cases	266 386	225 858	193 695	208 064	135 053	121 054	150 333	129 175	154 816	181 676	138 870
	Presumed and confirmed	119 074	36 150	6 458	1 240	411	80	95	30	8	9^	14^
	Microscopy examined	109 806	82 175	64 318	56 192	30 515	30 237	35 947	37 705	45 976	51 042	35 256
	Microscopy positive	40 250	19 739	5 208	1 025	347	80	94	30	8	9	14
	RDT examined	85 643	127 272	128 437	151 855	104 538	90 817	114 385	91 470	108 840	130 634	103 614
	RDT positive	7 887		310	198	64					7	3
	Imported cases							0	13	7	9	7

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WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WESTERN PACIFIC												
Cambodia	Suspected cases	411 104	356 606	300 344	207 483	356 027	332 613	298 108	376 702	282 295	596 009	1 354 564
	Presumed and confirmed	181 857	106 905	74 628	46 890	70 304	68 109	43 380	76 804	62 582	32 197	15 891
	Microscopy examined	90 175	86 526	80 212	54 716	48 591	49 357	42 802	38 188	42 834	38 964	20 956
	Microscopy positive	14 277	13 792	10 124	4 598	5 288	7 423	3 695	5 908	8 318	2 635	709
	RDT examined	235 536	270 080	215 055	149 946	306 310	283 256	255 306	338 514	239 461	557 045	1 333 608
	RDT positive	82 187	93 113	59 427	39 471	63 890	60 686	39 685	70 896	54 264	29 562	15 182
	Imported cases										0	0
China[1,2,3]	Suspected cases	7 118 649	9 190 401	6 918 770	5 555 001	4 403 633	4 052 616	3 194 915	2 409 289	1 904 290	1 680 801	1 274 340
	Presumed and confirmed	9 973	4 498	2 716	4 246	3 079	3 279	3 150	2 672	2 511	2 486	1 051
	Microscopy examined	7 115 784	9 189 270	6 918 657	5 554 960	4 403 633	4 052 588	3 194 915	2 409 280	1 904 290	1 680 796	1 274 340
	Microscopy positive	7 108	3 367	2 603	4 205	3 079	3 251	3 150	2 663	2 511	2 481	1 051
	RDT examined											
	RDT positive											
	Imported cases	2 118	2 059	2 399	4 051	3 026	3 212	3 149	2 663	2 511	2 486	1 050
Lao People's Democratic Republic[2]	Suspected cases	340 119	244 956	336 783	359 143	313 859	284 361	240 505	234 365	287 984	567 650	576 848
	Presumed and confirmed	22 879	17 532	46 153	39 589	50 674	36 078	15 509	8 435	9 038	6 692	3 498
	Microscopy examined	212 202	167 125	192 594	225 795	153 198	133 363	113 198	116 343	89 811	128 387	87 957
	Microscopy positive	6 619	6 223	13 206	11 487	10 629	6 198	2 367	1 575	1 093	898	297
	RDT examined	127 917	77 831	144 189	133 348	160 661	150 998	127 307	118 022	198 173	439 263	488 069
	RDT positive	16 260	11 309	32 947	28 102	40 045	29 880	13 142	6 860	7 945	5 794	3 201
	Imported cases									0	0	4
Malaysia[2,3,5]	Suspected cases	1 619 074	1 600 439	1 566 872	1 576 012	1 443 958	1 066 518	1 153 155	1 046 223	1 070 356	1 072 252	901 799
	Presumed and confirmed	6 650	5 306	4 725	3 850	3 923	2 359	2 349	4 174	4 630	3 941	2 839
	Microscopy examined	1 619 074	1 600 439	1 566 872	1 576 012	1 443 958	1 066 470	1 153 108	1 046 163	1 070 356	1 072 252	901 799
	Microscopy positive	6 650	5 306	4 725	3 850	3 923	2 311	2 302	4 114	4 630	3 941	2 839
	RDT examined											
	RDT positive						48	47	60			
	Imported cases	831	1 142	924	865	766	435	428	423	485	630	177
Papua New Guinea	Suspected cases	1 505 393	1 279 140	1 113 528	1 520 167	1 015 615	996 660	1 246 456	1 432 082	1 513 776	1 279 574	1 589 675
	Presumed and confirmed	1 379 787	1 151 343	878 371	1 176 874	707 716	620 785	785 120	892 235	940 693	646 648	932 973
	Microscopy examined	198 742	184 466	156 495	139 972	83 257	112 864	146 242	139 910	121 766	72 636	50 564
	Microscopy positive	75 985	70 603	67 202	70 658	68 118	64 719	80 472	70 449	59 652	39 684	26 925
	RDT examined	20 820	27 391	228 857	519 446	538 678	609 442	849 913	888 815	967 566	1 206 938	1 356 392
	RDT positive	17 971	13 457	82 993	245 467	245 918	281 712	454 347	418 429	456 597	606 964	723 329
Philippines[2]	Suspected cases	314 788	329 665	360 126	353 823	339 319	315 010	321 848	398 759	443 997	343 174	235 560
	Presumed and confirmed	19 648	9 648	9 107	8 926	6 099	11 445	6 690	6 791	4 641	5 778	6 120
	Microscopy examined	301 031	327 060	332 063	317 360	287 725	224 843	255 302	171 424	122 502	170 887	103 488
	Microscopy positive	18 560	9 552	7 133	5 826	3 618	5 694	2 860	874	569	1 370	1 229
	RDT examined	13 211	2 540	27 042	35 257	51 582	90 132	66 536	227 335	321 495	172 287	132 072
	RDT positive	542	31	953	1 894	2 469	5 716	3 820	5 917	4 072	4 408	4 891
	Imported cases					68	85	53	69	82	95	26
Republic of Korea[2]	Suspected cases							673	515	576	559	434
	Presumed and confirmed	1 772	838	555	443	635	692^	662^	515^	576^	559^	390
	Microscopy examined							673	515	576	559	386
	Microscopy positive	1 772	838	555	443	635	692	662	515	576	559	386
	RDT examined										94	
	RDT positive						452	454	372	429	94	
	Imported cases	56	64	47	50	78	72	71	79	75	74	29
Solomon Islands	Suspected cases	284 931	254 506	249 520	245 014	233 803	192 044	274 881	238 814	244 523	271 748	240 199
	Presumed and confirmed	95 006	80 859	57 296	53 270	51 649	50 916	84 514	68 712	72 430	86 116	90 830
	Microscopy examined	212 329	182 847	202 620	191 137	173 900	124 376	152 690	89 061	89 169	79 694	66 824
	Microscopy positive	35 373	23 202	21 904	21 540	13 865	14 793	26 187	15 978	17 825	18 239	19 621
	RDT examined	17 300	17 457	13 987	26 216	26 658	40 750	92 109	133 560	142 115	178 705	160 182
	RDT positive	4 331	3 455	2 479	4 069	4 539	9 205	28 245	36 541	41 366	54 528	58 016
Vanuatu[2]	Suspected cases	55 161	38 150	39 047	32 716	40 333	16 044	24 232	34 152	26 931	23 531	29 362
	Presumed and confirmed	20 982	7 263	4 812	2 883	1 314	845	2 531	1 228	644	576	507
	Microscopy examined	29 180	19 183	16 981	15 219	18 135	4 870	6 704	9 187	5 935	4 596	2 941
	Microscopy positive	4 013	2 077	733	767	190	15	225	120	53	26	22
	RDT examined	14 816	17 883	21 786	17 497	22 198	10 900	17 249	24 965	20 996	11 318	26 421
	RDT positive	5 804	4 102	3 799	2 116	1 124	556	2 027	1 108	591	550	485
	Imported cases							0	1	12	9	14
Viet Nam[2]	Suspected cases	2 803 918	3 312 266	3 436 534	3 115 804	2 786 135	2 673 662	2 497 326	2 614 663	2 169 224	2 420 032	2 053 578
	Presumed and confirmed	54 297	45 588	43 717	35 406	27 868	19 252	10 446	8 411^	6 870^	5 987^	1 733^
	Microscopy examined	2 760 119	2 791 917	2 897 730	2 684 996	2 357 536	2 204 409	2 082 986	2 009 233	1 674 897	1 914 379	1 521 490
	Microscopy positive	17 515	16 612	19 638	17 128	15 752	9 331	4 161	4 548	4 813	4 765	1 309
	RDT examined	7 017	491 373	514 725	412 530	416 483	459 332	408 055	603 161	492 270	504 431	532 088
	RDT positive								1 594	1 848	3 243	1 168
	Imported cases									1 681	1 565	46

ANNEX 5 – H. REPORTED MALARIA CASES BY METHOD OF CONFIRMATION, 2010–2020

WHO region Country/area	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
REGIONAL SUMMARY (presumed and confirmed malaria cases)											
African	104 478 124	102 271 202	113 746 338	125 732 193	135 093 617	142 470 937	160 847 310	164 220 162	157 996 344	166 546 099	165 864 663
Americas	677 547	495 220	471 839	441 271	390 790	455 828	628 253	888 249	880 974	815 543	602 476
Eastern Mediterranean	6 369 494	5 952 130	5 835 463	4 953 423	5 353 609	5 418 414	3 678 726	4 464 691	5 278 663	4 492 250	4 160 003
European	261	247	431	283	265	234	225	230	18	13	9
South-East Asia	3 085 804	2 504 441	2 144 878	1 682 010	1 696 834	1 660 301	1 477 428	1 240 704	752 593	671 835	512 084
Western Pacific	1 792 851	1 429 780	1 122 080	1 372 377	923 261	813 760	954 351	1 069 977	1 104 615	790 980	1 055 832
Total	**116 404 081**	**112 653 020**	**123 321 029**	**134 181 557**	**143 458 376**	**150 819 474**	**167 586 293**	**171 884 013**	**166 013 207**	**173 316 720**	**172 195 067**

Data as of 2 December 2021

RDT: rapid diagnostic test; WHO: World Health Organization

"–" refers to not applicable or data not available.

