2016
WORLD MALARIA REPORT

World Health Organization

2016
WORLD MALARIA REPORT

World Health Organization

World malaria report 2016.

ISBN 978-92-4-151171-1

Suggested citation. World Malaria Report 2016. Geneva: World Health Organization; 2016. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at http://apps.who.int/iris.

Map production: WHO Global Malaria Programme and WHO Public Health Information and Geographic Systems.

Design and layout: Alex Williamson (cover), designisgood.info and www.paprika-annecy.com

Photo credits | pp. vi, x, 1, 6, 16, 23, 26, 34, 38, 56: © The Global Fund/John Rae | p. 86: © WHO/Sven Torfinn

Please consult the WHO Global Malaria Programme website for the most up-to-date version of all documents (www.who.int/malaria)

Printed in Switzerland

Contents

Foreword

Dr Margaret Chan
Director-General
World Health Organization

The *World Malaria Report*, published annually by WHO, provides an in-depth analysis of progress and trends in the malaria response at global, regional and country levels. It is the result of a collaborative effort with ministries of health in affected countries and many partners around the world.

Our 2016 report spotlights a number of positive trends, particularly in sub-Saharan Africa, the region that carries the heaviest malaria burden. It shows that, in many countries, access to disease-cutting tools is expanding at a rapid rate for those most in need.

Children are especially vulnerable, accounting for more than two thirds of global malaria deaths. In 22 African countries, the proportion of children with a fever who received a malaria diagnostic test at a public health facility increased by 77% over the last 5 years. This test helps health providers swiftly distinguish between malarial and non-malarial fevers, enabling appropriate treatment.

Malaria in pregnancy can lead to maternal mortality, anaemia and low birth weight, a major cause of infant mortality. WHO recommends intermittent preventive treatment in pregnancy, known as IPTp, for all pregnant women in sub-Saharan Africa living in areas of moderate-to-high transmission of malaria. The last 5 years have seen a five-fold increase in the delivery of three or more doses of IPTp in 20 African countries.

Long-lasting insecticidal nets are the mainstay of malaria prevention. WHO recommends their use for all people at risk of malaria. Across sub-Saharan Africa, the proportion of people sleeping under treated nets has nearly doubled over the last 5 years.

We have made excellent progress, but our work is incomplete. Last year alone, the global tally of malaria reached 212 million cases and 429 000 deaths. Across

Africa, millions of people still lack access to the tools they need to prevent and treat the disease.

In many countries, progress is threatened by the rapid development and spread of mosquito resistance to insecticides. Antimalarial drug resistance could also jeopardize recent gains.

In 2015, the World Health Assembly endorsed the WHO *Global Technical Strategy for Malaria*, a 15-year malaria framework for all countries working to control and eliminate malaria. It sets ambitious but attainable goals for 2030, with milestones along the way to track progress.

The Strategy calls for the elimination of malaria in at least 10 countries by the year 2020 – a target well within reach. According to this report, 10 countries and territories reported fewer than 150 locally-acquired cases of malaria. A further nine countries reported between 150 and 1000 cases.

But progress towards other global targets must be accelerated. The report finds that less than half of the 91 malaria-affected countries are on track to achieve the 2020 milestones of a 40% reduction in case incidence and mortality.

To speed progress towards our global malaria goals, WHO is calling for new and improved malaria-fighting tools. Greater investments are needed in the development of new vector control interventions, improved diagnostics and more effective medicines.

WHO announced that the world's first malaria vaccine would be piloted in three countries in sub-Saharan Africa. The vaccine, known as RTS,S, has been shown to provide partial protection against malaria in young children. It will be evaluated as a potential complement to the existing package of WHO-recommended malaria preventive, diagnostic and treatment measures.

The need for more funding is an urgent priority. In 2015, malaria financing totalled US$ 2.9 billion. To achieve our global targets, contributions from both domestic and international sources must increase substantially, reaching US$ 6.4 billion annually by 2020.

The challenges we face are sizeable but not insurmountable. Recent experience has shown that with robust funding, effective programmes and country leadership, progress in combatting malaria can be sustained and accelerated.

The potential returns are well worth the effort. With all partners united, we can defeat malaria and improve the health of millions of people around the world.

Acknowledgements

We are very grateful to the numerous people who contributed to the production of the *World Malaria Report 2016*. The following people collected and reviewed data from malaria endemic countries:

Ahmad Mureed and Fraidon Sediqi (Afghanistan); Lammali Karima (Algeria); Pedro Rafael Dimbu and Yava Luvundo Ricardo (Angola); Giovanini Coelho and Mario Zaidenberg (Argentina); Suleyman Mammadov (Azerbaijan); Anjan Kumar Saha (Bangladesh); Carlos Ayala and Kim Bautista (Belize); Dos Santos Hounkpe Bella (Benin); Tenzin Wangdi (Bhutan); Percy Halkyer and Raúl Marcelo Manjón Tellería (Bolivia [Plurinational State of]); Tjantilili Mosweunyane (Botswana); Oscar Mesones Lapouble and Cassio Roberto Leonel Peterka (Brazil); Yacouba Savadogo (Burkina Faso); Ndayizeye Félicien (Burundi); António Lima Moreira (Cabo Verde); Tol Bunkea (Cambodia); Kouambeng Celestin (Cameroon); Christophe Ndoua (Central African Republic); Mahamat Idriss Djaskano (Chad); Li Zhang (China); Gabriela Rey and Sandra Lorena Giron Vargas (Colombia); Astafieva Marina (Comoros); Youndouka Jean Mermoz (Congo); Liliana Jiménez Gutiérrez and Enrique Pérez-Flores (Costa Rica); Ehui Anicet and Parfait Katche (Côte d'Ivoire); Kim Yun Chol (Democratic People's Republic of Korea); Joris Losimba Likwela (Democratic Republic of the Congo); Luz A. Mercedes and Hans Salas (Dominican Republic); César Díaz and Adriana Estefanía Echeverría Matute (Ecuador); Ahmed El-Taher Khater (Egypt); Jaime Enrique Alemán Escobar and Franklin Hernandez (El Salvador); Matilde Riloha (Equatorial Guinea); Selam Mihreteab and Selam Mihreteab (Eritrea); Hiwot Solomon Taffese (Ethiopia); Laure Garancher (French Guiana); Okome Nze Gyslaine (Gabon); Momodou Kalleh (Gambia); Constance Bart-Plange (Ghana); Jaime Juárez and Erica Chávez Vásquez (Guatemala); Nouman Diakite (Guinea); Jean Seme Fils Alexandre and Quacy Grant (Guyana); Darlie Antoine and Moussa Thior (Haiti); Engels Ilich Banegas Medina and Rosa Elena Mejía (Honduras); A.C. Dhariwal (India); M. Epid and Elvieda Sariwati (Indonesia); Leyla Faraji and Ahmad Raeisi (Iran [Islamic Republic of]); Muthana Ibrahim Abdul Kareem (Iraq); Khalil Kanani (Jordan); James Kiarie (Kenya); Almunther Alhasawi (Kuwait); Bouasy Hongvanthong (Lao People's Democratic Republic); Najib Achi (Lebanon); Oliver J. Pratt (Liberia); Abdunnaser Ali El-Buni (Libya); Rakotorahalahy Andry Joeliarijaona (Madagascar); Austin Albert Gumbo (Malawi); Mohd Hafizi Bin Abdul Hamid (Malaysia); Diakalia Kone (Mali); Mohamed Lemine Ould Khairy (Mauritania); Anita Bahena, Ezequiel Díaz Pérez, Rosario García Suárez and Héctor Olguín Bernal (Mexico); Souad Bouhout (Morocco); Guidion Mathe (Mozambique); Aung Thi (Myanmar); Mwalenga Nghipumbwa (Namibia); Rajendra Mishra and Uttam Raj Pyakurel (Nepal); Martha Reyes and Aída Mercedes Soto Bravo (Nicaragua); Djermakoye Hadiza Jackou (Niger); Audu Bala Mohammed (Nigeria); Majed Al-Zadjali (Oman); Muhammad Suleman Memon (Pakistan); Margarita Ana Botello, José Lasso, Carlos Victoria and Fernando Vizcaíno (Panama); John Deli (Papua New Guinea); Miguel Angel Aragón and Cynthia Viveros (Paraguay); Mónica Guardo and Victor Alberto Laguna Torres (Peru); Raffy Deray (Philippines); Maha Hammam Alshamali (Qatar); Park Kyeongeun (Republic of Korea); Murindahabi Ruyange Monique

(Rwanda); Jessica Da Veiga Soares (Sao Tome and Principe); Mohammed Hassan Al-Zahrani (Saudi Arabia); Medoune Ndiop (Senegal); Samuel Juana Smith (Sierra Leone); John Leaburi (Solomon Islands); Fahmi Essa Yusuf (Somalia); Bridget Shandukani (South Africa); H.D.B. Herath (Sri Lanka); Abd Alla Ahmed Ibrahim Mohammed (Sudan); Beatrix Jubithana and Juanita Malmberg (Suriname); Zulisile Zulu (Swaziland); Nipon Chinanonwait (Thailand); Maria do Rosiro de Fatima Mota (Timor-Leste); Tchadjobo Tchassama (Togo); Dhikrayet Gamara (Tunisia); Damian Rutazaana (Uganda); Mary John (United Arab Emirates); Anna Mahendeka (United Republic of Tanzania, [Mainland]); Abdul-wahid H. Al-mafazy (United Republic of Tanzania [Zanzibar]); Esau Nackett (Vanuatu); Angel Manuel Alvarez and Jesus Toro Landaeta (Venezuela [Bolivarian Republic of]); Nguyen Quy Anh (Viet Nam); Moamer Badi (Yemen); Mercy Mwanza Ingwe (Zambia); Busisani Dube and Wonder Sithole (Zimbabwe).

The following WHO staff in regional and subregional offices assisted in the design of data collection forms; the collection and validation of data; and the review of epidemiological estimates, country profiles, regional profiles and sections:

Birkinesh Amenshewa, Magaran Bagayoko, Steve Banza Kubenga and Issa Sanou (WHO Regional Office for Africa [AFRO]); Spes Ntabangana (AFRO/Inter-country Support Team [IST] Central Africa); Khoti Gausi (AFRO/IST East and Southern Africa); Abderrahmane Kharchi Tfeil (AFRO/IST West Africa); Maria Paz Ade, Janina Chavez, Rainier Escalada, Valerie Mize, Roberto Montoya, Eric Ndofor and Prabhjot Singh (WHO Regional Office for the Americas [AMRO]); Hoda Atta, Caroline Barwa and Ghasem Zamani (WHO Regional Office for the Eastern Mediterranean [EMRO]); Elkhan Gasimov and Karen Taksoe-Vester (WHO Regional Office for Europe [EURO]); Eva-Maria Christophel (WHO Regional Office for South-East Asia [SEARO]); Rabindra Abeyasinghe, James Kelley, Steven Mellor and Raymond Mendoza (WHO Regional Office for the Western Pacific [WPRO]).

Carol D'Souza and Jurate Juskaite (Global Fund to Fight AIDS, Tuberculosis and Malaria [Global Fund]) supplied information on financial disbursements from the Global Fund. Adam Wexler (Kaiser Family Foundation) provided information on financial contributions for malaria control from the United States of America. Julie Wallace (United States Agency for International Development) and Iain Jones (United Kingdom Department for International Development) reviewed financing data from their respective agencies. Jeremy Lauer (WHO Department of Health Systems Governance and Financing) edited the narrative on the economic valuation of malaria mortality reduction. John Milliner (Milliner Global Associates) provided information on long-lasting insecticidal nets delivered by manufacturers. Peter Gething (University of Oxford), Samir Bhatt (Imperial College, University of London) and the Malaria Atlas Project (MAP, www.map.ox.ac.uk) team, with the support of the Bill & Melinda Gates Foundation and the Medical Research Council (United Kingdom of Great Britain and Northern Ireland [United Kingdom]), produced estimates of insecticide-treated mosquito net (ITN) coverage for African countries using data from household surveys, ITN deliveries by manufacturers, ITNs distributed by national malaria control programmes (NMCPs), and ITN coverage indicators. They also produced estimates of *Plasmodium falciparum* parasite prevalence in sub-Saharan Africa. Catherine Moyes and Antoinette Wiebe (MAP) and Christen Fornadel (United States President's Malaria Initiative) provided data on insecticide resistance and Anna Trett assisted with data compilation. Liliana Carvajal and Valentina Buj (United Nations Children's Fund [UNICEF]) reviewed data and texts and made suggestions for improvement.

Michael Lynch, John Painter and Nelli Westercamp (United States Centers for Disease Control and Prevention) and Cristin Fergus (London School of Economics, University of London) provided data analysis and interpretation for sections on chemoprevention, diagnostic testing and treatment. Adam Bennett (Global Health Group), Donal Bisanzio and Peter Gething (MAP) and Thom Eisele (Tulane University) produced analysis of malaria treatment from household surveys. Li Liu (Johns Hopkins Bloomberg School of Public Health), Dan Hogan and Colin Mathers (WHO Department of Health Statistics and Information Systems) prepared estimates of malaria mortality in children aged under 5 years, on behalf of the Child Health Epidemiology Reference Group, and undertook calculations on life expectancy.

The maps for country and regional profiles were produced by MAP's ROAD-MAPII team; led by Mike Thorn, the team comprised Harry Gibson, Naomi Gray, Joe Harris, Andy Henry, Annie Kingsbury, Daniel Pfeffer and Jen Rozier. MAP is supported by the Bill & Melinda Gates Foundation and the Medical Research Council (United Kingdom).

We are also grateful to:

- Melanie Renshaw (African Leaders Malaria Alliance [ALMA]), Trenton Ruebush (independent consultant) and Larry Slutsker (Program for Appropriate Technology in Health [PATH]), who graciously reviewed all sections and provided substantial comments for their improvement;
- Claudia Nannini (WHO) for legal review;
- Carlota Gui (WHO consultant) and Laurent Bergeron (WHO Global Malaria Programme) for the translation into Spanish and French, respectively, of the foreword and key points;
- Claude Cardot and the Designisgood team for the design and layout of the report;
- Paprika (Annecy, France) for generating Annex 4;
- Alex Williamson for the report cover; and
- Hilary Cadman and the Cadman Editing Services team for technical editing of the report.

The production of the *World Malaria Report 2016* was coordinated by Richard Cibulskis (WHO Global Malaria Programme). Laurent Bergeron (WHO Global Malaria Programme) provided programmatic support for overall management of the project. The *World Malaria Report 2016* was produced by John Aponte (WHO consultant), Maru Aregawi, Laurent Bergeron, Richard Cibulskis, Jane Cunningham, Tessa Knox, Edith Patouillard, Pascal Ringwald, Silvia Schwarte, Saira Stewart and Ryan Williams, on behalf of the WHO Global Malaria Programme. We are grateful to our colleagues in the Global Malaria Programme who reviewed sections of the report and provided helpful comments: Pedro Alonso, Amy Barrette, Andrea Bosman, Gawrie Loku Galappaththy, Abdisalan Noor, Peter Olumese, Leonard Ortega, Camille Pillon, Charlotte Rasmussen, Vasee Sathiyamoorthy and David Schellenberg. We also thank Hiwot Taffese Negash and Simone Colairo-Valerio for administrative support.

Funding for the production of this report was gratefully received from the Bill & Melinda Gates Foundation; Luxembourg's Ministry of Foreign and European Affairs – Directorate for Development Cooperation and Humanitarian Affairs; the Spanish Agency for International Development Cooperation; the Swiss Agency for Development and Cooperation through a grant to the Swiss Tropical and Public Health Institute; and the United States Agency for International Development.

Abbreviations

ACT	artemisinin-based combination therapy
AIDS	acquired immunodeficiency syndrome
AIM	*Action and investment to defeat malaria 2016–2030*
AMFm	Affordable Medicine Facility–malaria
ANC	antenatal care
AQ	amodiaquine
CDC	Centers for Disease Control and Prevention
CI	confidence interval
cITN	conventional insecticide-treated net
CRS	creditor reporting system
DAC	Development Assistance Committee
DDT	dichloro-diphenyl-trichloroethane
GDP	gross domestic product
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GTS	*Global Technical Strategy for Malaria 2016–2030*
HIV	human immunodeficiency virus
HRP2	histidine rich protein 2
IPTi	intermittent preventive treatment in infants
IPTp	intermittent preventive treatment in pregnancy
IQR	interquartile range
IRS	indoor residual spraying
ITN	insecticide-treated mosquito net
LLIN	long-lasting insecticidal net
M&E	monitoring and evaluation
NMCP	national malaria control programme
OECD	Organisation for Economic Co-operation and Development
P.	*Plasmodium*
PMI	President's Malaria Initiative
PPP	purchasing power parity
RDT	rapid diagnostic test
SDG	Sustainable Development Goal
SMC	seasonal malaria chemoprevention
SP	sulfadoxine-pyrimethamine
UI	uncertainty interval
UN	United Nations
UNICEF	United Nations Children's Fund
USA	United States of America
USAID	United States Agency for International Development
VSL	value of a statistical life
WHO	World Health Organization
WTA	willingness to accept

Abbreviations of WHO regions and offices

AFR	WHO African Region
AFRO	WHO Regional Office for Africa
AMR	WHO Region of the Americas
AMRO	WHO Regional Office for the Americas
EMR	WHO Eastern Mediterranean Region
EMRO	WHO Regional Office for the Eastern Mediterranean
EUR	WHO European Region
EURO	WHO Regional Office for Europe
SEAR	WHO South-East Asia Region
SEARO	WHO Regional Office for South-East Asia
WPR	WHO Western Pacific Region
WPRO	WHO Regional Office for the Western Pacific

Key points

1. Global targets, milestones and indicators

- The targets of the *Global Technical Strategy for Malaria 2016–2030* (GTS) are, by 2030: to reduce malaria incidence and mortality rates globally by at least 90% compared with 2015 levels; to eliminate malaria from at least 35 countries in which malaria was transmitted in 2015; and to prevent re-establishment of malaria in all countries that are malaria free.
- For malaria, Target 3.3 of the Sustainable Development Goals (SDGs) – to end the epidemics of AIDS, TB, malaria and neglected tropical diseases (NTDs) by 2030 – is interpreted by WHO as the attainment of the GTS targets.
- To track progress of the GTS, the *World Malaria Report 2016* presents information on 26 indicators.
- The *World Malaria Report* is produced by the WHO Global Malaria Programme, with the help of WHO regional and country offices, ministries of health in endemic countries and a broad range of other partners.
- The primary sources of information are reports from 91 endemic countries. This information is supplemented by data from nationally representative household surveys and databases held by other organizations.