* The country reported double counting of RDTs and microscopy but did not indicate the number of cases double counted. Confirmed cases have not been corrected.

^ Confirmed cases are corrected for double counting of microscopy and RDTs.

+ Incomplete laboratory data. Confirmed cases reported by the country exceed microscopy positive + RDT positive.

$ Data are available for Zanzibar only.

Between 2010 and 2018, suspected cases were calculated based on the formula suspected = presumed+microscopy examined+rdt examined, unless reported retrospectively by the country. From 2019 onwards, suspected cases were reported by countries. If data quality issues were detected, suspected cases were re-calculated applying the same formula used in 2010-2018.

1 Certified malaria free countries are included in this listing for historical purposes.

2 Cases include imported and/or introduced cases.

3 There are no indigenous cases in 2020.

4 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf).

5 Figures include non-human malaria cases, none of them being indigenous malaria cases.

Note: After the closure of data analysis for the report, Cambodia updated the following variables for 2020: presumed and confirmed (3 565), microscopy positive (693), RDT examined (769 844) and RDT positive (9 271).

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Algeria[1]	Indigenous cases	1*	1*	55*	8*	0*	0*	0*	0*	0*	0*	0*
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	396	187	828	587	260	727	420	446	1 241	1 014	2 725
	Total introduced cases	4	3	3	6	0	18	12	7	1	0	0
Angola	Indigenous cases	1 682 870	1 632 282	1 496 834	1 999 868	2 298 979	2 769 305	3 794 253	3 874 892	5 150 575	7 054 978	6 599 327
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Benin	Indigenous cases	–	422 968	705 839	1 090 602	1 309 238	1 721 626	1 610 790	1 933 912	1 975 812	2 895 878	2 516 465
	Total *P. falciparum*	–	68 745	–	–	1 044 235	1 268 347	1 324 576	1 696 777	1 768 450	2 895 878	2 516 465
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Botswana	Indigenous cases	1 046	432	193	456"	1 346"	284^	659^	1 847^	534*	169*	884*
	Total *P. falciparum*	1 046	432	193	456	1 346	278	640	1 831	534	169	884
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	12	9	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	30	30	48	64	62	51	103	69
Burkina Faso	Indigenous cases	804 539	428 113	3 858 046	3 769 051	5 428 655	7 015 446	9 779 411	10 557 260	10 278 970	5 877 426	10 600 340
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	5 877 426	10 248 510
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Burundi	Indigenous cases	1 763 447	1 575 237	2 166 690	4 178 338	4 726 299	5 428 710	8 793 176	8 795 952	4 966 511	9 959 533	4 720 103
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	3 963 662
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Cabo Verde	Indigenous cases	47	7*	1*	22*	26*	7*	48*	423*	2*	0*	0*
	Total *P. falciparum*	47	7	1	22	26	7	48	423	2	0	0
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	29	35	24	20	21	27	23	18	39	10
	Total introduced cases	–	–	–	–	0	0	0	0	1	1	0
Cameroon	Indigenous cases	–	17 874	66 656	42 581	–	1 193 281	2 476 153	2 244 788	2 257 633	2 819 803	2 890 193
	Total *P. falciparum*	–	–	–	–	–	592 351	1 675 264	1 191 257	1 249 705	2 318 830	2 890 193
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Central African Republic	Indigenous cases	–	–	87 566	163 701	295 088	598 833	1 239 317	411 913	972 119	2 416 960	1 740 970
	Total *P. falciparum*	–	–	–	–	295 088	598 833	1 032 764	383 309	972 119	2 416 960	1 740 970
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Chad	Indigenous cases	200 448	181 126	7 710	754 565	914 032	787 046	1 294 768	1 962 372	1 364 706	1 632 529	1 544 194
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	1 480 402	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Comoros	Indigenous cases	36 538	24 856	49 840	53 156	2 203	1 884	1 467	3 896	15 613	17 599^	4 546*
	Total *P. falciparum*	33 791	21 387	43 681	45 669	2 203	1 300	1 066	2 274	15 613	17 599	4 546
	Total *P. vivax*	528	334	637	72	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	880	557	–	363	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	–	–	98	0