2. Investments in malaria programmes and research

- Total funding for malaria control and elimination in 2015 is estimated at US$ 2.9 billion, having increased by US$ 0.06 billion since 2010. This total represents just 46% of the GTS 2020 milestone of US$ 6.4 billion.
- Governments of endemic countries provided 32% of total funding in 2015, of which US$ 612 million was direct expenditures through national malaria control programmes (NMCPs) and US$ 332 million was expenditures on malaria patient care.
- The United States of America is the largest single international funder of malaria control activities, accounting for an estimated 35% of global funding in 2015, followed by the United Kingdom of Great Britain and Northern Ireland (16%), France (3.2%), Germany (2.4%), Japan (2.3%), Canada (1.7%), the Bill & Melinda Gates Foundation (1.2%) and European Union institutions (1.1%). About one half of this international funding (45%) is channelled through the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund).
- Spending on research and development for malaria was estimated at US$ 611 million in 2014 (the latest year for which data are available), increasing from US$ 607 million in 2010, and representing more than 90% of the GTS annual investment target of US$ 673 million.

- Countries with the highest number of malaria cases are furthest from the per capita spending milestones for 2020 set in the GTS.

3. Preventing malaria

Vector control

- The proportion of the population at risk in sub-Saharan Africa sleeping under an insecticide-treated mosquito net (ITN) or protected by indoor residual spraying (IRS) is estimated to have risen from 37% in 2010 (uncertainty interval [UI]: 25–48%) to 57% in 2015 (UI: 44–70%).
- In sub-Saharan Africa, 53% of the population at risk slept under an ITN in 2015 (95% confidence interval [CI]: 50–57%), increasing from 30% in 2010 (95% CI: 28–32%),
- The rise in the proportion of people at risk sleeping under an ITN has been driven by an increase in the proportion of the population with access to an ITN (60% in 2015, 95% CI: 57–64%; 34% in 2010, 95% CI: 32–35%).
- The proportion of households with at least one ITN increased to 79% in 2015 (95% CI: 76–83); thus, a fifth of households where ITNs are the main method of vector control do not have access to a net.
- The proportion of households with sufficient ITNs for all household members was 42% (95% CI: 39–45%).
- IRS is generally used by NMCPs only in particular areas. The proportion of the population at risk protected by IRS declined from a peak of 5.7% globally in 2010 to 3.1% in 2015, and from 10.5% to 5.7% in sub-Saharan Africa.
- Reductions in IRS coverage may be attributed to cessation of spraying with pyrethroids, particularly in the WHO African Region.
- Of 73 malaria endemic countries that provided monitoring data for 2010 onwards, 60 reported resistance to at least one insecticide, and 50 reported resistance to two or more insecticide classes.
- Resistance to pyrethroids – the only class currently used in ITNs –is the most commonly reported. A WHO-coordinated five-country evaluation showed that ITNs still remained effective but there is still a need for new vector control tools.

Intermittent preventive therapy in pregnancy

- In 2015, 31% of eligible pregnant women received three or more doses of intermittent preventive treatment in pregnancy (IPTp) among 20 countries with sufficient data, a major increase from 6% in 2010.

4. Diagnostic testing and treatment

Access to care

- Among 23 nationally representative surveys completed in sub-Saharan Africa between 2013 and 2015 (representing 61% of the population at risk), a median of 54% of febrile children aged under 5 years (interquartile range [IQR]: 41–59%) were taken to a trained provider.

- A higher proportion of febrile children sought care in the public sector (median: 42%, IQR: 31–50%) than in the private sector (median: 20%, IQR: 12–28%).
- A large proportion of febrile children were not brought for care (median: 36%, IQR: 26–42%).

Diagnostic testing

- The proportion of febrile children who received a malaria diagnostic test was greater if they sought care in the public sector (median: 51%, IQR: 35–60%) than if the children sought care in the formal private sector (median: 40%, IQR: 28–57%) or in the informal private sector (median: 9%, IQR: 4–12%). The proportion receiving a test in the public sector has increased from 29% in 2010 (IQR: 19–46%).
- Data reported by NMCPs indicate that the proportion of suspected malaria cases receiving a parasitological test in the public sector increased from 40% of suspected cases in the WHO African Region in 2010 to 76% in 2015. This increase was primarily due to an increase in the use of rapid diagnostic tests (RDTs), which accounted for 74% of diagnostic testing among suspected cases in 2015.
- HRP2 deletions, which allow malaria parasites to evade detection by common RDTs, have been reported from more than 10 countries.

Treatment

- Among 11 nationally representative household surveys conducted in sub-Saharan Africa from 2013 to 2015, the median proportion of children aged under 5 years with evidence of recent or current *Plasmodium falciparum* infection and a history of fever, who received any antimalarial drug, was 30% (IQR: 20–51%). The median proportion receiving an artemisinin-based combination therapy (ACT) was 14% (IQR: 5–45%). However, no clear conclusions can be drawn from these findings because the ranges associated with the medians are wide, indicating large variation among countries; in addition, the household surveys cover only a third of the population at risk in sub-Saharan Africa.
- Further investments are needed to better track malaria treatment at health facilities (through routine reporting systems and health facility surveys) and at community level to better understand the extent of barriers to accessing malaria treatment.
- The proportion of antimalarial treatments that are ACTs given to children with both a fever in the previous 2 weeks and a positive RDT at the time of survey increased from a median of 29% in 2010–2012 (IQR: 17–55%) to 80% in 2013–2015 (IQR: 29–95%).
- Antimalarial treatments were more likely to be ACTs if children sought treatment at public health facilities or via community health workers than if they sought treatment in the private sector.
- *Plasmodium falciparum* resistance to artemisinin has been detected in five countries in the Greater Mekong subregion. In Cambodia, high failure rates after treatment with an ACT have been detected for four different ACTs.

5. Malaria surveillance systems

- The proportion of health facility reports received at national level exceeded 80% in 40 of the 47 countries that reported on this indicator.
- This indicator could not be calculated for 43 countries, either because the number of health facilities that were expected to report was not specified (two countries) or because the number of reports submitted was not stated (17 countries), or both (24 countries).
- A total of 23 countries received reports from private health facilities, but these comprised a minority of all reports received in these countries (median: 2.1%, IQR: 0.6–13%).
- In 2015, it is estimated that malaria surveillance systems detected 19% of cases that occur globally (UI: 16–21%).
- The bottlenecks in case detection vary by country and WHO region. In four WHO regions a large proportion of patients seek treatment in the private sector and these cases are not captured by existing surveillance systems. In three WHO regions a relatively low proportion of patients attending public health facilities also receive a diagnostic test.
- Case detection rates have improved since 2010 (10%), with most of the improvement being due to increased diagnostic testing in sub-Saharan Africa.

6. Impact

Parasite prevalence

- The proportion of the population at risk in sub-Saharan Africa who are infected with malaria parasites is estimated to have declined from 17% in 2010 to 13% in 2015 (UI: 11–15%).
- The number of people infected with malaria parasites in sub-Saharan Africa is estimated to have decreased from 131 million in 2010 (UI: 126–136 million) to 114 million in 2015 (UI: 99–130 million).
- Infection rates are higher in children aged 2–10 years, but most infected people are in other age groups.

Case incidence

- In 2015, an estimated 212 million cases of malaria occurred worldwide (UI: 148–304 million).
- Most of the cases in 2015 were in the WHO African Region (90%), followed by the WHO South-East Asia Region (7%) and the WHO Eastern Mediterranean Region (2%).
- About 4% of estimated cases globally are due to *P. vivax*, but outside the African continent the proportion of *P. vivax* infections is 41%.
- The incidence rate of malaria is estimated to have decreased by 41% globally between 2000 and 2015, and by 21% between 2010 and 2015.

- Of 91 countries and territories with malaria transmission in 2015, 40 are estimated to have achieved a reduction in incidence rates of 40% or more between 2010 and 2015, and can be considered on track to achieve the GTS milestone of a further reduction of 40% by 2020.
- Reductions in case incidence rates need to be accelerated in countries with high case numbers if the GTS milestone of a 40% reduction in case incidence rates by 2020 is to be achieved.

Mortality

- In 2015, it was estimated that there were 429 000 deaths from malaria globally (UI: 235 000–639 000).
- Most deaths in 2015 are estimated to have occurred in the WHO African Region (92%), followed by the WHO South-East Asia Region (6%) and the WHO Eastern Mediterranean Region (2%).
- The vast majority of deaths (99%) are due to *P. falciparum* malaria. *Plasmodium vivax* is estimated to have been responsible for 3100 deaths in 2015 (range: 1800–4900), with 86% occurring outside Africa.
- In 2015, 303 000 malaria deaths (range: 165 000–450 000) are estimated to have occurred in children aged under 5 years, which is equivalent to 70% of the global total. The number of malaria deaths in children is estimated to have decreased by 29% since 2010, but malaria remains a major killer of children, taking the life of a child every 2 minutes.
- Malaria mortality rates are estimated to have declined by 62% globally between 2000 and 2015 and by 29% between 2010 and 2015. In children aged under 5 years, they are estimated to have fallen by 69% between 2000 and 2015 and by 35% between 2010 and 2015.
- Of 91 countries and territories with malaria transmission in 2015, 39 are estimated to have achieved a reduction of 40% or more in mortality rates between 2010 and 2015. A further 10 countries had zero indigenous deaths in 2015.
- If the GTS milestone of a 40% reduction in mortality rates is to be achieved by 2020, rates of mortality reduction must increase in countries with high numbers of deaths.

Elimination

- Between 2000 and 2015, 17 countries eliminated malaria (i.e. attained zero indigenous cases for 3 years or more); six of these countries have been certified as malaria free by WHO.
- In progressing to malaria elimination, the 17 countries reported a median of 184 indigenous cases 5 years before attaining zero cases (IQR: 78–728) and a median of 1748 cases 10 years before attaining zero cases (IQR: 423–5731).
- In 2015, 10 countries and territories reported fewer than 150 indigenous cases and a further nine countries reported between 150 and 1000 indigenous cases. Thus, there appears to be a good prospect of attaining the GTS milestone of eliminating malaria from 10 countries by 2020.

- Malaria has not been re-established in any of the countries that eliminated malaria between 2000 and 2015.

Reduced malaria mortality, increased life expectancy and economic valuation

- Between 2001 and 2015, it is estimated that a cumulative 6.8 million fewer malaria deaths have occurred globally than would have occurred had incidence and mortality rates remained unchanged since 2000.
- The highest proportion of deaths was averted in the WHO African Region (94%). Of the estimated 6.8 million fewer malaria deaths between 2001 and 2015, about 6.6 million (97%) were for children aged under 5 years.
- Not all of the deaths averted can be attributed to malaria control efforts. Some progress is probably related to increased urbanization and overall economic development, which has led to improved housing and nutrition.
- As a consequence of reduced malaria mortality rates, particularly among children aged under 5 years, it is estimated that life expectancy at birth has increased by 1.2 years in the WHO African Region. This increase represents 12% of the total increase in life expectancy of 9.4 years seen in sub-Saharan Africa, from 50.6 years in 2000 to 60 years in 2015.
- Globally, reductions in malaria mortality have led to an increase in life expectancy of 0.26 years in malaria endemic countries, representing 5% of the overall gain of 5.1 years.
- Current methodologies suggest that the increased life-expectancy resulting from malaria mortality reductions observed between 2000 and 2015 can be valued at US$ 1810 billion in the WHO African Region (UI: US$ 1330–2480 billion), which is equivalent to 44% of the gross domestic product (GDP) of the affected countries in 2015.
- Globally, the malaria mortality reductions are valued at US$ 2040 billion (UI: US$ 1560–2700 billion), which is 3.6% of the total GDP of malaria affected countries.
- The economic value of longer life is expressed as a percentage of GDP to provide a convenient and well-known comparison, but is not meant to suggest that the value of longevity is itself a component of domestic output, or that the value of these gains enter directly into the national income accounts. Nonetheless, the comparison suggests that the value of the gains in life expectancy due to reductions in malaria mortality are substantial.

Avant-propos

Dr Margaret Chan
Directeur général
de l'Organisation mondiale de la Santé
(OMS)

Le *Rapport sur le paludisme dans le monde*, publié chaque année par l'OMS, fournit une analyse détaillée des progrès et des tendances de la lutte contre le paludisme au niveau mondial, régional et national. Il s'agit là du produit d'un effort collaboratif entre les ministères de la Santé des pays endémiques et de nombreuses organisations partenaires dans le monde.

Notre rapport 2016 met en lumière plusieurs tendances positives, notamment en Afrique subsaharienne où la maladie sévit le plus. Il indique que l'accès aux interventions préventives et thérapeutiques augmente rapidement parmi les populations qui en ont le plus besoin et ce, dans nombre de pays.

Les enfants sont particulièrement vulnérables ; ils représentent plus des deux tiers des décès dus au paludisme dans le monde. Des enquêtes réalisées dans 22 pays africains montrent que le pourcentage d'enfants ayant été soumis à un test de diagnostic du paludisme au sein d'établissements de soins publics a augmenté de 77 % ces cinq dernières années. Ce test permet aux prestataires de santé de rapidement différencier les fièvres palustres des autres, ce qui garantit l'administration d'un traitement approprié.

Le paludisme pendant la grossesse peut avoir des conséquences dramatiques : mortalité maternelle, anémie et enfants présentant un poids insuffisant à la naissance, une cause principale de mortalité néonatale. L'OMS recommande le traitement préventif intermittent pendant la grossesse (TPIp) à toutes les femmes enceintes d'Afrique subsaharienne vivant dans des zones de transmission modérée à élevée. Au cours des cinq dernières années, le taux d'administration d'au moins trois doses de TPIp a été multiplié par cinq dans 20 pays africains au total.

Les moustiquaires imprégnées d'insecticide longue durée sont essentielles à la prévention du paludisme et l'OMS en recommande l'utilisation à l'ensemble de la population à risque. En Afrique subsaharienne, le pourcentage de la population dormant sous moustiquaire a quasiment doublé ces cinq dernières années.

Les progrès réalisés sont excellents, mais il reste beaucoup à faire. Pour la seule année 2015, les estimations font état de 212 millions de cas de paludisme et de 429 000 décès associés. En Afrique, la population n'ayant toujours pas accès aux outils nécessaires pour prévenir et traiter la maladie se compte par millions.

Dans de nombreux pays, les progrès sont menacés par le développement et la propagation rapides de la résistance des moustiques aux insecticides. La résistance aux antipaludiques pourrait aussi mettre en péril les avancées récentes.

En 2015, l'Assemblée mondiale de la Santé a approuvé la *Stratégie technique mondiale de lutte contre le paludisme*, un cadre opérationnel d'une durée de 15 ans pour tous les pays engagés dans le contrôle et l'élimination du paludisme. Cette stratégie définit des cibles ambitieuses et néanmoins réalisables pour 2030, avec des objectifs intermédiaires permettant un suivi des progrès.

Cette stratégie vise à éliminer le paludisme dans au moins 10 pays d'ici à 2020, ce qui semble réalisable. Le présent rapport indique en effet que 10 pays et territoires ont rapporté moins de 150 cas de paludisme transmis localement, et que 9 autres en ont recensé entre 150 et 1 000.

Néanmoins les progrès relatifs aux autres cibles mondiales doivent s'accélérer. D'après ce rapport, plus de la moitié des 91 pays endémiques ne sont pas en voie d'atteindre les objectifs de 40 % de réduction de l'incidence du paludisme et de la mortalité associée d'ici à 2020.

Pour accélérer les progrès vers les cibles mondiales liées au paludisme, l'OMS demande expressément le développement de nouveaux outils antipaludiques et l'amélioration de l'arsenal existant. Des investissements plus importants sont nécessaires pour mettre au point de nouvelles interventions de lutte antivectorielle, des outils de diagnostic améliorés et des médicaments plus efficaces.