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Congo	Indigenous cases	–	37 744	120 319	43 232	66 323	51 529	171 847	127 939	116 903	117 837	91 538
	Total *P. falciparum*	–	37 744	120 319	43 232	66 323	51 529	171 847	127 939	116 903	117 837	91 538
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Côte d'Ivoire	Indigenous cases	62 726	29 976	1 140 627	2 524 326	3 712 831	3 375 904	3 754 504	4 032 381	4 766 477	5 935 178	4 980 640
	Total *P. falciparum*	–	–	–	2 506 953	3 712 831	3 375 904	3 471 024	3 274 683	4 766 477	5 935 178	4 980 640
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Democratic Republic of the Congo	Indigenous cases	2 417 780	4 561 981	4 791 598	6 719 887	10 288 519	12 538 805	16 821 130	16 793 002	16 972 207	20 480 310	22 590 646
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	20 480 310	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Equatorial Guinea	Indigenous cases	53 813	22 466	15 169	16 405	20 417	15 142	147 714	15 725	8 962	25 904	–
	Total *P. falciparum*	53 813	22 466	15 169	13 129	17 452	–	–	–	–	–	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Eritrea	Indigenous cases	35 982	34 848	21 815	21 317	50 534	28 036	24 251	54 005	46 440	93 878	74 041
	Total *P. falciparum*	9 785	10 263	12 121	12 482	23 787	14 510	20 704	21 849	16 553	75 568	66 600
	Total *P. vivax*	3 989	4 932	9 204	7 361	6 780	4 780	2 999	9 185	6 108	15 790	7 119
	Total mixed cases	63	94	346	1 391	166	70	543	429	268	2 340	300
	Total other species	57	19	–	83	35	12	5	23	26	180	22
Eswatini	Indigenous cases	268	379^	409^	728^	389^	318*	250*	440*	686*	239*	233*
	Total *P. falciparum*	87	189	192	253	389	318	250	440	686	239	233
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	1	–	–	–	–	–	–	–
	Imported cases	–	170	153	234	322	157	67	687	271	338	82
	Total introduced cases	–	0	0	0	0	0	0	0	0	0	0
Ethiopia	Indigenous cases	1 196 829	1 480 360	1 692 578	2 645 454	2 118 815	1 867 059	1 718 504	1 530 739	962 087	904 495	1 743 755
	Total *P. falciparum*	732 776	814 547	946 595	1 687 163	1 250 110	1 188 627	1 142 235	1 059 847	859 675	738 155	1 340 869
	Total *P. vivax*	390 252	665 813	745 983	958 291	868 705	678 432	576 269	470 892	102 412	166 340	263 877
	Total mixed cases	73 801	–	–	–	–	–	–	–	–	–	30 051
	Total other species	–	–	–	–	–	–	–	–	–	–	108 958
Gabon	Indigenous cases	13 936	–	19 753	28 982	31 900	23 867	23 915	35 244	111 719	53 182	53 659
	Total *P. falciparum*	2 157	–	–	26 432	26 117	–	23 915	35 244	111 719	52 811	53 659
	Total *P. vivax*	720	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	55	–	–	–	–	–	–	–	–	371	–
	Total other species	2 015	–	–	–	1 570	–	–	–	–	–	–
Gambia	Indigenous cases	116 353	268 020	313 469	242 513	168 256	246 348	162 739	78 040	87 448	53 386	75 801
	Total *P. falciparum*	64 108	190 379	271 038	240 792	99 976	240 382	153 685	69 931	87 448	53 386	75 801
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Ghana	Indigenous cases	1 071 637	1 041 260	3 755 166	1 643 642	3 415 912	5 657 096	5 428 979	7 003 155	4 931 454	6 115 267	5 447 563
	Total *P. falciparum*	926 447	593 518	3 755 166	1 629 198	3 415 912	4 319 919	4 421 788	4 266 541	4 808 163	6 075 297	5 412 537
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	83 654	82 153	–	28 952	–
	Total other species	102 937	31 238	–	–	–	–	29 725	27 245	27 635	11 018	35 026
Guinea	Indigenous cases	20 936	95 574	340 258	211 257	660 207	810 979	992 146	1 335 323	1 214 996	2 143 225	2 008 976
	Total *P. falciparum*	20 936	5 450	191 421	63 353	660 207	810 979	992 146	1 335 323	1 214 996	2 143 225	2 008 976
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Guinea-Bissau	Indigenous cases	50 391	71 982	50 381	54 584	97 424	150 085	156 471	152 619	171 075	160 907	–
	Total *P. falciparum*	–	–	–	–	–	96 520	97 889	89 784	125 511	115232	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Kenya	Indigenous cases	898 531	1 002 805	1 453 471	2 375 129	2 851 555	2 041 277	3 064 796	3 607 026	2 318 090	5 019 389	3 659 170
	Total *P. falciparum*	898 531	1 002 805	1 453 471	2 335 286	2 808 931	1 499 027	2 783 846	3 215 116	1 521 566	5 019 389	3 659 170
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Liberia	Indigenous cases	922 173	1 921 159	1 412 629	1 244 220	881 224	941 711	1 191 137	1 093 115	–	915 845	–
	Total *P. falciparum*	212 927	577 641	1 407 455	1 244 220	864 204	–	809 356	–	–	915 845	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Madagascar	Indigenous cases	202 450	224 498	402 900	433 450	470 212^	938 490^	686 024	985 852	972 790	970 828	1 950 471
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	1 949 964
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	253
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	254
	Imported cases	–	–	–	–	712	1 167	–	–	–	–	–
Malawi	Indigenous cases	–	304 499	1 564 984	1 280 892	2 905 310	3 661 238	4 827 373	4 947 443	5 865 476	5 184 107	7 139 065
	Total *P. falciparum*	–	–	1 564 984	1 280 892	2 905 310	3 585 315	4 730 835	4 901 344	5 830 741	4 287 578	7 057 864
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Mali	Indigenous cases	239 787	307 035	886 482	1 506 940	2 039 853	2 454 508	2 311 098	2 277 218	2 345 475	3 221 535	2 666 266
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	3 165 483	2 666 266
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Mauritania	Indigenous cases	1 994	2 926	1 888	1 587	15 835	22 631	29 156	20 105	30 609	14 869	12 425
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Mayotte	Indigenous cases	201*	45*	27*	1*	1*	1*	18*	9*	3*	–	–
	Total *P. falciparum*	–	38	21	–	1	–	–	–	–	–	–
	Total *P. vivax*	–	2	2	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	4	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	236	51	47	71	14	10	10	10	44	–	–
	Total introduced cases	–	–	–	–	–	–	5	–	–	–	–
Mozambique	Indigenous cases	1 522 577	1 756 874	1 853 276	3 282 172	7 407 175	8 222 814	9 690 873	9 892 601	10 304 472	11 734 926	11 318 685
	Total *P. falciparum*	878 009	663 132	927 841	2 998 874	7 117 648	7 718 782	8 520 376	8 921 081	9 292 928	11 734 926	11 318 685
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Namibia	Indigenous cases	556	1 525	194	4 775	15 692	9 162*	19 510*	54 268*	30 567*	2 376*	12 331*
	Total *P. falciparum*	556	335	194	136	15 692	9 162	19 510	54 268	30 567	2 340	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	6	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	2 888	3 980	11 874	4 021	1 064	1 305
Niger	Indigenous cases	642 774	838 585	2 329 260	2 373 591	3 963 768	2 392 108	4 258 110	2 761 268	3 046 450	3 771 451	4 377 938
	Total *P. falciparum*	601 455	757 449	2 185 060	2 306 354	3 828 486	2 267 867	3 961 178	2 638 580	3 046 450	3 748 155	4 154 337
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	17 123	21 370	22 399	46 068	78 102	–	–	–	–	–	–
	Total other species	–	–	–	–	–	4 133	186 989	–	–	23 296	–
Nigeria	Indigenous cases	551 187	–	–	–	8 572 322	8 068 583	13 598 282	13 087 878	14 548 024	19 806 915	18 325 240
	Total *P. falciparum*	523 513	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Rwanda	Indigenous cases	669 322	273 293	483 470	962 618	1 623 176	2 505 794	3 380 568	5 940 533	4 231 883	3 612 822	2 043 392
	Total *P. falciparum*	638 669	208 858	483 470	962 618	1 623 176	–	–	2 927 780	1 657 793	1 306 846	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	2 305 976	2 043 392
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Sao Tome and Principe	Indigenous cases	2 740	8 442	12 550	9 243	1 754	2 056^	2 238	2 239^	2 937^	2 732^	1 933^
	Total *P. falciparum*	2 219	6 363	10 700	9 242	1 754	2 055	2 238	2 239	2 937	2 447	1 648
	Total *P. vivax*	14	4	1	1	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	6	–	–	–	1	–	–	–	–	–
	Imported cases	–	–	–	–	–	2	0	2	3	10	11
	Total introduced cases	–	–	–	–	–	–	–	–	–	–	9
Senegal	Indigenous cases	330 331	274 119	280 241	366 687	268 912	492 253	349 540	395 706	530 652^	354 663^	445 313^
	Total *P. falciparum*	330 331	274 119	280 241	366 687	268 912	492 253	349 540	395 706	530 652	354 663	445 313
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	0	0	0	292	45	0
Sierra Leone	Indigenous cases	934 028	638 859	1 537 322	1 701 958	1 374 476	1 483 376	1 775 306	1 651 236	1 733 831	2 407 505	725 006
	Total *P. falciparum*	218 473	25 511	1 537 322	1 701 958	1 374 476	1 483 376	1 775 306	1 651 236	1 733 831	2 407 505	725 006
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
South Africa	Indigenous cases	8 060	9 866	6 621	8 645	11 705	4 959"	4 323"	23 381*	9 540*	3 096*	4 463*
	Total *P. falciparum*	2 181	4 206	4 565	8 645	11 563	4 344	4 323	23 381	9 540	3 096	3 173
	Total *P. vivax*	0	14	5	–	–	5	–	–	–	–	–
	Total mixed cases	12	–	–	–	–	3	–	–	–	–	–
	Total other species	5	15	0	–	–	5	–	–	–	–	–
	Imported cases	–	–	–	–	–	3 568	3 075	6 234	5 742	8 890	3 663
South Sudan[2]	Indigenous cases	900 283	112 024	225 371	262 520	71 377	24 371	7 619	1 488 005	98 843	1 903 742	661 922
	Total *P. falciparum*	–	112 024	–	–	–	24 371	7 619	1 488 005	3 242	1 902 505	145 954
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	2 205
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	3 851
Togo	Indigenous cases	1 019 029	506 764	909 129	965 832	1 524 339	1 610 711	1 746 334	1 756 582	2 002 877	2 406 091	–
	Total *P. falciparum*	1 018 801	506 741	909 120	965 824	1 524 322	1 610 568	1 746 101	1 756 331	2 002 712	2 402 967	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	228	23	9	8	17	143	233	251	165	3 124	–
Uganda	Indigenous cases	1 628 595	231 873	2 662 258	1 502 362	3 631 939	7 412 747	9 735 849	11 667 831	5 759 174	13 982 362	14 196 657
	Total *P. falciparum*	1 565 348	231 873	2 662 258	1 502 362	3 631 939	7 137 662	9 385 132	11 667 831	5 759 174	13 982 362	–
	Total *P. vivax*	15 812	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	47 435	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
United Republic of Tanzania	Indigenous cases	1 279 362	2 151 236	1 987 629	1 554 117	680 442	4 900 085	5 762 373	5 744 907	6 051 844	5 908 168	5 969 953^
	Total *P. falciparum*	1 279 362	1 817 668	1 774 792	71 132	108 844	413 615	5 015$	1 733$	1 462$	1 338$	5 678 149
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	12$	0
	Total mixed cases	–	–	201$	–	–	–	89$	1 606$	0	132$	2 193$
	Total other species	–	–	–	–	–	–	–	10$	0	65$	208$
	Imported cases	–	–	–	719$	1 583	2 550$	–	–	1 754$	3 286$	4 314$
Mainland	Indigenous cases	1 277 024	2 146 747	1 984 698	1 552 444	678 207	4 898 211	5 755 669	5 739 863	6 050 382	5 906 621	5 963 725
	Total *P. falciparum*	1 277 024	1 813 179	1 772 062	69 459	106 609	411 741	–	–	–	–	5 670 676
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Zanzibar	Indigenous cases	2 338	4 489	2 931	1 673*	2 235*	1 874*	6 704	5 044	1 462*	1 547*	6 228*
	Total *P. falciparum*	2 338	4 489	2 730	1 673	2 235	1 874	5 015	1 733	1 462	1 338	7 473
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	12	0
	Total mixed cases	0	0	201	0	0	0	89	1 606	0	132	2 193
	Total other species	–	–	–	–	–	–	–	10	0	65	208
	Imported cases	–	–	–	719	1 583	2 550	–	–	1 754	3 286	4 314