Le mois dernier, l'OMS a annoncé la mise en place de projets pilotes dans trois pays d'Afrique subsaharienne concernant le premier vaccin antipaludique. Ce vaccin, RTS, S, a démontré une protection partielle contre le paludisme chez les jeunes enfants ; il sera évalué en tant qu'outil complémentaire à l'arsenal de mesures recommandées par l'OMS en matière de prévention, de diagnostic et de traitement du paludisme.

Il est prioritaire et urgent d'augmenter le financement de la lutte contre le paludisme, estimé à US$ 2,9 milliards en 2015. Pour atteindre les cibles mondiales, les investissements nationaux et internationaux doivent en effet atteindre US$ 6,4 milliards par an d'ici 2020.

Les obstacles face à nous ne sont ni négligeables ni insurmontables. L'expérience récente a démontré qu'avec des financements solides, des programmes efficaces et un leadership national fort, les progrès en matière de lutte contre le paludisme peuvent être maintenus et accélérés.

Les perspectives de retour sur investissement sont séduisantes. Avec l'ensemble des partenaires réunis, nous pouvons vaincre le paludisme et améliorer la santé de millions de personnes dans le monde.

Points essentiels

1. Cibles, objectifs intermédiaires et indicateurs au niveau mondial

- Les cibles définies par la *Stratégie technique mondiale de lutte contre le paludisme 2016-2030* (le « GTS ») pour 2030 sont les suivantes : réduire, au plan mondial, l'incidence du paludisme et la mortalité associée d'au moins 90 % par rapport à 2015, éliminer le paludisme dans au moins 35 pays où il y avait transmission en 2015 et empêcher la réapparition du paludisme dans tous les pays exempts.
- Concernant le paludisme, la cible 3.3 des Objectifs de développement durable, à savoir mettre fin à l'épidémie de sida, à la tuberculose, au paludisme et aux maladies tropicales négligées d'ici à 2030, est interprétée par l'Organisation mondiale de la Santé (OMS) comme l'atteinte des cibles du GTS.
- Pour suivre les progrès réalisés par rapport au GTS, le *Rapport sur le paludisme dans le monde* décrit les avancées réalisées par rapport à 26 indicateurs.
- Le *Rapport sur le paludisme dans le monde* est produit par le Programme mondial de lutte antipaludique créé par l'OMS, en collaboration avec les bureaux nationaux et régionaux de l'OMS, les ministères de la Santé des pays endémiques et de nombreuses organisations partenaires.
- Les principales sources de données sont les rapports émanant de 91 pays et territoires endémiques, complétées par des informations issues des enquêtes nationales réalisées auprès des ménages et des bases de données provenant d'autres organisations.

2. Investissements dans les programmes et la recherche antipaludiques

- En 2015, le financement mondial pour le contrôle et l'élimination du paludisme a été estimé à US$ 2,9 milliards, soit US$ 60 millions de plus qu'en 2010. Ce montant ne représente que 46 % de l'objectif intermédiaire fixé par le GTS à US$ 6,4 milliards pour 2020.
- Les gouvernements des pays endémiques ont contribué à hauteur de 32 % du total des financements en 2015, dont US$ 612 millions de dépenses directes par le biais des programmes nationaux de lutte contre le paludisme (PNLP) et US$ 332 millions en prise en charge des patients souffrant d'infections palustres.
- Avec une contribution estimée à 35 % du financement mondial de la lutte contre le paludisme en 2015, les États-Unis arrivent en tête des bailleurs de fonds individuels, suivis par le Royaume-Uni de Grande-Bretagne et d'Irlande du

Nord (16 %), la France (3,2 %), l'Allemagne (2,4 %), le Japon (2,3 %), le Canada (1,7 %), la Fondation Bill & Melinda Gates (1,2 %) et les institutions de l'Union Européenne (1,1 %). Environ la moitié de ce financement international (45 %) transite par le Fonds mondial de lutte contre le sida, la tuberculose et le paludisme (Fonds mondial).

- Les dépenses en matière de recherche et de développement pour lutter contre le paludisme ont été estimées à US$ 611 millions en 2014 (l'année la plus récente pour laquelle des données sont disponibles), contre US$ 607 millions en 2010, ce qui représente plus de 90 % de l'objectif d'investissements annuels fixé à US$ 673 millions par le GTS.
- Les pays ayant le plus de cas de paludisme sont aussi ceux où les dépenses nationales (rapportées au nombre d'habitants) sont les plus éloignées de l'objectif défini par le GTS pour 2020.

3. Prévention du paludisme

Lutte antivectorielle

- En Afrique subsaharienne, le pourcentage de la population à risque dormant sous moustiquaire imprégnée d'insecticide (MII) ou ayant bénéficié de la pulvérisation intradomiciliaire d'insecticides à effet rémanent (PID) aurait augmenté de 37 % en 2010 (incertitude comprise entre 25 % et 48 %) à 57 % en 2015 (incertitude : 44 %–70 %).
- En Afrique subsaharienne, 53 % de la population à risque dort sous moustiquaire en 2015 (intervalle de confiance [IC] de 95 % : 50 %–57 %), contre 30 % en 2010 (IC de 95 % : 28 %–32 %).
- L'augmentation du pourcentage de la population à risque dormant sous MII est due à un accès accru aux moustiquaires (60 % en 2015, IC de 95 % : 57 %–64 % ; 34 % en 2010, IC de 95 % : 32 %–35 %).
- Le pourcentage des ménages possédant au moins une MII a augmenté, pour atteindre 79 % en 2015 (IC de 95 % : 76 %–83 %) ; en d'autres termes, un cinquième des ménages pour lesquels les MII sont le principal moyen de lutte antivectorielle n'ont pas accès à une moustiquaire.
- Le pourcentage des ménages avec un nombre de MII suffisant pour couvrir tous les membres du foyer s'élève à 42 % (IC de 95 % : 39 %–45 %).
- La PID est généralement utilisée par les PNLP dans des zones spécifiques uniquement. Le pourcentage de la population à risque protégée par PID a baissé, passant d'un pic de 5,7 % au niveau mondial en 2010 à 3,1 % en 2015, et de 10,5 % à 5,7 % en Afrique subsaharienne.
- La baisse de la couverture en PID peut être attribuée à l'arrêt de la pulvérisation à base de pyréthoïdes, en particulier dans la région Afrique de l'OMS.
- Sur 73 pays endémiques ayant communiqué des données de suivi à partir de 2010, 60 ont signalé une résistance à au moins une classe d'insecticides, et 50 à deux classes au moins.
- La résistance aux pyréthoïdes, la seule classe d'insecticides actuellement utilisée pour les MII, est la plus fréquente. Quand bien même une évaluation coordonnée par l'OMS dans cinq pays a montré que les moustiquaires étaient toujours efficaces, de nouveaux outils de lutte antivectorielle sont nécessaires.

Traitement préventif intermittent pendant la grossesse

- Dans 20 pays disposant de données suffisantes, 31 % des femmes enceintes éligibles ont reçu au moins trois doses de traitement préventif intermittent pendant la grossesse (TPIp) en 2015, contre 6 % en 2010.

4. Diagnostic et traitement

Accès aux soins

- Sur 23 enquêtes représentatives au niveau national et réalisées en Afrique subsaharienne entre 2013 et 2015 (représentant 61 % de la population à risque), une médiane de 54 % des enfants de moins de 5 ans ayant eu de la fièvre (écart interquartile [ÉI] : 41 %–59 %) ont été orientés vers un prestataire de santé formé.
- Le pourcentage des enfants fiévreux ayant sollicité des soins dans le secteur public est plus important que dans le secteur privé, à savoir une médiane de 42 % (ÉI : 31 %–50 %) contre 20 % (ÉI : 12 %–28 %).
- Le pourcentage d'enfants fiévreux n'ayant pas sollicité de soins est important (médiane de 36 %, ÉI : 26 %–42 %).

Diagnostic

- Le pourcentage d'enfants fiévreux ayant été soumis à un test de diagnostic est plus important dans le secteur public (médiane de 51 %, ÉI : 35 %–60 %) que dans le secteur privé formel (médiane de 40 %, ÉI : 28 %–57 %) ou le secteur privé informel (médiane de 9 %, ÉI : 4 %–12 %). Le pourcentage d'enfants ayant été soumis à un test dans le secteur public est en augmentation, car il était de 29 % en 2010 (ÉI : 19 %–46 %).
- Les données rapportées par les PNLP indiquent que le pourcentage de cas suspectés de paludisme soumis à un test parasitologique dans le secteur public a augmenté de 40 % dans la région Afrique de l'OMS à 76 % en 2015. Cette hausse est principalement due à une plus grande utilisation des tests de diagnostic rapide (TDR) qui représentent 74 % des moyens de dépistage parmi les cas suspectés de paludisme en 2015.
- La suppression de la HRP2, permettant aux parasites du paludisme d'échapper à la détection par les tests de diagnostic rapide habituels, a été rapportée dans plus de 10 pays.

Traitement

- Sur 11 enquêtes nationales réalisées auprès des ménages entre 2013 et 2015 en Afrique subsaharienne, le pourcentage médian des enfants de moins de 5 ans présentant, ou ayant récemment présenté une infection à *Plasmodium* (*P.*) *falciparum* avec des antécédents de fièvre et ayant reçu un médicament antipaludique s'élève à 30 % (ÉI : 20 %–51 %). Le pourcentage médian ayant reçu une combinaison thérapeutique à base d'artémisinine (ACT) est de 14 % (ÉI : 5 %–45 %). Ces résultats ne permettent néanmoins de tirer aucune conclusion précise ; en effet, les plages associées aux valeurs médianes sont larges, indiquant des écarts importants entre pays. Par ailleurs, ces enquêtes réalisées auprès des ménages ne couvrent qu'un tiers de la population à risque en Afrique subsaharienne.

- Des financements plus importants sont nécessaires pour mieux suivre l'accès au traitement antipaludique au niveau des établissements de soins (par le biais des systèmes de reporting de routine et des enquêtes auprès des établissements de soins) et au niveau communautaire et ce, dans le but de mieux mesurer l'ampleur des obstacles.
- Le pourcentage d'ACT parmi les traitements antipaludiques administrés aux enfants ayant eu de la fièvre dans les 2 semaines précédant l'enquête et eu un résultat positif au TDR au moment de l'enquête a augmenté d'une valeur médiane de 29 % en 2010-2012 (ÉI : 17 %-55 %) à 80 % en 2013-2015 (ÉI : 29 %-95 %).
- Le traitement antipaludique était plus susceptible d'être par ACT si les enfants sollicitaient des soins d'établissements de soins publics ou d'agents de santé communautaires que s'ils s'orientaient vers le secteur privé.
- La résistance du parasite *Plasmodium falciparum* à l'artémisinine a été détectée dans cinq pays de la sous-région du Grand Mékong. Au Cambodge, des taux d'échec au traitement ont été observés pour quatre types d'ACT.

5. Systèmes de surveillance du paludisme

- Le pourcentage de rapports reçus au niveau national et provenant des établissements de soins a dépassé 80 % dans 40 des 47 pays ayant donné des informations sur cet indicateur.
- Cet indicateur n'a pas pu être calculé pour 43 pays et ce, pour différentes raisons : ou il n'était pas mentionné combien d'établissements de soins devaient rapporter (le cas pour 2 pays), ou le nombre de rapports soumis n'était pas indiqué (le cas pour 17 pays), ou les deux (24 pays).
- Au total, 23 pays ont reçu des rapports de la part des établissements de soins privés, mais ces rapports ne représentent qu'une minorité de tous les rapports reçus dans ces pays (valeur médiane : 2,1 %, ÉI : 0,6 %-13 %).
- En 2015, il est estimé que les systèmes de surveillance du paludisme ont détecté 19 % des cas au niveau mondial (incertitude : 16 %-21 %).
- Les obstacles au dépistage des cas ne sont pas les mêmes d'un pays et d'une région de l'OMS à l'autre. Dans quatre d'entre elles, une large proportion des patients sollicitent un traitement dans le secteur privé, et ces cas ne sont pas capturés par les systèmes de surveillance existants. Dans trois régions de l'OMS, une part relativement faible des patients se rendant dans des établissements de soins publics reçoivent un test de diagnostic.
- Le taux de dépistage des cas a augmenté depuis 2010 (10 %), principalement en raison de l'intensification du diagnostic en Afrique subsaharienne.

6. Impact

Prévalence parasitaire

- Le pourcentage d'infections palustres parmi la population à risque en Afrique subsaharienne est estimée en baisse, passant de 17 % en 2010 à 13 % en 2015 (incertitude : 11 %-15 %).

- En Afrique subsaharienne, le nombre de patients atteints d'infections palustres aurait diminué de 131 millions en 2010 (incertitude : 126-136 millions) à 114 millions en 2015 (incertitude : 99-130 millions).
- Le taux d'infection est plus élevé chez les enfants de 2 à 10 ans ; néanmoins la plupart des infections (74 %) concernent les tranches d'âge supérieures.

Incidence des cas

- Au niveau mondial, le nombre de cas de paludisme est estimé à 212 millions en 2015 (incertitude : 148-304 millions).
- En 2015, la plupart des cas (90 %) ont été enregistrés dans la région Afrique de l'OMS, loin devant la région Asie du Sud-Est (7 %) et la région Méditerranée orientale (2 %) de l'OMS.
- Les infections à *P. vivax* sont estimées responsables d'environ 4 % des cas de paludisme dans le monde mais, hors Afrique, cette proportion atteint 41 %.
- Au niveau mondial, l'incidence du paludisme aurait diminué de 41 % entre 2000 et 2015, et de 21 % entre 2010 et 2015.
- Entre 2010 et 2015, l'incidence du paludisme aurait diminué d'au moins 40 % dans 40 des 91 pays et territoires où la transmission du paludisme reste active en 2015. On peut donc considérer que ces pays et territoires sont en bonne voie pour atteindre une réduction de 40 % d'ici 2020, qui est un objectif intermédiaire du GTS.
- Pour atteindre cet objectif d'ici 2020, la baisse doit s'accélérer dans les pays où l'incidence du paludisme est la plus élevée.

Mortalité

- Au niveau mondial, le nombre de décès dus au paludisme a été estimé à 429 000 en 2015 (incertitude : 235 000-639 000).
- En 2015, la plupart de ces décès sont survenus dans la région Afrique (92 %), loin devant la région Asie du Sud-Est (6 %) et la région Méditerranée orientale (2 %) de l'OMS.
- L'immense majorité (99 %) des décès sont dus au paludisme à *P. falciparum*. Les infections à *P. vivax* seraient à l'origine de 3 100 décès en 2015 (incertitude : 1 800-4 900), dont 86 % hors Afrique.
- En 2015, le nombre de décès dus au paludisme chez les enfants de moins de 5 ans a été estimé à 303 000 (incertitude : 165 000-450 000), soit 70 % du total mondial toutes tranches d'âge confondues. Ce nombre serait en baisse de 29 % depuis 2010 ; cependant, le paludisme reste l'une des principales causes de mortalité infantile, tuant un enfant toutes les deux minutes.
- Au niveau mondial, la mortalité liée au paludisme aurait diminué de 62 % entre 2000 et 2015, et de 29 % entre 2010 et 2015. Chez les enfants de moins de 5 ans, elle aurait chuté de 69 % entre 2000 et 2015, et de 35 % entre 2010 et 2015.
- Entre 2010 et 2015, la mortalité liée au paludisme aurait diminué d'au moins 40 % dans 39 des 91 pays et territoires où la transmission du paludisme reste active en 2015. Dix autres pays ont réduit à zéro le nombre de décès dus au paludisme indigène en 2015.
- Pour réduire la mortalité liée au paludisme d'au moins 40 % d'ici 2020 (objectif intermédiaire du GTS), la baisse doit s'accélérer dans les pays payant le plus lourd tribut à la maladie.

Élimination

- Entre 2000 et 2015, 17 pays ont éliminé le paludisme (c'est-à-dire réduit à zéro le nombre de cas indigènes pendant au moins trois ans) et 6 d'entre eux ont été certifiés exempts de paludisme par l'OMS.
- Sur la voie de l'élimination du paludisme, ces 17 pays ont rapporté une médiane de 184 cas indigènes cinq ans avant d'avoir réduit le nombre de cas à zéro (ÉI : 78-728) et une médiane de 1 748 cases dix ans auparavant (ÉI : 423-5 731).
- En 2015, 10 pays et territoires ont rapporté moins de 150 cas indigènes, et 9 autres pays en ont recensé entre 150 et 1 000. Il s'agit là de résultats encourageants vers l'atteinte de l'objectif intermédiaire de 2020, à savoir éliminer le paludisme dans au moins 10 pays.
- La transmission du paludisme n'est réapparue dans aucun des pays ayant éliminé cette maladie entre 2000 et 2015.

Baisse de la mortalité liée au paludisme, augmentation de l'espérance de vie et valorisation économique

- Au total, 6,8 millions de décès dus au paludisme ont été évités au niveau mondial entre 2001 et 2015, par rapport aux chiffres que nous aurions enregistrés si les taux d'incidence et de mortalité étaient restés inchangés depuis 2000.
- La plupart des décès (94 %) ont été évités dans la région Afrique de l'OMS. Sur les 6,8 millions de décès dus au paludisme évités entre 2001 et 2015, environ 6,6 millions (97 %) l'ont été parmi les enfants de moins de 5 ans.
- Tous les décès évités ne sont pas liés aux efforts de lutte contre le paludisme ; une partie d'entre eux s'expliquent vraisemblablement par une urbanisation accrue et la croissance économique en général, à l'origine de l'amélioration des conditions de logements et d'une meilleure nutrition.
- Conséquence de la baisse de la mortalité due au paludisme, en particulier chez les enfants de moins de 5 ans, l'espérance de vie à la naissance aurait augmenté de 1,2 an dans la région Afrique de l'OMS. Cette hausse représente 12 % de l'augmentation de 9,4 ans de l'espérance de vie en Afrique subsaharienne, passée de 50,6 ans en 2000 à 60 ans en 2015.
- Au niveau mondial, la baisse du risque de mortalité due au paludisme aurait contribué à une augmentation de l'espérance de vie de 0,26 an dans les pays endémiques, soit 5 % des 5,1 ans gagnés au total.
- La baisse du risque de mortalité due au paludisme entre 2000 et 2015 et donc, les gains en termes d'espérance de vie, peuvent être valorisés à US$ 1 810 milliards dans la région Afrique de l'OMS (incertitude : US$ 1 330-2 480 milliards), soit 44 % du produit intérieur brut (PIB) des pays affectés en 2015.
- Au niveau mondial, la baisse du risque de mortalité due au paludisme est valorisée à US$ 2 040 milliards (incertitude : US$ 1 560-2 700 milliards), soit 3,6 % du total du PIB des pays affectés.
- Ces valeurs de bien-être économique sont exprimées en termes de pourcentage du PIB à titre comparatif ; elles ne sauraient laisser entendre que la valeur de la longévité est une composante de la richesse nationale produite, ni que la valeur de ces gains est directement intégrée dans le revenu national. Cette comparaison suggère seulement que la valeur économique attachée à la baisse de la mortalité due au paludisme est conséquente.

Prefacio

Dra. Margaret Chan,
Directora General
Organización Mundial de la Salud

El *Informe Mundial sobre Paludismo*, publicado anualmente por la Organización Mundial de la Salud (OMS), ofrece un análisis en profundidad del progreso y las tendencias en la respuesta al paludismo (o malaria) a nivel mundial, regional y nacional. Es el resultado de un continuo esfuerzo colaborativo entre los Ministerios de Salud de los países endémicos y numerosas organizaciones colaboradoras en todo el mundo.

Nuestro informe 2016 destaca una serie de tendencias positivas, en particular, en el África subsahariana, la región que padece la mayor carga de paludismo. Esto demuestra que, en muchos países, el acceso a las intervenciones preventivas se está expandiendo a un ritmo acelerado entre las poblaciones más necesitadas.

Los niños son especialmente vulnerables y representan más de dos tercios de las muertes por paludismo a nivel mundial. En 22 países africanos, la proporción de niños con fiebre que recibieron una prueba de diagnóstico de paludismo en un centro de salud público se incrementó un 77% en los últimos 5 años. Esta prueba ayuda a los proveedores de salud poder distinguir rápidamente entre paludismo y fiebres no palúdicas, permitiendo asistir con un tratamiento adecuado.

El paludismo durante el embarazo puede causar mortalidad materna, anemia y recién nacidos con bajo peso al nacer, una de las principales causas de mortalidad infantil. La OMS recomienda el tratamiento preventivo intermitente durante el embarazo, conocido como el TPIe, para todas las mujeres embarazadas en el África subsahariana, que viven en zonas de transmisión moderada y alta. En los últimos 5 años, la tasa de administración de al menos tres dosis de TPIe se ha incrementado por cinco en 20 países africanos.

Los mosquiteros (o toldillos) con insecticidas de larga duración siguen siendo uno de los pilares de la prevención del paludismo y la OMS recomienda su uso para toda población en riesgo de contraer la enfermedad. En el África subsahariana, la proporción de personas que duermen bajo mosquiteros tratados con insecticida se ha duplicado por poco en los últimos 5 años.

Hemos hecho grandes progresos, pero nuestro trabajo sigue incompleto. Sólo en el último año, el recuento mundial del paludismo alcanzó los 212 millones de

casos y 429 000 muertes. En África, millones de personas siguen sin acceso a las herramientas necesarias para prevenir y tratar la enfermedad.

En muchos países, el progreso se ve amenazado por el rápido desarrollo y la propagación de la resistencia del mosquito a los insecticidas. La resistencia a los medicamentos antipalúdicos también podría poner en peligro los logros recientes.

En 2015, la Asamblea Mundial de la Salud adoptó la Estrategia técnica mundial contra la malaria 2016-2030, un marco operacional para los próximos 15 años para todos los países que trabajan en el control y la eliminación del paludismo. Esta estrategia establece unos objetivos ambiciosos pero alcanzables para el 2030, con objetivos a corto y medio plazo que permiten hacer un seguimiento del progreso.

La estrategia insta a la eliminación del paludismo en al menos 10 países para el año 2020: un objetivo a nuestro alcance. Según este informe, 10 países y territorios han registrado menos de 150 casos de paludismo autóctonos. Otros nueve países informaron entre 150 y 1000 casos.

Pero el progreso hacia los otros objetivos mundiales debe ser acelerado. El informe llega a la conclusión de que menos la mitad de los 91 países afectados por el paludismo están en vías de alcanzar los objetivos a medio plazo de 2020, es decir, una reducción del 40% en el caso de incidencia y mortalidad.

Para acelerar los progresos hacia nuestras metas a nivel mundial en relación con el paludismo, la OMS hace un llamamiento para nuevas y mejores herramientas para la lucha contra la enfermedad. Se necesitan mayores inversiones en el desarrollo de nuevas intervenciones de control vectorial, mejores diagnósticos y medicamentos más eficaces.

El mes pasado, la OMS anunció que la primera vacuna contra el paludismo será pilotada en 3 países del África subsahariana. La vacuna, conocida como RTS,S ha demostrado proporcionar una protección parcial contra el paludismo en los más jóvenes. Será evaluada como un posible complemento al paquete de medidas y herramientas existentes recomendadas por la OMS en materia de prevención, diagnóstico y tratamiento.

La necesidad de contar con más fondos es una prioridad urgente. Se estima que en 2015, la financiación para la lucha contra el paludismo superó los US$ 2,9 mil millones. Para lograr nuestras metas a nivel mundial, las contribuciones de fuentes nacionales e internacionales deben aumentar de manera considerable para poder alcanzar los US$ 6,4 mil millones anuales para el año 2020.

Los retos a los que nos enfrentamos son considerables, pero no insuperables. La experiencia reciente ha demostrado que con una sólida financiación, programas eficaces y liderazgo de los países, el progreso en la lucha contra el paludismo puede ser sostenido y acelerado.

Las ganancias potenciales bien valen el esfuerzo. Todos unidos, podemos derrotar al paludismo y mejorar la salud de millones de personas alrededor del mundo.

Puntos clave

1. Metas mundiales, hitos e indicadores

- Las metas para el 2030 de la *Estrategia técnica mundial contra la malaria 2016-2030* (en adelante referido como "el GTS", por sus siglas en inglés de *Global Technical Strategy for Malaria 2016-2030*) consisten en: reducir a nivel mundial la incidencia de casos de paludismo (o malaria) y la mortalidad asociada en al menos un 90% en comparación con los datos de 2015; eliminar el paludismo en al menos 35 países en los que había transmisión en el 2015 y prevenir el restablecimiento del paludismo en todos los países que la han eliminado.
- Respecto al paludismo en los Objetivos de desarrollo sostenibles (ODS), la Meta 3.3 es poner fin a las epidemias del SIDA, la tuberculosis, la malaria y las enfermedades tropicales desatendidas para el 2030 y es interpretado por la Organización mundial de la salud (OMS) como el logro de las metas del GTS.
- Para el seguimiento del progreso del GTS y de la *Acción e inversión para vencer a la malaria 2016-2030* (*AIM*), la OMS y el programa Roll Back Malaria han definido conjuntamente una lista de 41 indicadores para utilizar a nivel mundial, nacional y subnacional. De entre ellos, 12 son considerados clave para monitorizar el GTS y el plan AIM a nivel mundial. El *Informe mundial sobre el Paludismo* tiene como objetivo informar acerca de los avances realizados cada año en estos 12 y una selección de otros indicadores.
- El Programa Mundial sobre Paludismo de la OMS produce el *Informe mundial sobre Paludismo* en colaboración con los equipos de las oficinas regionales y nacionales de la OMS, Ministerios de Salud de los países endémicos y un amplio número de organizaciones colaboradoras.
- Las principales fuentes de información son los informes procedentes de 91 países endémicos, complementados con datos procedentes de encuestas nacionales representativas y bases de datos mantenidas por otras organizaciones.

2. Inversión en programas del paludismo e investigación

- En 2015, la financiación total para el control y eliminación del paludismo era aproximadamente de US$ 2,9 mil millones, US$ 60 millones más que en 2010. Esta cantidad no representa más que el 46% de la meta fijada por el GTS en US$ 6,4 mil millones para el 2020.
- Los gobiernos de países con paludismo endémico han contribuido con un 32% del total de la financiación en 2015, de los cuales US$ 612 millones han sido costes directos de los programas nacionales de control de malaria (PNCM) y US$ 332 millones han sido costes de tratamientos de pacientes con paludismo.

- Los Estados Unidos de América son el principal inversor internacional de fondos para las actividades destinadas al control del paludismo, con una contribución estimada del 35% de la financiación mundial para la lucha contra el paludismo en 2015, seguido por el Reino Unido de Gran Bretaña e Irlanda del Norte (16%), Francia (3,2%), Alemania (2,4%), Japón (2,3%), Canadá (1,7%), la fundación Bill & Melinda Gates (1,2%) y las instituciones de la Unión Europea (1,1%). Alrededor de la mitad de las inversiones internacionales (45%) son canalizadas a través del Fondo Mundial de lucha contra el sida, la tuberculosis y la malaria (Fondo Mundial).
- El gasto en investigación y desarrollo para la lucha contra el paludismo se ha estimado en US$ 611 millones en 2014 (el último año con datos disponibles), incrementando la cifra de US$ 607 millones en 2010, y representando más del 90% de la meta de la inversión anual fijada por el GTS en US$ 673 millones.
- Los países con el mayor número de casos de paludismo, son aquellos que están más alejados de la meta de gasto per cápita para el 2020 establecida por el GTS.

3. Prevención del paludismo

Control de vectores

- En el África subsahariana, el porcentaje de la población en riesgo de paludismo que duerme bajo un mosquitero tratado con insecticida (MTI) o protegido con el rociado residual intradomiciliario (RRI) se estima que habría incrementado de un 37% en 2010 (Intervalo de incertidumbre [II]:25%–48%) al 57% en 2015 (II: 44%–70%).
- Para los países en el África subsahariana donde los MTI son el principal método de intervención para el control vectorial, 53% de la población en riesgo duerme bajo un MTI en 2015 (Intervalo de confianza [IC] de 95%: 50%–57%), contra el 30% en 2010 (IC de 95%: 28%–32%).
- El crecimiento en el acceso a los MTI en los hogares (60% en 2015, IC de 95%: 57%–64%; 34% en 2010, IC de 95%: 32%–35%) ha logrado un gran aumento de la población en riesgo de paludismo que duerme bajo un MTI.
- El porcentaje de hogares con al menos un MTI ha aumentado, alcanzando el 79% en 2015 (IC de 95%: 76%–83%); por lo tanto, una quinta parte de los hogares donde los MTI son la principal herramienta para la lucha antivectorial no tienen acceso a una red tratada.
- El porcentaje de hogares con un número suficiente de MTI para todos los miembros del hogar se ha elevado a un 42% (IC de 95%: 39%–45%)
- El RRI es generalmente usado por los PNMC en zonas específicas. A nivel global, el porcentaje de la población en riesgo protegida por el RRI ha decaído de un máximo del 5,7% alcanzado en 2010 a un 3,1% en 2015, y de un 10,5% a un 5,7% en el África Subsahariana.
- La reducción en la cobertura del RRI podría ser atribuida al cese del rociamiento con piretroides, en particular en la zona regional de África de la OMS.

- De los 73 países endémicos que proporcionaron datos a partir del 2010 en adelante; 60 reportaron una resistencia de al menos un insecticida y 50 reportaron resistencia a dos o más clases de insecticida.
- La resistencia a los piretroides (la única clase de insecticida que se utiliza actualmente en los MTI) es la que se registra con más frecuencia. La última evaluación llevada a cabo en 5 países y bajo la coordinación de la OMS, llegó a la conclusión de que los MTI seguían siendo efectivos, sin embargo se siguen necesitando nuevas herramientas para el control vectorial.

Tratamiento preventivo intermitente durante el embarazo

- En los 20 países africanos con datos suficientes, 31% de las mujeres embarazadas elegibles recibieron tres o más dosis de tratamiento preventivo intermitente durante el embarazo (TPIe) en 2015, contra el 6% en 2010.

4. Pruebas de diagnóstico y tratamiento

Acceso al tratamiento

- En las 23 encuestas representativas a nivel nacional y realizadas en el África subsahariana entre 2013 y 2015 (representando el 61% de la población en riesgo), una mediana de 54% de niños febriles por debajo de los 5 años (Rango intercuartil [RI]: 41%–59%) fueron llevados a un proveedor de salud formado.
- El porcentaje de niños febriles que solicitó tratamiento en el sector público (mediana: 42%, RI: 31%–50%) fue más alto que en el sector privado (mediana: 20%, RI: 12%–28%).
- El porcentaje de niños febriles que no solicitaron tratamiento es importante (mediana: 36%, RI: 26%–42%)

Pruebas de diagnóstico

- El porcentaje de niños febriles que tuvieron una prueba de diagnóstico del paludismo ha sido mayor si solicitaban tratamiento en el sector público (mediana: 51%, RI: 35%–60%) que si recurrían a un tratamiento en el sector privado formal (mediana: 40%, RI: 28%–57%) o el sector privado informal (mediana: 9%, RI: 4%–12%). El porcentaje de niños que tuvieron la prueba de diagnóstico en el sector público ha aumentado del 29% en 2010 (RI: 19%–46%).
- Los datos comunicados por los PNCM indican que el porcentaje de casos sospechosos de paludismo que tienen una prueba parasitológica en el sector público ha aumentado de un 40% de casos sospechosos en la región de África de la OMS en 2010 a un 76% en 2015. Este incremento es principalmente debido a una mayor utilización de los test de diagnóstico rápido (RDT, por sus siglas en inglés *Rapid diagnostic tests*), que contribuyeron al 74% de las pruebas de diagnóstico entre los casos sospechosos en 2015.
- En más de 10 países se han reportado deleciones del gen HRP2, lo cual permite a parásitos del paludismo evadir la detección por los test de diagnósticos más comunes.

Tratamiento

- Entre las 11 encuestas representativas a nivel nacional que fueron llevadas a cabo entre 2013 y 2015 en el África subsahariana, la proporción mediana de niños por debajo de los 5 años con evidencia de una infección de *P. falciparum* reciente o presente e historia de fiebre que recibieron algún medicamento antipalúdico se elevó a 30% (RI: 20%–51%). De mediana, el 14% (RI: 5%–45%) recibió una terapia combinada con artemisinina (TCA). Sin embargo, no pudo extraerse ninguna conclusión clara de estos resultados puesto que los rangos asociados a las medianas eran muy amplios, indicando una gran variedad entre los países, a lo que hay que añadir que las encuestas solo representaban un tercio de la población en riesgo en el África subsahariana.
- Son necesarias mayores inversiones para poder mejorar el seguimiento de los tratamientos en los centros de salud (a través de los sistemas rutinarios de reporte y de las encuestas a los centros de salud) y a nivel comunitario, para poder entender hasta qué punto existen barreras que impiden el acceso a un tratamiento contra el paludismo.
- El porcentaje de tratamientos antipalúdicos con TCA proporcionados a niños con fiebre en las últimas dos semanas y con un RDT positivo en el momento de la encuesta, aumentó de una mediana inicial de 29% entre 2010-2012 (RI: 17%–55%) al 80% en 2013-2015 (RI: 29%–95%).
- Los tratamientos antipalúdicos fueron más probables de ser TCA si los niños buscaban tratamiento en centros de salud pública o a través de trabajadores de salud de las comunidades, que si se dirigían al sector privado.
- Se ha detectado resistencia de *P. falciparum* a la artemisinina en cinco países de la subregión del Gran Mekong. En Camboya, altos índices de fracaso después de las TCA han sido detectados en cuatro diferentes.