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN												
Zambia	Indigenous cases	–	–	–	–	4 077 547	4 184 661	4 851 319	5 505 639	5 039 679	5 147 350	8 121 215
	Total *P. falciparum*	–	–	–	–	4 077 547	4 184 661	4 851 319	5 505 639	5 039 679	5 147 350	8 121 215
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Zimbabwe	Indigenous cases	249 379	319 935	276 963	422 633	548 276	482 199^	313 645^	467 508^	263 346^	308 173	447 381
	Total *P. falciparum*	249 379	319 935	276 963	422 633	535 931	391 471	279 630	315 624	183 755	308 173	–
	Total *P. vivax*	0	0	0	0	0	0	0	0	0	0	–
	Total mixed cases	0	0	0	0	0	0	0	0	0	0	–
	Total other species	0	0	0	0	0	0	0	0	0	0	–
	Imported cases	–	–	–	–	–	180	358	768	672	–	–
AMERICAS												
Argentina[1]	Indigenous cases	54*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
	Total *P. falciparum*	0	0	0	0	0	0	0	0	0	0	0
	Total *P. vivax*	14	–	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	55	28	16	11	15	11	7	18	23	–	–
	Total introduced cases	11	0	0	0	0	0	0	0	0	–	–
Belize	Indigenous cases	150	72*	33*	20*	19*	9*	4*	7*	3*	0*	0*
	Total *P. falciparum*	–	–	–	–	–	–	–	–	1	–	–
	Total *P. vivax*	149	72	33	20	19	9	4	5	2	0	0
	Total mixed cases	1	–	–	–	–	–	–	2	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	7	4	4	0	4	1	2	4	2	0
Bolivia (Plurinational State of)	Indigenous cases	13 769	7 143	7 415	7 342	7 401	6 874*	5 542*	4 572^	5 342*	9 338*	12 180^
	Total *P. falciparum*	1 165	370	337	959	325	77	4	–	–	31	66
	Total *P. vivax*	12 569	6 756	7 067	6 346	7 060	6 785	5 535	4 572	5 342	9 299^	12 107
	Total mixed cases	35	17	11	37	16	12	3	–	–	5	7
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	33	11	15	12	19	7
Brazil	Indigenous cases	334 667	267 146	242 758	169 623^	137 888^+	141 229^	124 177^	189 558*+	187 757*	153 296^	143 381*
	Total *P. falciparum*	47 406	32 029	31 913	25 928	21156+	14 762	13 160	18 614+	17 861	15 138	21 438
	Total *P. vivax*	283 435	231 368	203 018	137 887	115 809+	122 746	110 340	169 887+	168 552	136 949	119 898
	Total mixed cases	3 642	3 606	7 722	5 015	894+	701	669	1 032+	1 333	1 189	2 037
	Total other species	183	143	104	51	38+	37	7	26+	11	20	8
	Imported cases	–	–	–	8 923	4 856	4 932	5 068	4 867	6 816	4 158	1 807
Colombia	Indigenous cases	117 650	64 436	60 179	51 722	40 768	55 334*	82 609*	52 805*	61 195^	78 109*	75 779^
	Total *P. falciparum*	32 900	14 650	15 215	17 650	20 067	27 875	47 232	29 558	25 483	40 074	21 935
	Total *P. vivax*	83 255	44 701	44 283	33 345	20 129	19 002	32 635	22 132	18 106	37 197	20 517
	Total mixed cases	1 434	754	672	690	567	739	2 742	1 115	675	838	787
	Total other species	48	16	9	11	5	0	0	0	5	0	0
	Imported cases	–	–	–	–	–	7 785	618	1 297	1 948	2 306	457
Costa Rica	Indigenous cases	110*	10*	6*	0*	0*	0*	4*	12*	70*	95*	90*
	Total *P. falciparum*	–	–	–	–	–	–	–	–	9	8	2
	Total *P. vivax*	110	10	–	–	–	–	4	12	61	87	88
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	4	6	1	4	5	8	9	13	38	45	34
	Total introduced cases	23	1	0	0	0	0	0	0	0	5	17
Dominican Republic	Indigenous cases	2 482	1 616	952	473*	459*	631*	690*	341*	433*	1 291*	826*
	Total *P. falciparum*	2 480	1 614	950	473	459	631	690	341	433	1 291	826
	Total *P. vivax*	2	2	2	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	106	37	30	65	57	51	23	3

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMERICAS												
Ecuador	Indigenous cases	1 888	1 218^	544*	368*	242	618*	1 191*	1 275*	1 653*	1 803*	1 934*
	Total *P. falciparum*	258	290	78	160	40	184	403	309	149	211	214
	Total *P. vivax*	1 630	928	466	208	202	434	788	963	1 504	1 592	1 715
	Total mixed cases	–	–	–	–	–	–	–	3	–	0	5
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	14	14	10	–	59	233	105	153	106	67
El Salvador[1]	Indigenous cases	17*	7*	13*	6*	6*	5*	12*	0*	0*	0*	0*
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	17	7	13	6	6	5	12	0	0	0	0
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	9	8	7	1	2	4	1	3	2	3	0
French Guiana	Indigenous cases	1 632+	1 209+	900+	875	448	374^	217^	554^	546	212"	140^
	Total *P. falciparum*	987+	584+	382+	304	136	61	55	62	49	17	4
	Total *P. vivax*	476+	339+	257+	220	129	194	95	368	496	193	136
	Total mixed cases	561+	496+	381+	348	182	119	67	124	–	0	0
	Total other species	5+	5+	2+	0	1	–	–	–	1	2	0
	Imported cases	–	–	–	–	–	60	41	43	–	36	14
Guatemala	Indigenous cases	7 384	6 817	5 346	6 214*	4 929^+	5 538*	5 000^	4 121^	3 018	2 069*	1 058*
	Total *P. falciparum*	30	64	54	101	24+	43	4	0	0	0	0
	Total *P. vivax*	7 163	6 707	5 278	6 062	4839+	5 487	4 849	3 744	3 018	2 069	1 058
	Total mixed cases	5	3	14	51	67+	8	0	0	–	0	0
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	2	2	1	3	3	3	0
Guyana	Indigenous cases	22 935	29 471	31 601	31 479	12 354	9 984	10 697^+	13 936	17 038	18 826	17 230
	Total *P. falciparum*	11 244	15 945	16 695	13 655	3 943	3 219	3 576+	5 141	6 033	5 737	5 544
	Total *P. vivax*	8 402	9 066	11 225	13 953	7 173	6 002	6 081+	7 645	9 854	11 940	10 901
	Total mixed cases	3 157	4 364	3 598	3 770	1 197	731	781+	1 078	1 086	1 110	757
	Total other species	132	96	83	101	41	32	57+	72	65	39	28
	Imported cases	–	–	–	–	–	–	411	–	–	–	–
Haiti	Indigenous cases	84 153	34 350	27 866	26 543	17 696	17 583	21 430	19 135	8 828	10 687	22 987
	Total *P. falciparum*	84 153	32 969	25 423	20 957	17 696	17 583	21 430	19 135	8 828	10 687	–
	Total *P. vivax*	0	0	0	0	0	0	0	0	0	0	–
	Total mixed cases	0	0	0	0	0	0	0	0	0	0	–
	Total other species	0	0	0	0	0	0	0	0	0	0	–
Honduras	Indigenous cases	9 745	7 618	6 439	5 364	3 378^	3 555	4 094^	1 266^	632^	330^	815^
	Total *P. falciparum*	866	581	559	1 073	528	902	1 310	128	55	11	223
	Total *P. vivax*	8 759	7 013	5 856	4 245	2 813	2 626	2 744	1 145	576	319	576
	Total mixed cases	120	24	24	46	37	27	40	0	1	0	7
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	2	0	3	17	21	61	98
	Total introduced cases	–	–	–	–	–	0	0	0	0	0	5
Mexico	Indigenous cases	1 226*	1 124*	833*	495*	656*	517*	551*	736*	803*	618*	356*
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	1 226	1 124	833	495	656	517	551	736	803	618	356
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	7	6	9	4	10	34	45	29	23	22	10
	Total introduced cases	0	0	0	0	0	0	0	0	0	2	0
Nicaragua	Indigenous cases	692	925	1 235	1 162*	1 142*	2 279*	6 267*+	10 949*	15 917*	13 200*	25 505*
	Total *P. falciparum*	154	150	236	208	155	338	1 285+	1 836	1 319	2 398	11 250
	Total *P. vivax*	538	775	999	954	985	1 937	4 965+	9 080	14 553	10 679	13 421
	Total mixed cases	–	–	–	–	2	4	22+	33	45	123	834
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	34	21	29	17	3	17	26	25
Panama	Indigenous cases	418	354	844	696*	864*	546*	769*	649*	684^	1 580^	2 190*
	Total *P. falciparum*	20	1	1	–	–	–	21	1	0	9	8
	Total *P. vivax*	398	353	843	696	864	546	748	648	684	1 196	2 181
	Total mixed cases	–	–	–	–	–	–	–	–	0	0	0
	Total other species	–	–	–	–	–	–	–	–	0	375	–
	Imported cases	–	–	–	9	10	16	42	40	31	17	13
	Total introduced cases	–	–	–	0	0	0	0	0	0	0	114