5. Sistemas de vigilancia del paludismo

- El porcentaje de informes recibidos a nivel nacional y procedente de los centros de salud superó el 80% en 40 de los 47 países que informaron sobre este indicador.
- Este indicador no pudo ser calculado en 43 países, por distintas razones: si bien porque no se especificó el número de centros de salud que se esperaba para poder informar (en 2 países) o bien porque no se especificó el número de informes entregados (en 17 países), o por último, con ambas situaciones (en 24 países).
- En total, 23 países recibieron informes de centros de salud privados, pero éstos representan una minoría de todos los informes recibidos (mediana: 2,1%, RI: 0,6%–13%).
- En 2015, se estima que los sistemas de vigilancia del paludismo detectan el 19% de los casos que ocurren a nivel mundial (II: 16%–21%).
- Los obstáculos que se hallan en la detección de casos varían según el país y la región de la OMS. En cuatro de las regiones de la OMS una gran proporción de pacientes solicitan tratamiento en el sector privado, y en sus casos no se

contabiliza en los sistemas de vigilancia existentes. En tres de las regiones de la OMS una proporción relativamente baja de los pacientes que asisten a los centros de salud públicos reciben una prueba de diagnóstico.

- La tasa de detección de casos ha mejorado y aumentado su cifra desde 2010 (10%), principalmente debido al incremento del uso de las pruebas de diagnóstico en el África subsahariana.

6. Impacto

Prevalencia del parásito que provoca el paludismo

- El porcentaje de las poblaciones en riesgo en el África subsahariana con infecciones por el parásito del paludismo ha descendido de un 17% calculado en 2010 a un 13% en 2015 (II: 11%–15%).
- En el África subsahariana, el número de personas infectadas por el parásito del paludismo ha descendido de 131 millones en 2010 (II: 126 – 136 millones) a 114 millones en 2015 (II: 99 – 130 millones.
- La tasa de infección es más alta en niños entre 2 y 10 años, aunque la mayor parte de las personas afectadas se encuentran en rangos de edades superiores.

Casos de incidencia

- A nivel mundial, se calcularon 212 millones de casos de paludismo en 2015 (II: 148 – 304 millones).
- En 2015, la mayoría de los casos fueron registrados en la región de África de la OMS (90%), seguida de la región de Asia sudoriental (7%) y la región del Mediterráneo oriental (2%).
- Las infecciones por *P. vivax* son responsables de un 4% de los casos mundiales de paludismo, sin embargo fuera del continente africano el porcentaje de infecciones por *P. vivax* es de 41%.
- A nivel mundial, la tasa de incidencia de casos del paludismo ha disminuido un 41% entre 2000 y 2015, y un 21% entre 2010 y 2015.
- De los 91 países y territorios con transmisión de paludismo en 2015, se estima que 40 han alcanzado una reducción en las tasas de incidencia de 40% o más entre 2010 y 2015, y se puede considerar que están en el camino de alcanzar la meta del GTS de una reducción adicional del 40% para el 2020.
- Si se quiere alcanzar la meta del GTS en reducir de 40% la tasa de incidencia de casos para el año 2020, se debería acelerar la disminución de la tasa de incidencia de casos en países con un alto número de casos reportados.

Mortalidad

- En 2015, se estimaron 429 000 muertes por paludismo en todo el mundo (II: 235 000 – 639 000).
- En 2015, se estimó que la mayoría de las muertes ocurrieron en la región de África de la OMS (92%), seguida de la región de Asia sudoriental de la OMS (6%) y la región del Mediterráneo oriental de la OMS (2%).

- La inmensa mayoría de las muertes (99%) por paludismo fueron debidas al *P. falciparum*. Se estima que P. *vivax* pudo haber sido el responsable de 3100 muertes en 2015 (rango: 1800 – 4900), 86% de ellas fuera de África.
- En 2015, el número estimado de muertes causadas por paludismo en niños menores de 5 años fue de 303 000 (rango: 165 000 – 450 000), el equivalente al 70% del total mundial. Se estima que el número de muertes ha disminuido un 29% desde 2010, aunque sigue siendo una de las principales causas de mortalidad infantil, acabando con la vida de un niño cada dos minutos.
- A nivel mundial, la tasa de mortalidad por paludismo habría disminuido un 62% entre 2000 y 2015, y un 29% entre 2010 y 2015. En niños menores de 5 años, habría disminuido un 69% entre 2000 y 2015, y en un 35% entre 2010 y 2015.
- Entre 2010 y 2015, la tasa de mortalidad por paludismo habría disminuido al menos un 40% en 39 de los 91 países y territorios con transmisión de paludismo activa en 2015. Otros 10 países no tuvieron muertes autóctonas en 2015.
- Si se quiere alcanzar la meta del GTS en reducir la tasa de la mortalidad en más de un 40% para el 2020, se debería acelerar la reducción de la tasa de mortalidad en países con un alto número de muertes.

Eliminación

- Entre 2000 y 2015, 17 países han eliminado el paludismo (es decir, que han reducido a cero los casos autóctonos en tres años o más) y entre los cuales, seis países han sido certificados por la OMS como libres de paludismo.
- En el progreso hacia la eliminación del paludismo, estos 17 países han reportado una media de 184 casos autóctonos cinco años antes de alcanzar los cero casos (RI: 78 – 728) y una mediana de 1748 casos en diez años antes de alcanzar los cero casos (RI: 423 – 5731).
- En 2015, 10 países y territorios reportaron menos de 150 casos autóctonos, y otros 9 países reportaron entre 150 y 1000 casos autóctonos. Por tanto, en perspectiva positiva, parecería que sería posible alcanzar la meta del GTS para el 2020 y eliminar el paludismo en 10 países.
- El paludismo no ha sido reintroducida en ninguno de los países que eliminaron esta enfermedad entre 2000 y 2015.

Reducción de la mortalidad por paludismo, el incremento de la esperanza de vida y la evaluación económica

- Entre 2001 y 2015, se estima que un total acumulado de 6,8 millones de muertes por paludismo han sido evitadas a nivel mundial entre 2000 y 2015, en relación a la cifras que se hubiesen producido si la incidencia y las tasas de mortalidad se hubiesen mantenido inalteradas desde 2000.
- La mayoría de las muertes (94%) fueron evitadas en la región de África de la OMS. Del total estimado de 6,8 millones menos de muertes por paludismo entre 2001 y 2015, alrededor de 6,6 millones (97%) fueron entre niños menores de 5 años.
- No todas las muertes pueden ser atribuidas a los esfuerzos para controlar el paludismo. Parte del progreso es probable que esté relacionado con un

incremento de la urbanización y de un desarrollo económico generalizado, lo que ha llevado a la mejora de la vivienda y la nutrición.

- Como consecuencia de la reducción de la tasa de mortalidad por paludismo, en particular, entre los niños menores de 5 años, se ha estimado que la esperanza de vida al nacer habría incrementado en más de 1,2 años en la región de África de la OMS. Este incremento representaría el 12% del aumento total de la esperanza de vida de 9,4 años en el África subsahariana, que ha pasado de 50,6 años en 2000 a 60 años en 2015.
- A nivel mundial, la reducción de la tasa de mortalidad por paludismo ha contribuido a un incremento en la esperanza de vida de 0,26 años en los países endémicos, siendo el 5% de los 5,1 años ganados en total.
- Los métodos de análisis actuales sugieren que el incremento en la esperanza de vida originados por la reducción de la mortalidad por paludismo observada entre los años 2000 y 2015 se puede valorar en US$ 1810 mil millones dentro de la región de África de la OMS (II: US$ 1330 – 2480 mil millones), lo que equivale al 45% del Producto Interior Bruto (PIB) de los países afectados en 2015.
- A nivel mundial, la reducción del riesgo de mortalidad debido al paludismo se valoriza en US$ 2040 mil millones (II: US$ 1560 – 2700 mil millones), siendo alrededor del 3,6% del PIB.
- Estos valores de bienestar económico se expresan en términos porcentuales del PIB a título comparativo, porque no pueden representar una parte actual de la riqueza producida ni dar a entender que pueden medir el mismo tipo de riqueza. Esta comparación sugiere únicamente que el valor económico que se atribuye a la disminución de la mortalidad por paludismo es substancial.

1. Global targets, milestones and indicators

Since 2000, substantial progress has been made in fighting malaria. According to the latest estimates, between 2000 and 2015, malaria case incidence was reduced by 41% and malaria mortality rates by 62% (see **Section 6** of this report). At the beginning of 2016, malaria was considered to be endemic in 91 countries and territories, down from 108 in 2000 (**Figure 1.1**). Much of the change can be attributed to the wide-scale deployment of malaria control interventions (*1*). Despite this remarkable progress, malaria continues to have a devastating impact on people's health and livelihoods. Updated estimates indicate that 212 million cases occurred globally in 2015, leading to 429 000 deaths, most of which were in children aged under 5 years in Africa.

Recognizing the need to hasten progress in reducing the burden of malaria, WHO developed the *Global Technical Strategy for Malaria 2016–2030* (GTS) (*2*), which sets out a vision for accelerating progress towards malaria elimination. The WHO strategy is complemented by the Roll Back Malaria advocacy plan, *Action and investment to defeat malaria 2016–2030* (AIM) (*3*). Together, these documents emphasize the need for universal access to interventions for malaria prevention, diagnosis and treatment; that all countries[1] should accelerate efforts towards malaria elimination; and that malaria surveillance should be a core intervention. The GTS and AIM also recognize the importance of innovation and research and a strong enabling environment, and share the same global targets for 2030 and the same milestones for 2020 and 2025, as shown in **Table 1.1**. The time frame of the GTS and AIM is aligned with that of the Sustainable Development Goals (SDGs) (*4*). For malaria, Target 3.3 of the SDGs – to end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, waterborne diseases, and other communicable diseases by 2030 – is interpreted as the attainment of the GTS and AIM targets. The indicator used to track progress of Target 3.3 is malaria case incidence.

1. In order to facilitate reading throughout the report, "countries" is used as a generic term referring to countries and areas or territories. The term "area" or "territory" is used only when mentioning one or more areas/territories in lists of specific countries.

Figure 1.1 Countries endemic for malaria in 2000 and 2016. Countries with 3 consecutive years of zero indigenous cases are considered to have eliminated malaria. No country in the WHO European region reported zero indigenous cases in 2015 but Tajikistan has not yet had 3 consecutive years of zero indigenous cases, its last case being reported in July 2014. Source: WHO database

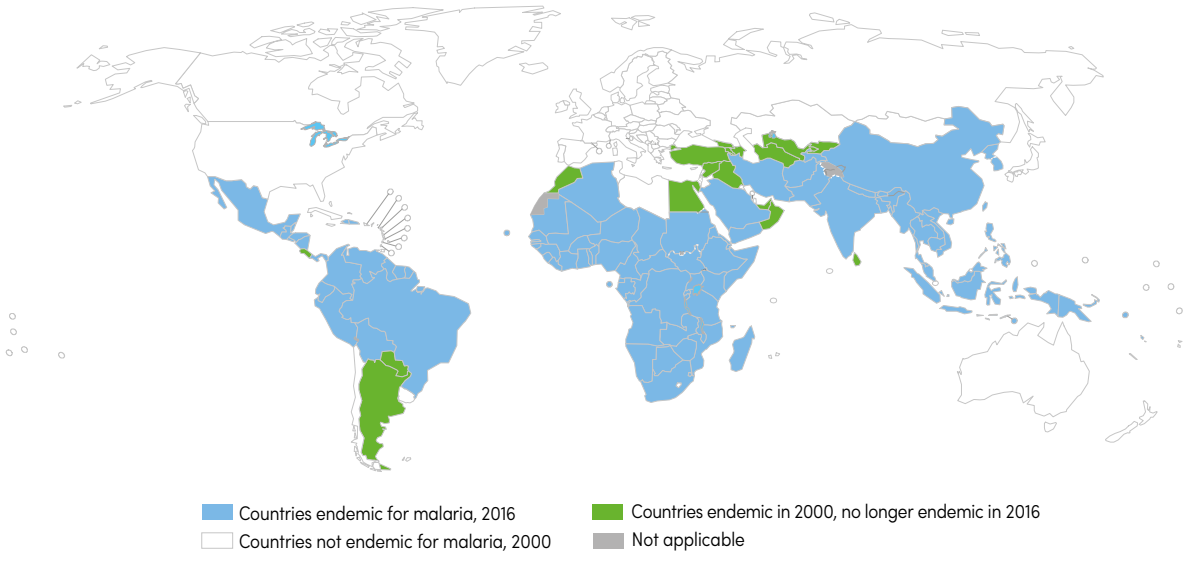


Table 1.1 Global targets for 2030 and milestones for 2020 and 2025. Source: (*2*)

Goals	Milestones		Targets
	2020	2025	2030
1. Reduce malaria mortality rates globally compared with 2015	≥40%	≥75%	≥90%
2. Reduce malaria case incidence globally compared with 2015	>40%	≥75%	≥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

1 Global targets, milestones and indicators

The GTS highlights a minimal set of 14 outcome and impact indicators against which progress in malaria control and elimination should be monitored, of which 12 are relevant at global level. The *World Malaria Report 2016* aims to report on these global indicators, and a selection of other indicators as shown in **Table 1.2**. It also reports on the supply of key commodities to endemic countries (which influences the progress of malaria control and elimination programmes) (**Section 2.4**); the evolution of resistance to interventions by vectors and parasites (**Sections 3.6** and **4.6**, respectively). This year, the report also considers the gain in life expectancy that the reductions in malaria mortality have brought about, and the economic value society places on such changes (**Section 6.7**). The main text is followed by methods, regional profiles, country trends in selected indicators and data tables. Country profiles and methods are available online at http://www.who.int/malaria/publications/world-malaria-report-2016/en/.

The *World Malaria Report* is produced by the WHO Global Malaria Programme, with the help of WHO regional and country offices, ministries of health in endemic countries, and a broad range of other partners. The primary sources of information are reports from national malaria control programmes (NMCPs) in the 91 endemic countries. This information is supplemented by data from nationally representative household surveys (demographic and health surveys, malaria indicator surveys and multiple indicator cluster surveys) and databases held by other organizations: the Alliance for Malaria Prevention; the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), the Organisation for Economic Co-operation and Development; Policy Cures; United Nations Children's Fund (UNICEF); the US President's Malaria Initiative; and WHO. A description of data sources and methods is provided in **Annex 1**.

Table 1.2 Indicators reviewed in *World Malaria Report 2016*. Indicators among minimal set of 14 recommended indicators in GTS are highlighted in light grey.

Indicator			Applicability of indicator by transmission setting		
			High	Low	Elimination or prevention of re-establishment
Inputs					
Financing	1.1	Total malaria funding and expenditure per capita for malaria control and elimination	●	●	●
	1.2	Funding for malaria relevant research	●	●	●
Outcome					
Vector control	2.1	Proportion of population at risk that slept under an ITN the previous night	●	○	
	2.2	Proportion of population with access to an ITN within their household	●	○	
	2.3	Proportion of households with at least one ITN for every two people	●	○	
	2.4	Proportion of households with at least one ITN	●	○	
	2.5	Proportion of available ITNs used the previous night	●	○	

Indicator			Applicability of indicator by transmission setting		
			High	Low	Elimination or prevention of re-establishment
Vector control	2.6	Proportion of targeted risk group receiving ITNs	●	●	●
	2.7	Proportion of population at risk protected by IRS in the previous 12 months	●	○	
	2.8	Proportion of population at risk sleeping under an ITN or living in house sprayed by IRS in the previous 12 months	●	○	
Chemoprevention	3.1	Proportion of pregnant women who received ≥3 doses of IPTp	●		
	3.2	Proportion of pregnant women who received 2 doses of IPTp	●		
	3.3	Proportion of pregnant women who received 1 dose of IPTp	●		
	3.4	Proportion of pregnant women who attended ANC at least once	●		
Case detection	4.1	Proportion of children under 5 with fever in the previous 2 weeks for whom advice or treatment was sought	●	○	
Diagnostic testing	5.1	Proportion of patients with suspected malaria who received a parasitological test	●	○	
	5.2	Proportion of children under 5 with fever in the previous 2 weeks who had a finger or heel stick	●		
Treatment	6.1	Proportion of patients with confirmed malaria who received first-line antimalarial treatment according to national policy	●	●	●
	6.2	Proportion of treatments with ACTs (or other appropriate treatment according to national policy) among febrile children <5	●	○	
Surveillance	7.1	Proportion of malaria cases detected by surveillance systems	●	●	●
	7.2	Proportion of expected health facility reports received	●	●	●
Impact					
Prevalence	8.1	Parasite prevalence: proportion of population with evidence of infection with malaria parasites	●	○	
Incidence	9.1	Malaria case incidence: number and rate per 1000 persons per year	●	●	●
Mortality	10.1	Malaria mortality: number and rate per 100 000 persons per year	●	○	○
Elimination	11.1	Number of areas/countries that have newly eliminated malaria since 2015			●
Prevention of re-establishment	12.1	Number of areas/countries that were malaria free in 2015 in which malaria has been re-established			●

● Indicator highly relevant to setting ○ Indicator potentially relevant to setting

ACT, artemisinin-based combination therapy; ANC, antenatal care; GTS, *Global Technical Strategy for Malaria 2016-2030*; IPTp, intermittent preventive treatment in pregnancy; IRS, indoor residual spraying; ITN, insecticide-treated mosquito net

2. Investments in malaria programmes and research

Progress in reducing malaria incidence and mortality between 2000 and 2015 was made possible by large increases in the financing of malaria control and elimination programmes. Further progress in reducing malaria depends on increased investments in malaria programmes. The GTS estimated that annual investments in malaria control and elimination need to increase to US$ 6.4 billion per year by 2020 to meet the first milestone under that strategy of a 40% reduction in malaria incidence and mortality rates.

The GTS also recognized that innovations in tools and approaches are needed to achieve its targets, and estimated that an additional US$ 674 million (range: US$ 530 million–832 million) would be required annually for malaria research and development.

This section of the report examines recent trends in the financing of malaria programmes and of malaria research and development. It considers the indicators listed in **Box 2.1**.

This section also considers the quantities of commodities delivered, because this provides insight into malaria expenditures, and because the availability of supplies is a key determinant of programme coverage.

Box 2.1 Indicators related to investments in malaria programmes and research

- Total expenditure for malaria control and elimination
- Funding for malaria research and development
- Expenditure per capita for malaria control and elimination

2 Investments in malaria programmes and research

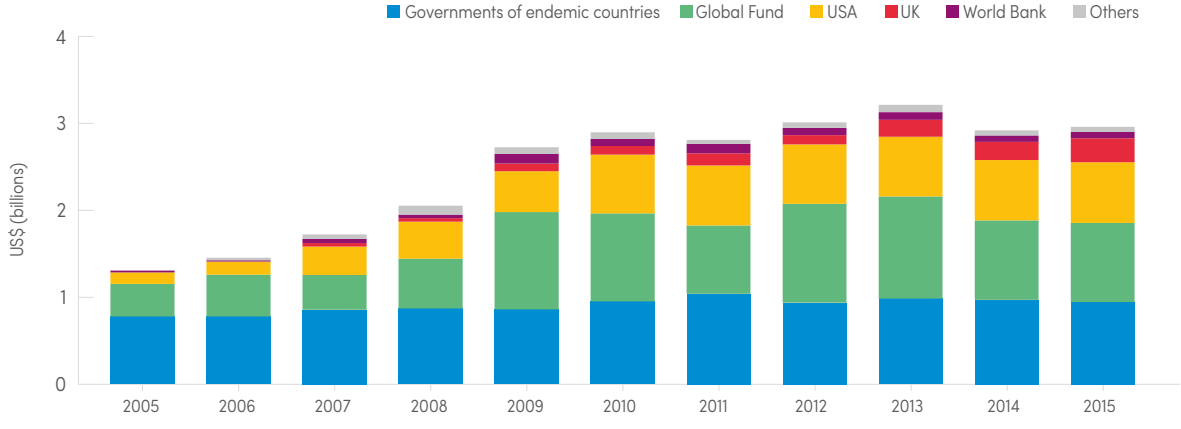
2.1 Total expenditure for malaria control and elimination

Total funding for malaria control and elimination in 2015 is estimated at US$ 2.9 billion, rising just US$ 0.06 billion since 2010 and representing only 46% of the GTS 2020 milestone of US$ 6.4 billion (**Figure 2.1**). Funding for malaria increased year on year between 2005 and 2010, but subsequently fluctuated, with totals for 2014 and 2015 lower than 2013. Pledges at the Global Fund replenishment conference for funding in 2017–2019 increased by 8% compared with 2014–2016. However, total funding needs to increase by a substantially greater amount if the 2020 milestone is to be achieved.

Governments of endemic countries provided 32% of total funding in 2015, of which US$ 612 million was direct expenditure through NMCPs and US$ 332 million was expenditure on patient service delivery care (**Figure 2.2**). Domestic government contributions are greatest in the WHO African Region (US$ 528 million), followed by the WHO Region of the Americas (US$ 202 million) and the WHO South-East Asia Region (US$ 92 million). Domestic governments accounted for the greatest share of funding for malaria in the WHO European Region (99%) and the WHO Region of the Americas (88%), but represented 50% or less in the other WHO regions. The level of domestic government financing reflects the size of the malaria burden in each region, and the willingness and ability of governments to tackle this burden.

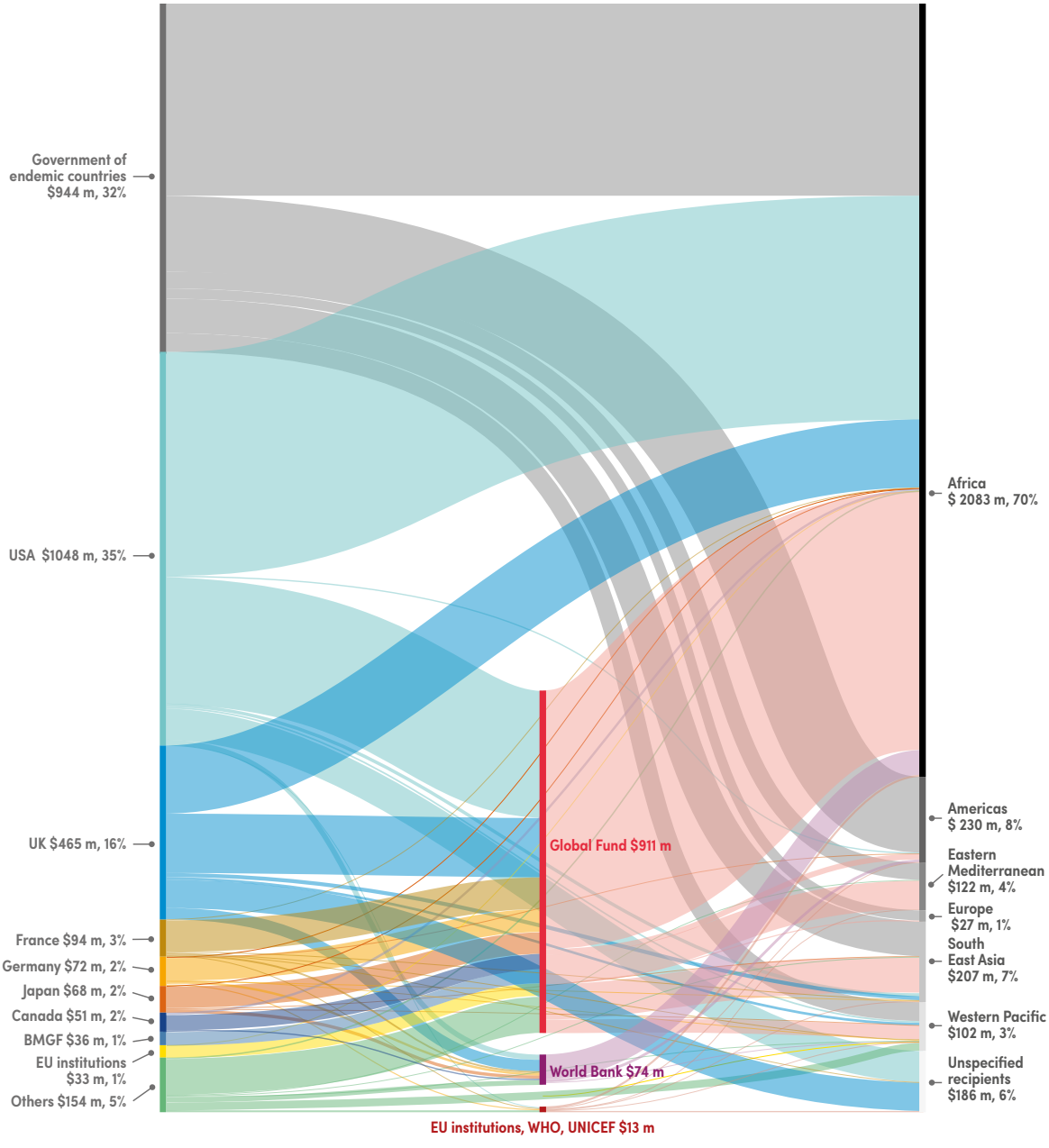
International funding accounts for most (68%) of the funding for malaria control and elimination programmes. Such funding may be provided direct to endemic countries through bilateral aid or through intermediaries such as the Global Fund, World Bank or other multilateral institutions (**Figure 2.2**). The United States of

Figure 2.1 Investments in malaria control activities by funding source, 2005–2015. Annual values have been converted to constant 2015 US$ using the gross domestic product implicit price deflator from the USA in order to measure funding trends in real terms. Sources: ForeignAssistance.gov, Global Fund to Fight AIDS, Tuberculosis and Malaria, national malaria control programme reports, Organisation for Economic Co-operation and Development (OECD) creditor reporting system, the World Bank Data Bank, WHO estimates of malaria cases and treatment seeking at public facilities, and WHO CHOICE unit cost estimates of outpatient visit and inpatient admission



Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USA, United States of America

Figure 2.2 Annual flow of funding for malaria control and elimination, 2014–2015. Sources of funds are listed on the left and destination WHO regions on the right. Intermediaries through which much donor funding is channelled are shown in the middle. Sources: ForeignAssistance.gov, Global Fund to Fight AIDS, Tuberculosis and Malaria, national malaria control programme reports, Organisation for Economic Co-operation and Development (OECD) creditor reporting system, the World Bank Data Bank, WHO estimates of malaria cases and treatment seeking at public facilities, and WHO CHOICE unit cost estimates of outpatient visit and inpatient admission



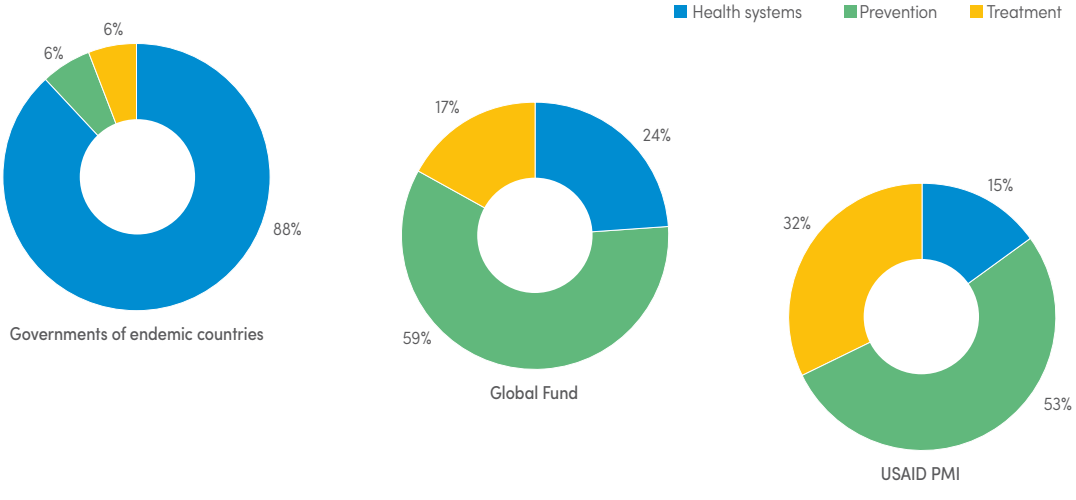
BMGF, Bill & Melinda Gates Foundation; EU, European Union; Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; UNICEF, United Nations Children's Fund; USA, United States of America

America is the largest single international funder of malaria control activities; it accounted for an estimated 35% of total malaria funding in 2015 (including bilateral aid and contributions to intermediaries), followed by the United Kingdom of Great Britain and Northern Ireland (16%), France (3.2%), Germany (2.4%), Japan (2.3%), Canada (1.7%), the Bill & Melinda Gates Foundation (1.2%) and European Union institutions (1.1%). Contributions from other countries represented 5% of total funding. Nearly half of all international funding (45%) is channelled through the Global Fund.

The Global Fund is responsible for a significant share of malaria funding in the WHO Eastern Mediterranean Region (62%), the WHO South-East Asia Region (45%) and the WHO Western Pacific Region (35%). In the WHO African Region, 25% of funding comes from domestic governments, 33% from the Global Fund and 29% from bilateral support from the United States Agency for International Development (USAID).

Almost 90% of domestic funding is accounted for by health system spending (**Figure 2.3**). In contrast, more than half of the funding from the Global Fund and USAID is devoted to the delivery of preventive interventions. Around a sixth of Global Fund, and a third of USAID funding is spent on treatment. The progress of prevention and treatment programmes is therefore highly sensitive to variations in donor spending.

Figure 2.3 Malaria financing, 2013–2015, by type of expenditure. Health-system spending includes planning, monitoring and evaluation, communications and advocacy, supply management, training and human resources (apart from those used for the delivery of services). Prevention includes procurement and delivery of insecticide-treated mosquito nets, support of indoor residual spraying and delivery of intermittent preventive therapy in pregnancy. Treatment includes commodities and resources for service delivery such as human resources, infrastructure and equipment. Sources: Global Fund Enhanced Financial Reporting (EFR), USAID PMI malaria operational plans for 2013-2015 available at https://www.pmi.gov/resource-library/mops/fy-2016, national malaria control programme reports, WHO estimates of malaria cases and treatment seeking at public facilities, and WHO CHOICE unit cost estimates of outpatient visit and inpatient admission



Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; PMI, President's Malaria Initiative; USAID, United States Agency for International Development

2.2 Funding for malaria-related research

Spending on research and development for malaria rose from an estimated US$ 607 million in 2010 to US$ 611 million in 2014 (the latest year for which data are available). The 2014 total represents more than 90% of the GTS annual investment target of US$ 674 million (**Figure 2.4**). The largest research and development spending category was antimalarial medicines (35%), followed by vaccines (28%) and basic research (27%). Investments in diagnostics and vector-control tools were each estimated to account for only 3% of the 2014 spending.

Public sector investors contributed to nearly half of total research and development funding in 2014, with the US National Institutes for Health and the US Department of Defence comprising 55% of this category (**Figure 2.5**). Philanthropic investment sources (primarily the Bill & Melinda Gates Foundation and the United Kingdom's Wellcome Trust) accounted for 28% of the total. Private sector funding sources, namely pharmaceutical and biotechnology companies, accounted for 23% of total spending in 2014.

Figure 2.4 Funding for malaria-related research and development, 2010–2014. Source: Gfinder Public Search Tool. Policy Cures. https://gfinder.policycures.org/PublicSearchTool/

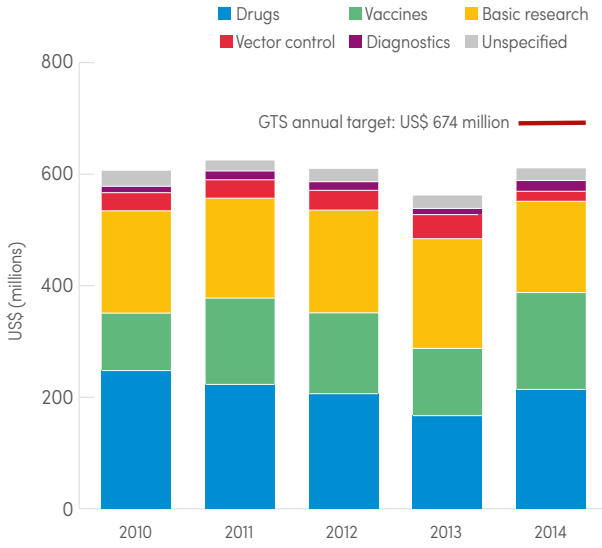
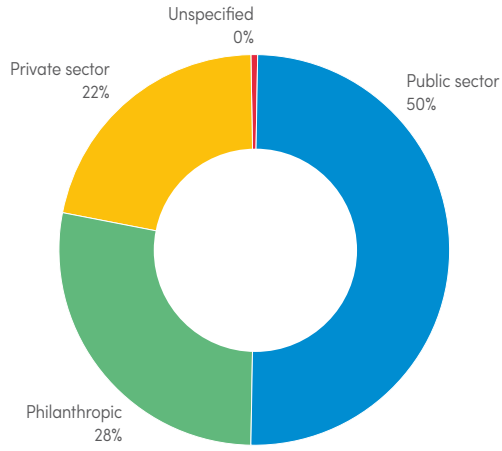


Figure 2.5 Source of funding for malaria-related research and development, 2014. Source: Gfinder Public Search Tool. Policy Cures. https://gfinder.policycures.org/PublicSearchTool/

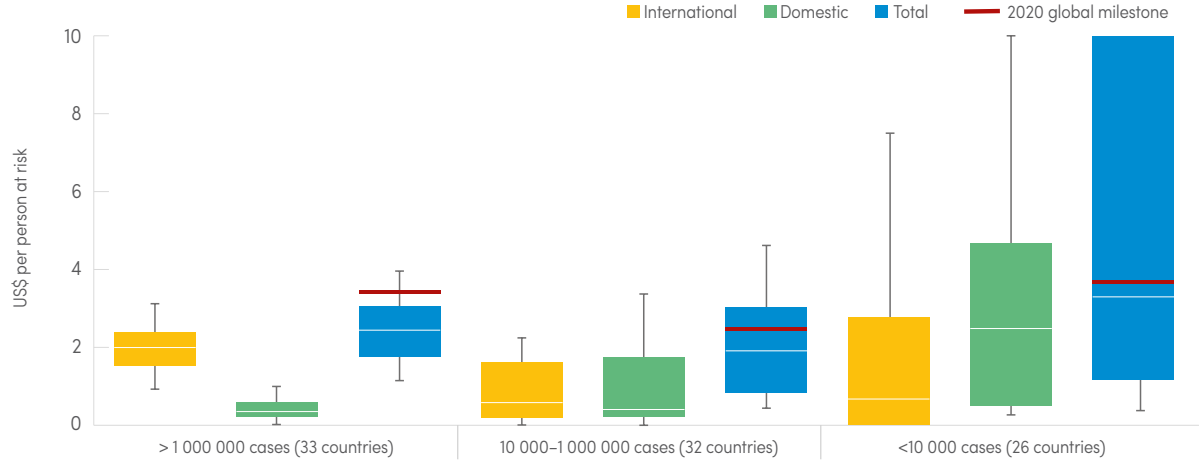


GTS, *Global Technical Strategy for Malaria 2016–2030*

2.3 Malaria expenditure per capita for malaria control and elimination

An analysis of malaria spending in relation to population at risk can help in assessing the adequacy of current funding levels. The composition and costs of malaria control and elimination programmes vary by setting. Based on resource need estimates from the GTS, countries with more than 1 million cases require a higher per capita spending (US$ 3.40) than those with between 10 000 and 1 million cases (US$ 2.50). Countries with fewer than 10 000 cases require the highest per capita spending (US$ 3.75) owing to the added cost of case-based surveillance, which becomes feasible with low case numbers. Countries with more than 1 million cases are furthest from the per capita spending milestones for 2020 set in the GTS (**Figure 2.6**). Countries with fewer than 10 000 cases are able to meet a greater proportion of funding requirements from domestic sources because of a lower total financial requirement (related to the lower number of cases) and generally higher gross national incomes.