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMERICAS												
Paraguay[1]	Indigenous cases	20*	1*	0*	0*	0*	0*	0*	0*	0*	0*	0*
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	20	1	–	–	–	–	–	–	–	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	9	9	15	11	8	8	10	5	0	0	–
	Total introduced cases	9	0	0	0	0	0	0	0	–	–	–
Peru	Indigenous cases	31 545	25 005	31 436+	48 719+	65 252*	61 865*	56 623*	55 367*	45 443*	24 324*	15 822*
	Total *P. falciparum*	2 291	2 929	3 399+	7 890+	10 416	12 569	15 319	13 173	9 438	4 724	3 198
	Total *P. vivax*	29 168	21 984	28 030+	40 829+	54 819	49 287	41 287	42 044	36 005	19 600	12 624
	Total mixed cases	83	89	102+	213+	–	–	–	–	–	–	–
	Total other species	3	3	7+	11+	17	9	17	2	–	–	–
	Imported cases	–	–	–	–	–	–	48	57	176	159	25
Suriname	Indigenous cases	1 771	795	569	729‖	401	81*	76*	19*	29*	95*	147*
	Total *P. falciparum*	638	331	126	322	165	17	6	1	5	0	0
	Total *P. vivax*	817	382	167	322	78	61	69	17	23	95	147
	Total mixed cases	83	21	11	85	158	3	1	1	1	0	0
	Total other species	36	17	2	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	204	–	295	251	414	199	111	88
	Total introduced cases	–	–	–	–	–	0	0	0	1	0	0
Venezuela (Bolivarian Republic of)	Indigenous cases	45 155	45 824	52 803	78 643*	90 708*	136 402*	240 613*	411 586*	404 924*	398 285*	197 466*
	Total *P. falciparum*	10 629	9 724	10 978	22 777	21 074	24 018	46 503	69 076	71 504	64 307	33 887
	Total *P. vivax*	32 710	34 651	39 478	50 938	62 850	100 880	179 554	316 401	307 622	308 132	151 783
	Total mixed cases	286	909	2 324	4 882	6 769	11 491	14 531	26 080	25 789	25 846	11 795
	Total other species	60	6	23	46	15	13	25	29	9	–	1
	Imported cases	–	–	–	1 677	1 210	1 594	1 948	2 941	2 125	1 848	1 356
	Total introduced cases	–	–	–	–	–	–	513	1	8	1	0
EASTERN MEDITERRANEAN												
Afghanistan	Indigenous cases	69 798	77 549	54 840	52 965	106 478	119 859	241 233	313 086	248 689	173 860	105 295
	Total *P. falciparum*	6 142	5 581	1 231	1 877	3 000	4 004	6 369	6 907	6 437	2 701	2 691
	Total *P. vivax*	63 255	71 968	53 609	43 369	58 362	82 891	132 407	154 468	166 583	170 747	102 316
	Total mixed cases	–	–	–	–	–	–	311	403	473	412	288
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Djibouti	Indigenous cases	1 010	–	25	1 684	9 439	9 473	13 822	14 810	25 319	49 402	73 535
	Total *P. falciparum*	1 010	–	20	–	–	–	11 781	9 290	16 130	36 025	46 537
	Total *P. vivax*	–	–	–	–	–	–	2 041	5 381	9 189	13 377	26 998
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Iran (Islamic Republic of)	Indigenous cases	1 847*	1 632*+	756*+	479*+	358*+	167*	81*	57*	0*	0*	0*
	Total *P. falciparum*	166	152+	44+	72+	21+	8	0	2	0	0	0
	Total *P. vivax*	1 656	1 502+	711+	426+	351+	157	79	55	0	0	0
	Total mixed cases	25	56+	32+	22+	4+	1	2	–	0	0	0
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	1 184	1 529	842	853	867	632	611	868	602	1 107	878
	Total introduced cases	–	78	12	26	7	24	8	13	20	85	171
Pakistan	Indigenous cases	240 591	334 589	290 781+	281 755	275 149	202 013	324 466	369 817	374 510	413 533	371 828
	Total *P. falciparum*	73 857	73 925	95 095+	46 974	33 391	30 075	42 011	54 407	55 639	87 169	74 899
	Total *P. vivax*	143 136	205 879	228 215+	215 655	232 332	163 872	257 962	300 623	314 572	323 355	293 077
	Total mixed cases	–	–	2 901+	12 019	9 426	8 066	24 493	14 787	4 299	3 009	3 852
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Saudi Arabia	Indigenous cases	29*	69*	82*	34*	30*	83*	272*	177*	61*	38*	83*
	Total *P. falciparum*	29	69	82	34	30	83	270	172	57	38	83
	Total *P. vivax*	–	–	–	–	–	–	2	5	4	–	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	1 912	2 719	3 324	2 479	2 254	2 537	5 110	2 974	2 517	2 029	3 453
	Total introduced cases	0	0	0	0	21	0	0	0	133	85	122

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EASTERN MEDITERRANEAN												
Somalia	Indigenous cases	24 833	3 351	6 817	7 407	11 001	20 953	35 628	35 138	31 021	39 687	27 333
	Total *P. falciparum*	5 629	–	–	–	–	–	–	–	–	36 766	–
	Total *P. vivax*	–	–	–	–	–	–	–	–	–	2 921	–
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Sudan	Indigenous cases	720 557	506 806	526 931	592 383	1 068 506	586 827	566 015	800 116	1 638 017	1 752 011	1 698 394
	Total *P. falciparum*	–	–	–	–	–	–	333 009	580 145	1 286 915	1 363 507	1 272 738
	Total *P. vivax*	–	–	–	–	–	–	82 175	58 335	143 314	194 904	170 202
	Total mixed cases	–	–	–	–	–	–	32 557	82 399	187 270	193 600	143 066
	Total other species	–	–	–	–	–	–	–	–	–	–	–
Yemen	Indigenous cases	106 697	90 954	112 359	102 778	86 707	76 259	99 700	143 333	157 900	165 899	164 066
	Total *P. falciparum*	77 271	59 689	109 504	102 369	86 428	75 898	45 469	109 849	112 823	163 941	162 318
	Total *P. vivax*	966	478	398	408	267	334	347	1 833	970	1 802	1 684
	Total mixed cases	30	7	2	–	12	27	70	2 322	63	114	3
	Total other species	2	33	4	–	–	–	–	–	69	42	61
EUROPEAN												
Armenia[1]	Indigenous cases	0^	0	0^	0	0^	0*	0*	0*	0^	0*	0*
	Total *P. falciparum*	0	0	0	0	0	0	0	0	0	0	0
	Total *P. vivax*	0	0	0	0	0	0	0	0	0	0	0
	Total mixed cases	0	0	0	0	0	0	0	0	0	0	0
	Total other species	0	0	0	0	0	0	0	0	0	0	0
	Imported cases	1	0	4	0	1	2	2	2	6	–	3
Azerbaijan	Indigenous cases	50*	4*	3*	0*	0*	0*	0*	0*	0*	0*	–
	Total *P. falciparum*	–	–	–	–	–	–	–	–	–	–	–
	Total *P. vivax*	50	4	3	0	0	0	0	0	0	0	–
	Total mixed cases	0	0	0	0	0	0	0	0	0	0	–
	Total other species	0	0	0	0	0	0	0	0	0	0	–
	Imported cases	2	4	1	4	2	1	1	1	2	0	–
Georgia	Indigenous cases	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
	Total *P. falciparum*	0	0	0	0	0	0	0	0	0	0	0
	Total *P. vivax*	0	0	0	0	0	0	0	0	0	0	0
	Total mixed cases	0	0	0	0	0	0	0	0	0	0	0
	Total other species	0	0	0	0	0	0	0	0	0	0	0
	Imported cases	0	5	4	7	5	5	7	8	9	8	4
	Total introduced cases	–	1	1	–	–	–	–	–	–	–	–
Kyrgyzstan[1]	Indigenous cases	3*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
	Total *P. falciparum*	–	0	0	0	0	0	0	0	0	0	0
	Total *P. vivax*	3	0	0	0	0	0	0	0	0	0	0
	Total mixed cases	0	0	0	0	0	0	0	0	0	0	0
	Total other species	0	0	0	0	0	0	0	0	0	0	0
	Imported cases	3	5	3	4	0	1	6	2	–	–	–
Tajikistan	Indigenous cases	112*	78*	28*	4*	2*	0*	0*	0*	0*	0^	0*
	Total *P. falciparum*	1	5	–	–	–	0	0	0	0	0	0
	Total *P. vivax*	111	73	–	–	–	0	0	0	0	0	0
	Total mixed cases	–	–	–	–	–	0	0	0	0	0	0
	Total other species	–	–	–	–	–	0	0	0	0	0	0
	Imported cases	4	22	11	10	5	4	1	3	1	3	0
	Total introduced cases	0	0	15	11	0	0	0	0	–	–	–
Turkey	Indigenous cases	0*	0*	0*	0*	0*	0*	0*	0*	–	–	–
	Total *P. falciparum*	0	0	0	0	0	0	0	0	–	–	–
	Total *P. vivax*	0	0	0	0	0	0	0	0	–	–	–
	Total mixed cases	0	0	0	0	0	0	0	0	–	–	–
	Total other species	0	0	0	0	0	0	0	0	–	–	–
	Imported cases	81	128	376	251	249	221	208	214	–	–	–
	Total introduced cases	0	0	219	0	5	3	1	0	–	–	–
Turkmenistan[1]	Indigenous cases	0*	0*	0*	0*	0*	0*	0*	0*	0*	–	–
	Total *P. falciparum*	0	0	0	0	0	0	0	0	0	–	–
	Total *P. vivax*	0	0	0	0	0	0	0	0	0	–	–
	Total mixed cases	0	0	0	0	0	0	0	0	0	–	–
	Total other species	0	0	0	0	0	0	0	0	0	–	–
	Imported cases	0	0	0	0	0	0	0	0	0	–	–