Figure 2.6 Malaria financing per person at risk, 2013–2015, by estimated number of malaria cases, 2015. The solid bar shows the interquartile range among countries endemic for malaria in 2015, and the white line shows the median. The 10th and 90th percentiles are shown as black cross-bars. Sources: ForeignAssistance.gov, Global Fund to Fight AIDS, Tuberculosis and Malaria, national malaria control programme reports, Organisation for Economic Co-operation and Development creditor (OECD) reporting system and the Data Bank of the World Bank



2.4 Commodity procurement trends

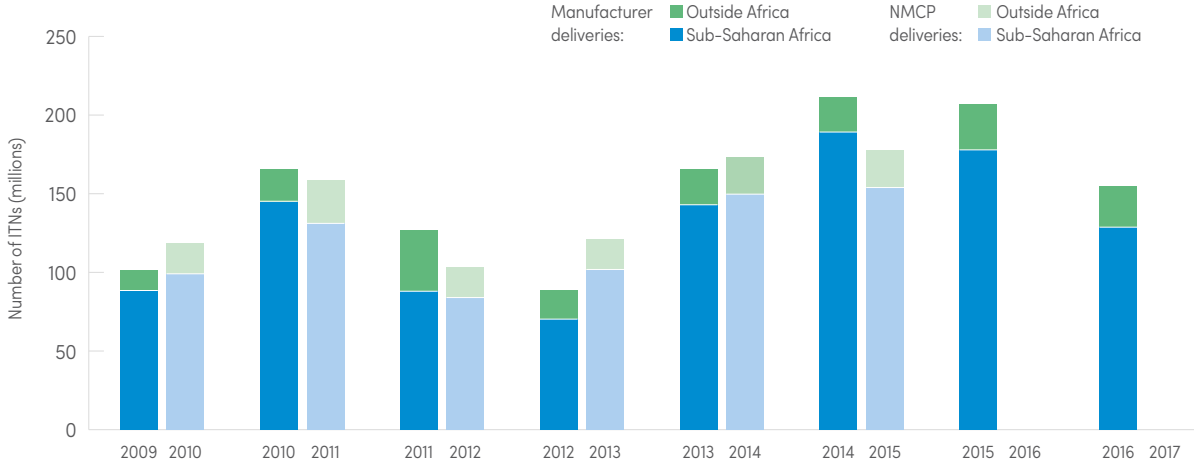
Insecticide-treated mosquito nets

Between 2013 and 2015, a total of 510 million insecticide-treated mosquito nets (ITNs) were reported by manufacturers as having been delivered to countries in sub-Saharan Africa, which exceeds the minimum amount required to achieve universal access to an ITN in the household (491 million)[1]. More ITNs were delivered in 2014 (189 million) and 2015 (178 million) than in any previous year (**Figure 2.7**). Decreasing prices may have contributed to increased procurement, with the average procurement price falling from US$ 6.27 to US$ 4.36 per net between 2010 and 2014 (2015 prices). Six countries accounted for more than 50% of deliveries in sub-Saharan Africa (Nigeria, 93 million ITNs; Democratic Republic of the Congo, 61 million; Ethiopia, 45 million; Uganda, 28 million; Burkina Faso, 20 million and Kenya, 18 million). Outside sub-Saharan Africa, 73 million ITNs were delivered by manufacturers between 2013 and 2015, with more than half of those deliveries accounted for by five countries (India, 13 million ITNs; Indonesia, 9.3 million; Myanmar, 8.9 million; Cambodia, 4.3 million and Papua New Guinea, 4.1 million).

Manufacturer deliveries are a forward indicator of in-country distribution and household coverage with ITNs. NMCP distributions to households lag the deliveries of ITNs to countries by an average of 0.5–1.0 years, and ITN coverage indicators, reviewed in Section 3 of this report, lag 3-year cumulative totals of manufacturer deliveries by about 1 year. A total of 128 million ITNs are projected to be delivered to countries in sub-Saharan Africa in 2016, based on shipments up to October 2016. The 3-year cumulative totals of manufacturer deliveries suggest that although ITN coverage will rise further in 2016 it may drop in 2017.

1. Based on the assumption that every household received the exact number of nets required for 100% access within households and that nets are retained for at least 3 years. In practice, ITNs are lost or replaced before 3 years, so the number of ITNs required to achieve universal access is greater.

Figure 2.7 Number of ITNs delivered by manufacturers and delivered by NMCPs 2009–2016. Data from NMCPs for 2016 and 2017 not yet available. Sources: Milliner Global Associates and NMCP reports



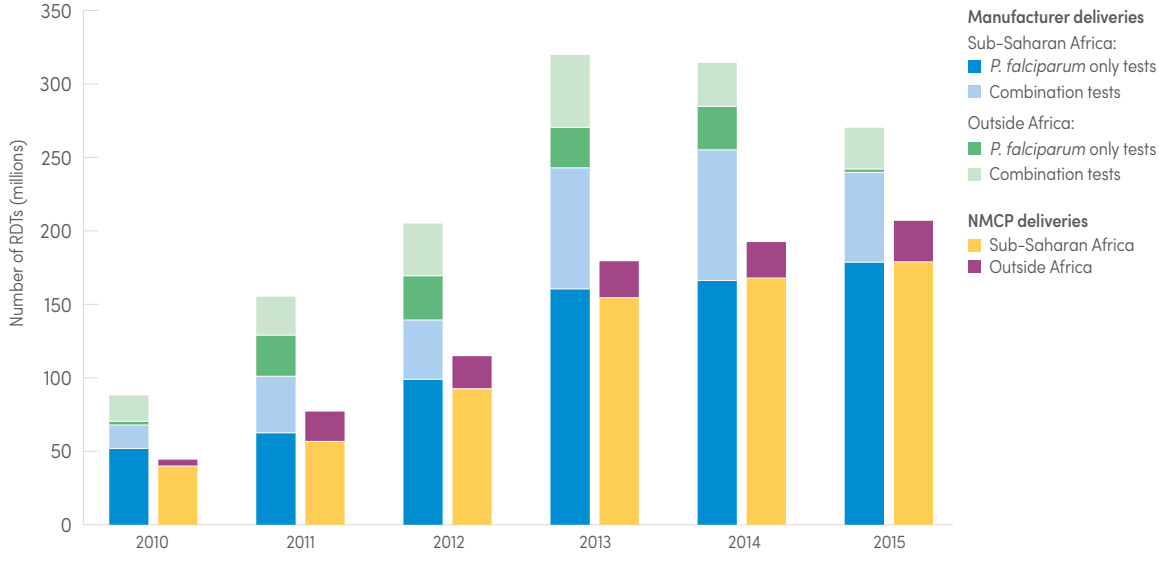
ITN, insecticide-treated mosquito net; NMCP, national malaria control programme

Rapid diagnostic tests

Sales of rapid diagnostic tests (RDTs) reported by manufacturers rose from 88 million globally in 2010 to 320 million in 2013, but fell to 270 million in 2015 (**Figure 2.8**). The decrease in sales was most pronounced in Asia, with sales of "falciparum only" tests falling from 22 million to less than 1 million between 2014 and 2015. In contrast, sales of "falciparum only" tests increased in Africa from 166 million to 179 million, whereas combination tests decreased from 89 million to 61 million between 2014 and 2015.

The number of RDTs distributed by NMCPs, while following a similar trend to manufacturer sales before 2015, did not show the same dip in 2015. In sub-Saharan Africa, the numbers distributed rose from 165 million in 2014 to 179 million in 2015; outside Africa, they rose from 25 million to 28 million. Some of the difference in trends and levels may be due to incomplete reporting. The differences may also be due to the fact that RDT sales reported by manufacturers include both public and private health sectors, whereas RDTs distributed by NMCPs represent tests in the public sector only. Because of inconsistencies in how data are reported, it is not possible to establish how trends in each variable are linked over time. It is not known to what extent the 2015 decline in reported manufacturer RDT deliveries will affect the availability of diagnostic testing for patients with fever.

Figure 2.8 Number of RDTs sold by manufacturers and distributed by NMCPs, 2010–2015. Sources: NMCP reports and data from manufacturers eligible for the WHO Foundation for Innovative New Diagnostics/US Centers for Disease Control and Prevention Malaria Rapid Diagnostic Test Product Testing Program



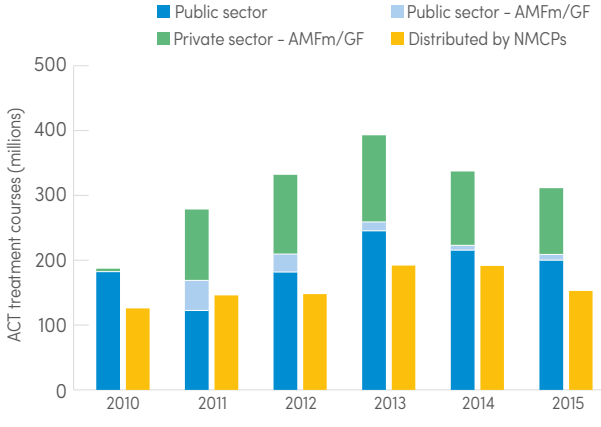
NMCP, national malaria control programme; RDT, rapid diagnostic test

Artemisinin-based combination therapies

The number of courses of artemisinin-based combination therapy (ACT) procured from manufacturers increased from 187 million in 2010 to a peak of 393 million in 2013, but subsequently fell to 311 million in 2015, of which 209 million were delivered to the public sector (**Figure 2.9**). The number of ACT treatments distributed by NMCPs to public sector health facilities also declined from 192 million in 2013 to 153 million in 2015. The discrepancy between manufacturer deliveries to the public sector and the number of courses distributed through public facilities can be accounted for, in part, by incomplete reporting by NMCPs. The WHO African Region accounted for 98% of all manufacturer deliveries in 2015 (in cases where the destination is known) and 97% of NMCP deliveries.

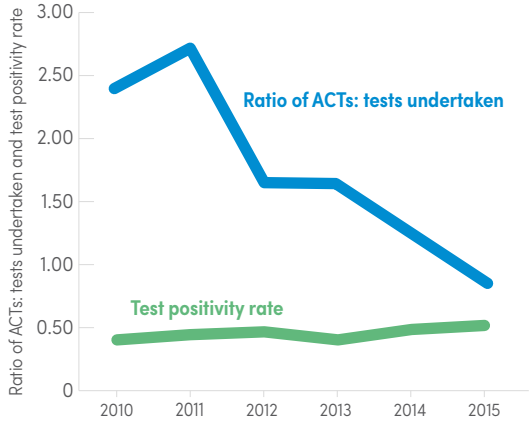
In the WHO African Region, the number of ACT treatments distributed by NMCPs in the public sector (148 million) is now fewer than the number of malaria diagnostic tests provided (170 million) (**Figure 2.10**). The decreasing ratio of treatments to tests in the public sector (87:100 in 2015) is a reflection that more patients are receiving a diagnostic test before being treated. However, there is still scope for improvement in the ratio of treatments to tests, because this ratio should approximate the malaria test positivity rate of patients seeking treatment, which is generally 52% (or 0.52) across all countries in sub-Saharan Africa.

Figure 2.9 Number of ACT treatment courses delivered by manufacturers and distributed by NMCPs, 2010–2015. AMFm/GF indicates AMFm operated from 2010 to 2013, and GF co-payment mechanism from 2014. Sources: Companies eligible for procurement by WHO/United Nations Children's Fund and NMCP reports



ACT, artemisinin-based combination therapy; AMFm, Affordable Medicines Facility–malaria; GF, Global Fund to Fight AIDS, Tuberculosis and Malaria; NMCP, national malaria control programme

Figure 2.10 Ratio of ACT treatment courses distributed to diagnostic tests performed (RDTs or microscopy), WHO African Region 2010–2015. Source: National malaria control programme reports, WHO African Region, 2010–2015



ACT, artemisinin-based combination therapy; RDT, rapid diagnostic test

3. Preventing malaria

Cases of malaria can be prevented by vector control (stopping mosquitoes from biting human beings), by chemoprevention (providing drugs that suppress infections) or, potentially, by vaccination. These prevention strategies are discussed below.

Vector control

The most commonly used methods to prevent mosquito bites are sleeping under an ITN and spraying the inside walls of a house with an insecticide – indoor residual spraying (IRS). Use of ITNs has been shown to reduce malaria incidence rates by 50% in a range of settings, and to reduce malaria mortality rates by 55% in children aged under 5 years in sub-Saharan Africa (*5*,*6*). Historical and programme documentation suggest a similar impact for IRS, but randomized trial data are limited (*7*). These two core vector-control interventions – use of ITNs and IRS – are considered to have made a major contribution to the reduction in malaria burden since 2000, with ITNs estimated to account for 50% of the decline in parasite prevalence among children aged 2–10 years in sub-Saharan Africa between 2001 and 2015 (*1*). In a few specific settings and circumstances, ITNs and IRS can be supplemented by larval source management (*8*) or other environmental modifications that reduce the suitability of environments as mosquito habitats or that otherwise restrict biting of humans.

Chemoprevention

In sub-Saharan Africa, intermittent preventive treatment of malaria in pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP) has been shown to reduce maternal anaemia (*7*), low birth weight (*1*) and perinatal mortality (*8*). Intermittent preventive treatment in infants (IPTi) with SP provides protection against clinical malaria and anaemia (*9*); however, as of 2015, no countries have reported implementation of an IPTi policy. Seasonal malaria chemoprevention (SMC) with amodiaquine (AQ) plus SP (AQ+SP) for children aged 3–59 months reduces the incidence of clinical attacks and severe malaria by about 80% (*10*,*11*) and could avert millions of cases and thousands of deaths in children living in areas of highly seasonal malaria transmission in the Sahel subregion (*12*). As of 2015, 10 countries had adopted the policy (Burkina Faso, Chad, Gambia, Guinea, Guinea Bissau, Mali, Niger, Nigeria, Senegal and Togo).

Vaccines

A number of malaria vaccine research projects are underway (*13*). The only vaccine to have completed Phase 3 testing is RTS,S/AS01, which reduced clinical incidence by 39% and severe malaria by 31.5% among children aged 5–17 months who completed four doses. Following the positive scientific opinion of the European Medicines Authority under Article 58 (*14*), WHO recommended that RTS,S be implemented on a pilot scale in parts of three to five sub-Saharan African countries (*15*). The aim is to provide information on feasibility, safety and mortality impact, to guide recommendations on the potential wider scale use of this vaccine in 3–5 years' time. The first phase of vaccination is expected to commence in 2018. RTS,S is being considered as a complementary malaria control tool in Africa that could potentially be added to, rather than replace, the core package of proven malaria preventive, diagnostic and treatment interventions.

Indicators

Ensuring universal access of populations at risk to preventive interventions is central to achieving the goals and milestones of the GTS. Accordingly, this section reviews the indicators listed in **Box 3.1** to assess the extent to which universal access to interventions has been achieved. Use of ITNs is reported only for sub-Saharan Africa, where malaria vectors are most amenable to control with this intervention. Similarly, the analysis of IPTp is confined to sub-Saharan Africa, the region where it is applicable. The coverage of IPTi, SMC and vaccines is not reported given their current limited adoption.