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EUROPEAN												
Uzbekistan[1]	Indigenous cases	3*	0*	0*	0*	0*	0*	0*	0*	0*	0^	0*
	Total *P. falciparum*	0	0	0	0	0	0	0	0	0	0	0
	Total *P. vivax*	3	0	0	0	0	0	0	0	0	0	0
	Total mixed cases	0	0	0	0	0	0	0	0	0	0	0
	Total other species	0	0	0	0	0	0	0	0	0	0	0
	Imported cases	2	1	1	3	1	0	0	0	0	1	2
	Total introduced cases	1	0	0	0	0	0	0	0	–	–	–
SOUTH-EAST ASIA												
Bangladesh	Indigenous cases	55 873	51 773	29 518	26 891	57 480	39 590^	27 628^	29 228^	10 482^	17 219^	6 128^
	Total *P. falciparum*	52 012	49 084	27 651	25 815	41 261	26 453	17 269	23 315	8 470	14 752	4 744
	Total *P. vivax*	3 824	2 579	1 699	983	3 348	4 000	3 297	4 442	1 672	2 126	1 245
	Total mixed cases	37	110	168	93	12 871	9 137	7 062	1 471	340	341	139
	Total other species	–	–	–	–	–	–	–	–	–	–	0
	Imported cases	–	–	–	–	–	129	109	19	41	6	2
Bhutan	Indigenous cases	436	194	82*	15*	19*	34*	15*	11*	6*	2*	22*
	Total *P. falciparum*	140	87	–	6	11	13	1	0	1	0	0
	Total *P. vivax*	261	92	–	9	8	21	13	11	5	2	22
	Total mixed cases	35	15	–	–	–	0	1	0	0	0	0
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	0	23	34	70	56	38	34	30	9
	Total introduced cases	–	–	0	–	0	0	3	13	14	10	23
Democratic People's Republic of Korea	Indigenous cases	13 520	16 760	21 850*	14 407*	10 535*	7 022	5 033	4 603	3 698	1 869	1 819
	Total *P. falciparum*	0	0	0	0	0	0	0	0	0	0	0
	Total *P. vivax*	13 520	16 760	21 850	14 407	10 535	7 022	5 033	4 603	3 698	1 869	1 819
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	0
	Total other species	–	–	–	–	–	–	–	–	–	–	0
	Imported cases	–	–	–	–	–	0	0	0	0	0	0
India	Indigenous cases	1 599 986	1 310 656	1 067 824	881 730	1 102 205	1 169 261	1 087 285	844 558	429 928	338 494	186 532
	Total *P. falciparum*	830 779	662 748	524 370	462 079	720 795	774 627	706 257	525 637	204 733	154 645	117 567
	Total *P. vivax*	765 622	645 652	534 129	417 884	379 659	390 440	375 783	315 028	222 730	181 514	67 444
	Total mixed cases	3 585	2 256	9 325	1 767	1 751	4 194	5 245	3 893	2 465	2 295	1 520
	Total other species	–	–	–	–	–	–	–	–	–	–	1
Indonesia	Indigenous cases	465 764	422 447	417 819	343 527	252 027	217 017	218 449	261 557	221 916^	250 541^+	253 955^
	Total *P. falciparum*	220 077	200 662	199 977	170 848	126 397	103 315	118 844	143 926	101 725	142 036+	141 807
	Total *P. vivax*	187 583	187 989	187 583	150 985	107 260	94 267	81 748	95 694	70 867	86 742+	83 743
	Total mixed cases	21 964	31 535	29 278	20 352	16 410	13 105	16 751	18 899	16 068	18 707+	25 148
	Total other species	2 547	2 261	981	1 342	1 960	1 395	1 106	1 818	2 111	3 057+	3 221
	Imported cases	–	–	–	–	–	–	–	–	11	61	38
Myanmar	Indigenous cases	420 808	465 294	481 204*	333 871	205 658	182 616	110 146*	85 019*	76 518	56 640	58 825^
	Total *P. falciparum*	388 464	433 146	314 676	222 770	138 311	110 449	62 917	50 730	38 483	23 017	15 191
	Total *P. vivax*	29 944	28 966	135 385	98 860	61 830	65 536	43 748	32 070	36 502	32 788	43 578
	Total mixed cases	2 054	3 020	31 040	12 216	5 511	6 624	3 476	2 214	1 530	606	–
	Total other species	346	162	103	25	6	7	5	5	3	–	–
	Imported cases	–	–	–	–	–	–	–	–	–	–	11
Nepal	Indigenous cases	3 894	2 335	2 204	1 974	832*	591*	507*	623*	493*	127*	73*
	Total *P. falciparum*	550	240	184	273	81	67	61	25	5	9	5
	Total *P. vivax*	2 349	1 208	872	1 659	693	504	433	587	488	118	68
	Total mixed cases	216	30	–	22	58	20	13	11	0	0	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	–	1 079	1 026	–	637	521	502	670	539	579	357
Sri Lanka[1]	Indigenous cases	684*	124*	23*	0*	0*	0*	0*	0*	0*	0*	0*
	Total *P. falciparum*	6	3	4	–	–	0	0	0	0	0	0
	Total *P. vivax*	669	119	19	–	–	0	0	0	0	0	0
	Total mixed cases	9	2	–	–	–	0	0	0	0	0	0
	Total other species	–	–	–	–	–	–	0	0	0	0	0
	Imported cases	52	51	70	95	49	36	41	57	48	53	30
	Total introduced cases	–	–	–	0	0	0	0	0	1	0	0

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SOUTH-EAST ASIA												
Thailand	Indigenous cases	32 480	24 897	46 895	41 602	41 218	8 022*	7 428*	5 694*	4 077*	3 198*	3 009^+
	Total *P. falciparum*	9 401	5 710	11 553	14 449	13 743	3 291	1 609	846	447	391	155+
	Total *P. vivax*	13 401	8 608	17 506	15 573	20 513	4 655	5 765	4 802	3 575	2 752	2 892+
	Total mixed cases	147	147	298	196	588	57	40	36	34	30	16+
	Total other species	20	13	3 172	3 084	3 077	19	14	10	21	25	46+
	Imported cases	–	–	–	–	–	9 890	5 724	4 020	1 618	1 342	798
Timor-Leste	Indigenous cases	48 137	19 739	5 518	1 223	411	80	81*	16*	0*	0*	3*
	Total *P. falciparum*	28 350	14 261	1 962	373	118	33	46	4	0	0	2
	Total *P. vivax*	11 432	3 758	2 288	512	139	24	7	3	0	0	0
	Total mixed cases	468	1 720	–	140	85	23	28	9	0	0	1
	Total other species	–	–	–	–	–	–	0	0	0	0	0
	Imported cases	–	–	–	–	–	–	–	13	7	9	7
	Total introduced cases	–	–	–	–	–	–	0	0	1	0	4
WESTERN PACIFIC												
Cambodia	Indigenous cases	96 464	106 905	69 551	44 069	69 178	68 109	43 380	76 804	62 582	32 197	15 891
	Total *P. falciparum*	8 213	7 054	14 896	7 092	8 332	17 830	12 156	20 328	10 525	4 834	1 673
	Total *P. vivax*	4 794	5 155	19 575	11 267	10 356	13 146	9 816	15 207	30 680	26 871	13 976
	Total mixed cases	1 270	1 583	4 971	2 418	6 464	2 954	1 520	1 397	1 080	492	242
	Total other species	–	–	–	–	–	–	0	0	0	0	0
China[1]	Indigenous cases	4 990*	1 308*	244*	83*	53*	39*	1*	0*	0*	0*	0*
	Total *P. falciparum*	1 269	57	16	11	6	1	0	0	0	0	0
	Total *P. vivax*	3 675	677	179	67	45	26	1	0	0	0	0
	Total mixed cases	26	1	5	1	0	0	0	0	0	0	0
	Total other species	20	0	0	0	0	6	0	0	0	0	–
	Imported cases	2 118	2 059	2 399	4 051	3 026	3 212	3 149	2 663	2 511	2 486	1 050
	Total introduced cases	–	–	–	–	0	0	0	0	4	0	0
Lao People's Democratic Republic	Indigenous cases	22 879+	17 532	46 153	39 589	50 674	36 078	15 509	8 435	9 038	6 692	3 494^
	Total *P. falciparum*	22 476+	16 556	37 685	25 441	25 317	14 439	5 737	4 169	4 828	2 168	1 575
	Total *P. vivax*	427+	962	7 594	13 067	23 763	20 815	9 441	4 104	4 099	4 445	1 882
	Total mixed cases	24+	–	873	1 079	1 593	823	329	162	111	79	37
	Total other species	0+	10	0	2	0	0	0	0	–	–	0
	Imported cases	–	–	–	–	–	–	–	–	0	0	4
	Total introduced cases	–	–	–	–	–	–	–	–	16	1	5
Malaysia	Indigenous cases	5 194*	3 954*	3 662*	1 028*	596*	242*	266*	85*	0*	0*	0*
	Total *P. falciparum*	1 344	634	651	422	177	110	67	18	0	0	0
	Total *P. vivax*	1 750	915	385	241	85	84	178	59	0	0	0
	Total mixed cases	145	120	48	42	33	22	9	1	0	0	0
	Total other species	943	1 660	2 187	0	0	26	12	7	0	0	0
	Imported cases	831	1 142	924	816	731	435	428	423	485	630	177
	Total introduced cases	107	124	35	26	8	–	16	0	21	96	54
Papua New Guinea	Indigenous cases	93 956	84 060	150 195	316 125	314 036	346 431	534 819	488 878	516 249	646 648	750 254
	Total *P. falciparum*	56 735	59 153	58 747	119 469	120 641	118 452	183 686	163 160	174 818	181 463	189 397
	Total *P. vivax*	13 171	9 654	7 108	7 579	78 846	62 228	95 328	113 561	138 006	163 237	186 981
	Total mixed cases	4 089	1 164	769	1 279	79 574	115 157	197 711	200 186	201 658	299 869	372 257
	Total other species	1 990	632	609	–	2 125	1 950	1 772	1 433	1 767	2 079	1 619
Philippines	Indigenous cases	19 102	9 583	8 086	7 720	6 019^	11 324^	6 627^	6 722^	4 559^	5 681+^	6 094+^
	Total *P. falciparum*	11 824	6 877	4 774	4 968	3 760	4 769	5 282	3 107	1 310	5 034+	5 234+
	Total *P. vivax*	2 885	2 380	2 189	1 357	834	755	816	528	116	537+	736+
	Total mixed cases	214	166	113	83	235	195	388	83	22	80+	88+
	Total other species	175	127	37	67	74	88	139	40	47	48+	37+
	Imported cases	–	–	–	–	68	85	53	69	82	95	26
Republic of Korea	Indigenous cases	1 267*	505*	394*	383*	557*	627*	602*	436*	501*	485*	356*
	Total *P. falciparum*	–	–	–	–	–	0	0	0	0	0	0
	Total *P. vivax*	–	–	–	383	557	627	602	436	501	485	356
	Total mixed cases	–	–	–	–	–	–	–	–	–	–	–
	Total other species	–	–	–	–	–	–	–	–	–	–	–
	Imported cases	56	64	47	50	78	72	71	79	75	74	29
	Total introduced cases	1	0	0	–	–	0	0	0	0	0	0

ANNEX 5 – I. REPORTED MALARIA CASES BY SPECIES, 2010–2020

WHO region Country/area		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WESTERN PACIFIC												
Solomon Islands	Indigenous cases	39 704	26 657	24 383	25 609	18 404	23 998	54 432	52 519	59 191	72 767	77 637
	Total *P. falciparum*	22 892	14 454	14 748	13 194	9 835	10 478	16 607	15 400	15 771	15 595	14 753
	Total *P. vivax*	12 281	8 665	9 339	11 628	7 845	12 150	33 060	30 169	35 072	47 164	52 039
	Total mixed cases	200	83	232	446	724	1 370	4 719	6 917	8 341	9 979	10 813
	Total other species	0	0	0	0	0	0	46	33	7	27	32
Vanuatu	Indigenous cases	9 817	6 179	4 532	2 883	1 314	571	2 252	1 227^	632^	567^	493^+
	Total *P. falciparum*	1 545	770	1 257	1 039	279	150	186	273	42	36	38+
	Total *P. vivax*	2 265	1 224	1 680	1 342	703	273	1 682	798	590	531	469+
	Total mixed cases	193	81	470	–	–	–	–	–	–	–	–
	Total other species	10	2	–	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	1	12	9	14
	Total introduced cases	–	–	–	–	–	–	9	0	0	0	0
Viet Nam	Indigenous cases	17 515	16 612	19 638	17 128	15 752	9 331	4 161	4 548	3 132+*	3 100+*	1 376*
	Total *P. falciparum*	12 763	10 101	11 448	9 532	8 245	4 327	2 323	2 858	2 966+	3 110+	792
	Total *P. vivax*	4 466	5 602	7 220	6 901	7 220	4 756	1 750	1 608	1 751+	1 514+	573
	Total mixed cases	286	909	970	695	287	234	73	70	83+	33+	11
	Total other species	–	–	–	–	0	14	15	12	13+	10+	0
	Imported cases	–	–	–	–	–	–	–	–	1 681	1 565	46

Data as of 1 December 2021

P.: *Plasmodium*; WHO: World Health Organization.

"–" refers to not applicable or data not available.

* Reported indigenous cases.

^ Indigenous cases = Confirmed cases – imported cases.

+ Data discrepancies between total indigenous cases and sum of species are due to the use of different data sources, differences in classification of mixed infections or failure to update species data following data audit.

$ Zanzibar only.

" No adjustment for imported cases due to incomplete information, data quality issues or use of different data sources for imported cases.

Indigenous cases do no include non-human malaria cases.

1 Certified malaria free countries are included in this listing for historical purposes.

2 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf).

Note: After the closure of data analysis for the report, Cambodia updated the following variables for 2020: indigenous cases (9 964), total *P. falciparum* (1 075), total *P. vivax* (8 722) and total mixed cases (167).

ANNEX 5 – J. REPORTED MALARIA DEATHS, 2010–2020

WHO region Country/area	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AFRICAN											
Algeria[1]	1	0	0	0	0	0	0	0	0	0	0
Angola	8 114	6 909	5 736	7 300	5 714	7 832	15 997	13 967	11 814	18 691	11 757
Benin	964	1 753	2 261	2 288	1 869	1 416	1 646	2 182	2 138	2 589	2 336
Botswana	8	8	3	7	22	5	3	17	9	7	11
Burkina Faso	9 024	7 001	7 963	6 294	5 632	5 379	3 974	4 144	4 294	1 060	3 983
Burundi	2 677	2 233	2 263	3 411	2 974	3 799	5 853	4 414	2 481	3 316	2 276
Cabo Verde[2]	1	1	0	0	1	0	1	2	0	0	0
Cameroon	4 536	3 808	3 209	4 349	4 398	3 440	2 639	3 195	3 256	4 510	4 121
Central African Republic	526	858	1 442	1 026	635	1 763	2 668	3 689	1 292	2 017	1 779
Chad	886	1 220	1 359	1 881	1 720	1 572	1 686	2 088	1 948	3 374	2 955
Comoros	53	19	17	15	0	1	0	3	8	0	7
Congo		892	623	2 870	271	435	733	229	131	107	99
Côte d'Ivoire	1 023	1 389	1 534	3 261	4 069	2 604	3 340	3 222	3 133	1 693	1 316
Democratic Republic of the Congo	23 476	23 748	21 601	30 918	25 502	39 054	33 997	27 458	18 030	13 072	18 636
Equatorial Guinea	30	52	77	66		28	109			15	
Eritrea	27	12	30	6	15	12	21	8	5	3	3
Eswatini	8	1	3	4	4	5	3	20	2	3	2
Ethiopia	1 581	936	1 621	358	213	662	510	356	158	213	173
Gabon	182	74	134	273	159	309	101	218	591	314	224
Gambia	151	440	289	262	170	167	79	54	60	41	73
Ghana	3 859	3 259	2 855	2 506	2 200	2 137	1 264	599	428	336	308
Guinea	735	743	979	108	1 067	846	867	1 174	1 267	1 881	1 119
Guinea-Bissau	296	472	370	418	357	477	191	296	244	288	
Kenya	26 017	713	785	360	472	15 061	603			858	742
Liberia	1 422		1 725	1 191	2 288	1 379	1 259	758		601	
Madagascar	427	398	552	641	551	841	443	370	927	657	674
Malawi	8 206	6 674	5 516	3 723	4 490	3 799	4 000	3 613	2 967	2 341	2 517
Mali	3 006	2 128	1 894	1 680	2 309	1 544	1 344	1 050	1 001	1 454	1 698
Mauritania	60	66	106	46	19	39	315	67			
Mayotte											
Mozambique	3 354	3 086	2 818	2 941	3 245	2 467	1 685	1 114	968	734	563
Namibia	63	36	4	21	61	45	65	104	82	7	16
Niger	3 929	2 802	2 825	2 209	2 691	2 778	2 226	2 316	3 576	4 449	5 849
Nigeria	4 238	3 353	7 734	7 878	6 082	9 330	7 397	8 720	14 936	26 540	1 811
Rwanda	670	380	459	409	496	516	715	376	341	224	149
Sao Tome and Principe[2]	14	19	7	11	0	0	1	1	0	0	0
Senegal	553	472	649	815	500	526	325	284	555	260	373
Sierra Leone	8 188	3 573	3 611	4 326	2 848	1 107	1 345	1 298	1 949	2 771	1 648
South Africa	83	54	72	105	174	110	34	301	69	79	38
South Sudan[3]	1 053	406	1 321	1 311				3 483	1 191	4 873	244
Togo	1 507	1 314	1 197	1 361	1 205	1 127	847	995	905	1 275	
Uganda	8 431	5 958	6 585	7 277	5 921	6 100	5 635	5 111	3 302	5 027	4 252
United Republic of Tanzania	15 915	11 806	7 828	8 528	5 373	6 315	5 046	3 685	2 753	1 171	2 569
Mainland	15 867	11 799	7 820	8 526	5 368	6 313	5 045	3 684	2 747	1 163	2 549
Zanzibar	48	7	8	2	5	2	1	1	6	8	20
Zambia	4 834	4 540	3 705	3 548	3 257	2 389	1 827	1 425	1 209	1 339	1 972
Zimbabwe	255	451	351	352	406	200	351	527	192	266	400

ANNEX 5 – J. REPORTED MALARIA DEATHS, 2010–2020

WHO region Country/area	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMERICAS											
Argentina[1]	0	0	0	0	0	0	0	0	0	0	0
Belize[2]	0	0	0	0	0	0	0	0	0	0	0
Bolivia (Plurinational State of)	0	0	0	0	1	0	0	0	0	0	
Brazil	76	70	60	40	36	35	35	34	56	36	42
Colombia	42	23	24	10	17	18	36	19	9	3	5
Costa Rica[2]	0	0	0	0	0	0	0	0	0	0	0
Dominican Republic	15	10	8	5	4	3	1	1	1	4	2
Ecuador	0	0	0	0	0	0	0	0	0	0	3
El Salvador[1]	0	0	0	0	0	0	0	0	0	0	0
French Guiana[2]	1	2	2	3	0	0	0	0	0	0	0
Guatemala[2]	0	0	0	1	1	1	0	0	0	0	0
Guyana	24	36	35	14	11	12	13	11	6	15	13
Haiti	8	5	6	10	9	15	13	12	19	7	11
Honduras[2]	3	2	1	1	2	0	0	1	1	0	0
Mexico[2]	0	0	0	0	0	0	0	0	0	0	0
Nicaragua[2]	1	1	2	0	0	1	2	1	3	1	0
Panama[2]	1	0	1	0	0	0	0	0	0	0	0
Paraguay[1]	0	0	0	0	0	0	0	0	0	0	
Peru	0	1	7	4	4	5	7	10	4	5	1
Suriname[2]	1	1	0	1	1	0	0	1	0	0	0
Venezuela (Bolivarian Republic of)	18	16	10	38	44	79	140	340	257	118	31
EASTERN MEDITERRANEAN											
Afghanistan[2]	22	40	36	24	32	49	47	10	1	0	0
Djibouti	0	0	0	17	28	23	5			0	
Iran (Islamic Republic of)[2]	0	0	0	0	0	1	0	1	0	0	0
Pakistan		4	260	244	56	34	33	113	102	0	80
Saudi Arabia[2]	0	0	0	0	0	0	0	0	0	0	0
Somalia	6	5	10	23	14	27	13	20	31	20	5
Sudan	1 023	612	618	685	823	868	698	1 534	3 129	1 663	701
Yemen	92	75	72	55	23	14	65	37	57	5	6
EUROPEAN											
Armenia[1]	0	0	0	0	0	0	0	0	0	0	0
Azerbaijan[2]	0	0	0	0	0	0	0	0	0	0	
Georgia[2]	0	0	0	0	0	0	0	0	0	0	0
Kyrgyzstan[1]	0	0	0	0	0	0	0	0	0	0	0
Tajikistan[2]	0	0	0	0	0	0	0	0	0	0	0
Turkey[2]	0	0	0	0	0	0	0	0	0	0	
Turkmenistan[1]	0	0	0	0	0	0	0	0	0	0	0
Uzbekistan[1]	0	0	0	0	0	0	0	0	0	0	0
SOUTH-EAST ASIA											
Bangladesh	37	36	11	15	45	9	17	13	7	9	9
Bhutan[2]	2	1	1	0	0	0	0	0	0	0	0
Democratic People's Republic of Korea[2]	0	0	0	0	0	0	0	0	0	0	0
India	1 018	754	519	440	562	384	331	194	96	77	93
Indonesia	432	388	252	385	217	157	161	47	34	49	32

ANNEX 5 – J. REPORTED MALARIA DEATHS, 2010–2020

WHO region Country/area	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SOUTH-EAST ASIA											
Myanmar	788	581	403	236	92	37	21	30	19	14	10
Nepal[2]	6	2	0	0	0	0	3	0	0	0	0
Sri Lanka[1]	0	0	0	0	0	0	0	0	0	0	0
Thailand	80	43	37	47	38	33	27	15	15	13	3
Timor-Leste[2]	58	16	6	3	1	0	0	0	0	0	0
WESTERN PACIFIC											
Cambodia[2]	151	94	45	12	18	10	3	1	0	0	0
China[1]	19	33	0	0	0	0	0	0	0	0	0
Lao People's Democratic Republic[2]	24	17	44	28	4	2	1	2	6	0	0
Malaysia[2]	13	12	12	10	4	4	2	0	0	0	0
Papua New Guinea	616	523	381	307	203	163	306	273	216	180	188
Philippines	30	12	16	12	10	20	7	4	2	9	3
Republic of Korea[2]	1	2	0	0	0	0	0	0	0	0	0
Solomon Islands	34	19	18	18	23	13	20	27	7	14	3
Vanuatu[2]	1	1	0	0	0	0	0	0	0	0	0
Viet Nam	21	14	8	6	6	3	3	6	1	0	0
REGIONAL SUMMARY											
African	150 383	104 057	104 113	116 354	99 380	127 616	111 145	102 933	88 212	108 456	76 693
Americas	190	167	156	127	130	169	247	430	356	189	108
Eastern Mediterranean	1 143	736	996	1 048	976	1 016	861	1 715	3 320	1 688	792
European	0	0	0	0	0	0	0	0	0	0	0
South-East Asia	2 421	1 821	1 229	1 126	955	620	560	299	171	162	147
Western Pacific	910	727	524	393	268	215	342	313	232	203	194
Total	**155 047**	**107 508**	**107 018**	**119 048**	**101 709**	**129 636**	**113 155**	**105 690**	**92 291**	**110 698**	**77 934**

Data as of 30 November 2021

E-2020: eliminating countries for 2020; WHO: World Health Organization.

1 Certified malaria free countries are included in this listing for historical purposes.

2 There were no indigenous malaria deaths in 2020.

3 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf).

Note: Indigenous deaths are shown for E-2020 countries and countries where 100% of cases have been investigated and classified. The latter may vary from year to year.

ANNEX 5 – K. METHODS FOR TABLES A-D-G-H-I-J

Annex 5 – A. Policy adoption, 2020

Information on existing policies and whether they were implemented in 2020 was reported by national malaria programmes (NMPs). Policy implementation in 2020 was adjusted for the following variables, based on whether supporting data were available and reported by NMPs to the world malaria report database: distribution of insecticide-treated mosquito nets or long-lasting insecticidal nets through antenatal care, the Expanded Programme on Immunization or mass campaigns, indoor residual spraying, intermittent preventive treatment in pregnancy (IPTp), seasonal malaria chemoprevention (SMC), rapid diagnostic tests (RDTs) used at community level and artemisinin-based combination therapies (ACTs) used for the treatment of *P. falciparum*. IPTp is only applicable in 43 countries and SMC in 34. Countries where these interventions are not applicable were automatically set to "not applicable".

Annex 5 – D. Commodities distribution and coverage, 2018–2020

See notes for **Fig. 7.1**, **Fig. 7.2**, **Fig. 7.3** and **Fig. 7.6**. Data sources for the number of malaria cases treated with ACTs were from NMP reports captured in the world malaria report database or, where such data were unavailable, from reports submitted to the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). For 2019 and 2020, missing data for ACT distributions or any first-line treatment courses delivered (including ACTs) were calculated based on the rate of distributions to the number of patients treated from the previous year, multiplied by the number of patients treated in the current year. If these data were not available, the number of patients treated was used as a proxy for distributions. In some countries, numbers of ACT distributions were used to replace missing information on any first-line treatment courses delivered (including ACTs).

Annex 5 – G. Population denominator for case incidence and mortality rate, and reported malaria cases by place of care, 2020

Presumed and confirmed cases were reported by health sector (public, private and community). Where data could not be separated into health sectors they are shown in the public sector, indicating which data have been combined. Presumed cases were reported through outpatient registers. Confirmed cases were reported through the laboratory, unless indicated by the country that confirmed cases should be used from the outpatient register owing to incomplete or inaccurate laboratory data. Confirmed cases were corrected for double counting of microscopy and RDT where the exact number of double counted cases was known. If the health sector where double counting occurred was not indicated, then data were combined, adjusted and displayed in the public sector.

Annex 5 – H. Reported malaria cases by method of confirmation, 2010–2020

Presumed and confirmed cases were calculated based on the sum of confirmed cases from the laboratory (adjusted for double counting) or the outpatient register (see notes on **Table G**) and the presumed cases reported from the outpatient register. Confirmed cases include indigenous, imported, introduced, relapsing and recrudescent cases, as well as all species, including non-human malaria *P. knowlesi*. Between 2010 and 2018, suspected cases were calculated based on the formula "suspected = presumed+microscopy examined+rdt examined", unless reported retrospectively by the country. From 2019 onwards, suspected cases were reported by countries. If data quality issues were detected, suspected cases were re-calculated applying the formula used in 2010–2018.

Annex 5 – I. Reported malaria cases by species, 2010–2020

Indigenous cases and species were reported based on the following: total confirmed cases, where no case investigations and case classifications had been carried out; total confirmed cases minus imported cases, where data were available; and reported indigenous cases for countries that were part of the eliminating countries for 2020 (E-2020) initiative and where the number of cases classified equalled the total number of confirmed cases. *P. knowlesi* cases were excluded in all three approaches.

Annex 5 – J. Reported malaria deaths, 2010–2020

All malaria deaths were reported except those in E-2020 countries and in countries where 100% of cases are investigated and classified – in which case, indigenous deaths are shown. In non-E-2020 countries the proportion of cases that are investigated and classified can vary from year to year.

Notes

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