Box 3.1 Indicators related to preventing malaria

Insecticide-treated mosquito nets

- Proportion of population at risk that slept under an ITN the previous night
- Proportion of population with access to an ITN within their household
- Proportion of households with at least one ITN for every two people
- Proportion of households with at least one ITN
- Proportion of existing ITNs used the previous night
- Proportion of targeted risk group receiving ITNs (antenatal and immunization clinic attenders)

Indoor residual spraying

- Proportion of population at risk protected by IRS in the previous 12 months

Insecticide-treated mosquito nets and indoor residual spraying

- Proportion of population at risk sleeping under an ITN or living in a house sprayed by IRS in the previous 12 months

Intermittent preventive therapy in pregnancy

- Proportion of pregnant women who received at least three doses of IPTp
- Proportion of pregnant women who received 2 doses of IPTp
- Proportion of pregnant women who received 1 dose of IPTp
- Proportion of pregnant women who attended antenatal care at least once

3.1 Population at risk sleeping under an insecticide-treated mosquito net

For countries in sub-Saharan Africa, it is estimated that 53% of the population at risk slept under an ITN in 2015 (95% confidence interval [CI]: 50–57%), increasing from 5% in 2005 and from 30% in 2010 (95% CI: 28–32%) (**Figure 3.1**). The rise in the proportion of the population sleeping under an ITN has been driven by increases in the proportion of the population that have access to an ITN in their house (in 2015 the proportion was 60%, 95% CI: 57–64%). The proportion sleeping under an ITN is generally close to the proportion with access to an ITN. Thus, while it continues to be important to encourage consistent ITN use among those who have access to a net, ensuring access to ITNs for those who do not have them is central to increasing overall use.

The proportion of households with one or more ITNs increased to 79% in 2015 (95% CI: 76–83%). However, this means that a fifth of households do not have access to any nets. Moreover, the proportion of households with sufficient ITNs for all household members was just 42% (95% CI: 39–45%), substantially short of universal access (100%) to this preventive measure. This reiterates the need to ensure that all households receive sufficient nets so there is at least one for every two persons.

3.2 Targeted risk group receiving ITNs

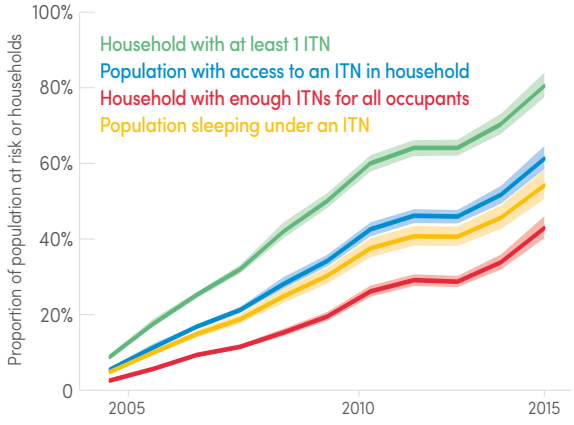
In addition to mass distribution campaigns, WHO recommends the continuous distribution of ITNs to all pregnant women attending antenatal care (ANC) and all infants attending child immunization clinics (*17*). Data reported by NMCPs indicate that, between 2013 and 2015, mass campaigns accounted for 86% of ITNs distributed in sub-Saharan Africa, while antenatal clinics accounted for 10% and immunization clinics for 4% (**Figure 3.2**).

The number of ITNs distributed through antenatal and immunization clinics can be compared to the number of pregnant women attending ANC and the number of children receiving immunization, to determine the extent to which these channels are used for ITN delivery (*18*). Data reported by NMCPs in 2013–2015 indicate that 39% of pregnant women that attended ANC and 20% of children that attended immunization clinics received an ITN. Hence, these continuous distribution channels for ITNs appear to be underused. Some of the gap can be attributed to countries not yet adopting a policy to distribute ITNs through these channels; four countries that did not distribute ITNs through ANC clinics accounted for 10% of the 61% gap, and nine countries that did not distribute ITNs through immunization clinics accounted for 22% of the 80% gap.

3.3 Population at risk protected by indoor residual spraying

NMCPs reported that 106 million people worldwide were protected by IRS in 2015; this figure includes 49 million people in the WHO African Region and 44 million people in the WHO South-East Asia Region (of whom >41 million are in India). The proportion of the population at risk protected by IRS declined globally from a peak of 5.7% in 2010 to 3.1% in 2015, with decreases seen in all WHO regions (**Figure 3.3**). The proportions of the population protected by IRS are low because IRS is generally used only in particular areas. Declining IRS coverage may be attributed to a change from pyrethroids to more expensive insecticide classes, although heavy reliance on pyrethroids continues particularly outside of the WHO African Region (**Figure 3.4**). Concurrent, sequential or mosaic use of insecticide classes with different modes of action is one component of a comprehensive insecticide resistance management strategy.

Figure 3.1 Proportion of population at risk with access to an ITN and sleeping under an ITN, and proportion of households with at least one ITN and enough ITNs for all occupants, sub-Saharan Africa, 2005–2015. Source: Insecticide-treated mosquito net coverage model from Malaria Atlas Project (*16*)



ITN, insecticide-treated mosquito net

Figure 3.2 Proportion of ITNs distributed through different delivery channels in sub-Saharan Africa, 2013–2015. Source: National malaria control programme reports

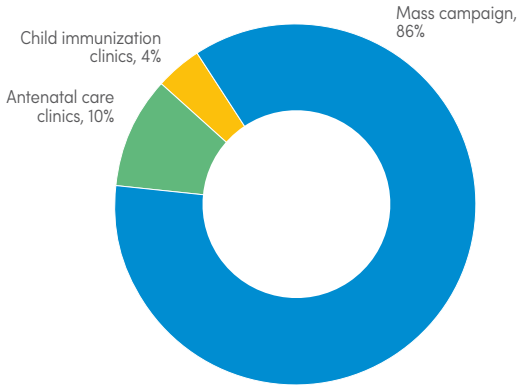
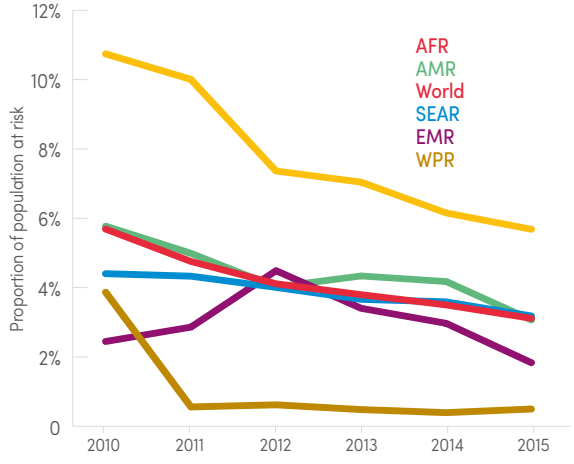
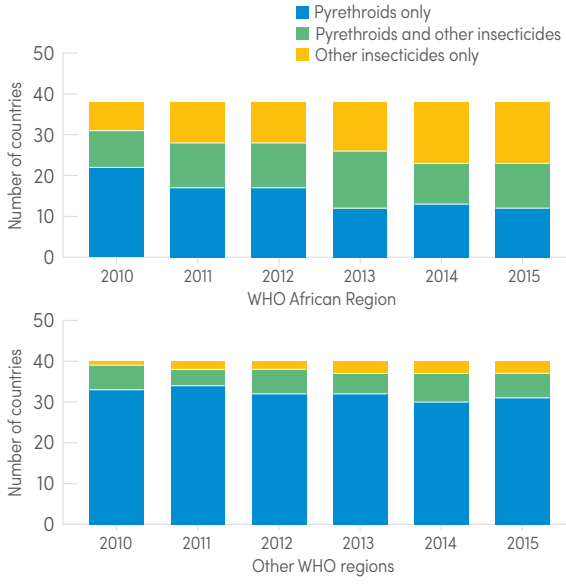


Figure 3.3 Proportion of the population at risk protected by IRS by WHO region, 2010–2015. Source: National malaria control programme reports



AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; IRS, indoor residual spraying; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

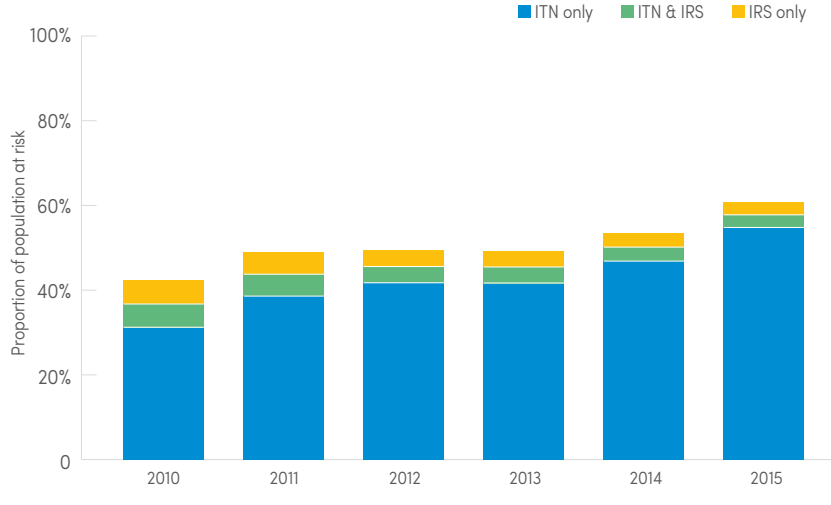
Figure 3.4 Insecticide class used for indoor residual spraying 2010–2015. Source: National malaria control programme reports



3.4 Population at risk sleeping under an insecticide-treated mosquito net or protected by indoor residual spraying

Combining data on the proportion of the population sleeping under an ITN with information on the proportion protected by IRS – and accounting for households that may receive both interventions – the proportion of the population in sub-Saharan Africa protected by vector control was estimated at 57% in 2015 (uncertainty interval [UI], 44–70%) compared with 37% in 2010 (UI, 25–48%) (**Figure 3.5**). The proportion exceeded 80% in three countries in 2015: Cabo Verde, Zambia and Zimbabwe.

Figure 3.5 Proportion of the population at risk protected by IRS or sleeping under an ITN in sub-Saharan Africa, 2010–2015. Sources: Insecticide-treated mosquito net coverage model from Malaria Atlas Project (*16*), national malaria control programme reports and further analysis by WHO



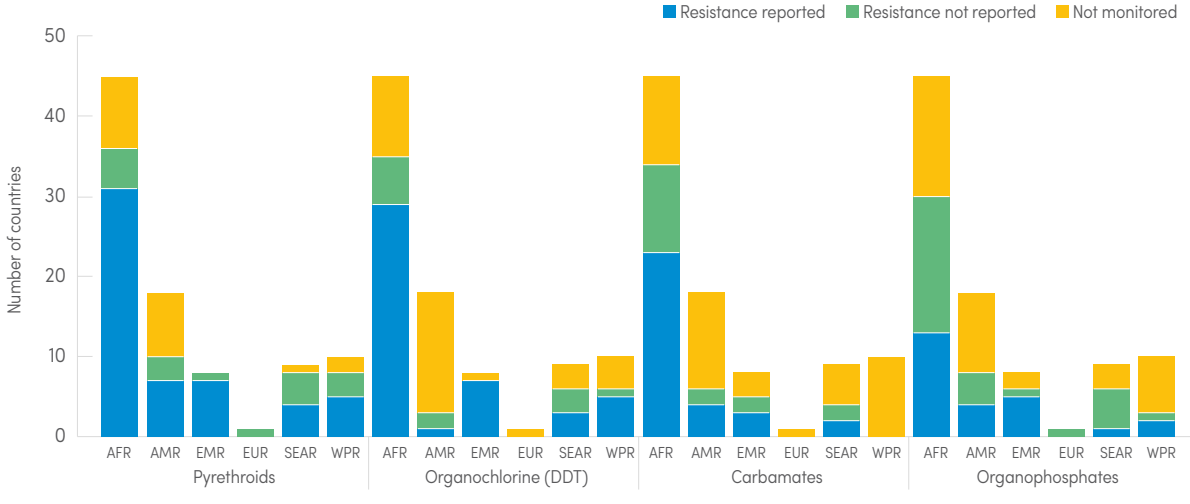
IRS, indoor residual spraying; ITN, insecticide-treated mosquito net

3.5 Vector insecticide resistance

Resistance of malaria vectors to the four insecticide classes currently used in ITNs and IRS threatens malaria prevention efforts. Of the 73 malaria endemic countries that provided monitoring data to WHO for 2010 onwards, 60 reported resistance to at least one insecticide in one malaria vector from one collection site, and 50 reported resistance to two or more insecticide classes. Resistance to pyrethroids – the only class currently used in ITNs – is the most commonly reported (**Figure 3.6**); in 2015, over three quarters of the countries monitoring this insecticide class reported resistance. However, the impact of pyrethroid resistance on ITN effectiveness is not yet well established. A WHO-coordinated five-country evaluation conducted in areas with pyrethroid-resistant malaria vectors did not find an association between malaria disease burden and levels of resistance, and showed that ITNs still provided personal protection (*19*). Nevertheless, evidence of geographical spread of resistance and intensification in some areas underscores the need to urgently take action to manage resistance and to reduce reliance on pyrethroids.

Priority actions include establishing and applying national insecticide resistance monitoring and management plans in line with the WHO *Global plan for insecticide resistance management in malaria vectors* (GPIRM), released in 2012. New vector monitoring and control tools and approaches are also urgently required. WHO *Test procedures for monitoring insecticide resistance in malaria vector mosquitoes* were updated in November 2016 to include bioassays for resistance intensity and metabolic mechanisms. Information from national programmes and partners on insecticide resistance in malaria vectors is collated by WHO in a global database.

Figure 3.6 Insecticide resistance and monitoring status for malaria endemic countries (2015), by insecticide class and WHO region, 2010–2015. Source: National malaria control programme reports, African Network for Vector Resistance, Malaria Atlas Project, President's Malaria Initiative (United States), scientific publications



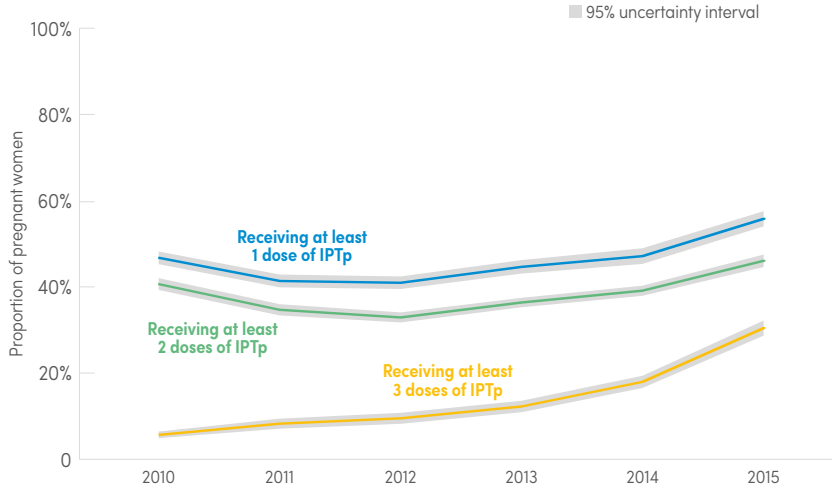
AFR, WHO African Region; AMR, WHO Region of the Americas; DDT, dichloro-diphenyl-trichloroethane; EMR, WHO Eastern Mediterranean Region; EUR, European Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

3.6 Pregnant women receiving three or more doses of intermittent preventive therapy

It is estimated that, in 2015, among 20 countries that reported, 31% of eligible pregnant women (UI: 29–32%) received three or more doses of IPTp in 36 African countries that have adopted the policy – a large increase from the 18% receiving three or more doses in 2014 and 6% in 2010 (**Figure 3.7**). The proportion still remains below full coverage. A significant proportion of pregnant women do not attend ANC (20% in 2015) and, of those who do, 30% do not receive a single dose of IPTp.

The proportion of women receiving IPTp varied across the continent, with 24 countries reporting that more than 50% of pregnant women received one or more doses, and 17 countries reporting more than 50% received two or more doses. Only three countries reported that more than 50% of pregnant women received three or more doses of IPTp.

Figure 3.7 Proportion of pregnant women receiving IPTp, by dose, sub-Saharan Africa, 2010–2015. Source: National malaria control programme reports and United Nations population estimates



IPTp, intermittent preventive treatment in pregnancy

Box 4.1 Indicators related to diagnostic testing and treatment

Care seeking

- Proportion of children under 5 with fever in the previous 2 weeks for whom advice or treatment was sought

Diagnostic testing

- Proportion of children under 5 with fever in the previous 2 weeks who had a finger or heel stick
- Proportion of patients with suspected malaria attending public health facilities who received a parasitological test

Treatment

- Proportion of patients with confirmed malaria who received first-line antimalarial treatment according to national policy
- Proportion of treatments with ACTs (or other appropriate treatment according to national policy) among febrile children <5

4. Diagnostic testing and treatment

Prompt diagnosis and treatment of malaria can cure a patient, preventing the development of severe malaria and subsequent death. It also reduces the length of time that patients carry malaria parasites in their blood, which in turn reduces the risk of onward transmission.

Diagnostic testing

WHO recommends that every suspected malaria case be confirmed by microscopy or an RDT before treatment (*20*). Accurate diagnosis improves the management of febrile illnesses and ensures that antimalarial medicines are only used when necessary. Only in areas where parasite-based diagnostic testing is not possible should malaria treatment be initiated solely on clinical suspicion.

Treatment

Prompt and appropriate treatment of uncomplicated malaria is critical in preventing progression to severe disease and death. WHO recommends ACTs for the treatment of uncomplicated *Plasmodium falciparum* malaria. ACTs have been estimated to reduce malaria mortality in children aged 1–23 months by 99% (range: 94–100%), and in children aged 24–59 months by 97% (range: 86–99%) (*21*).

Indicators

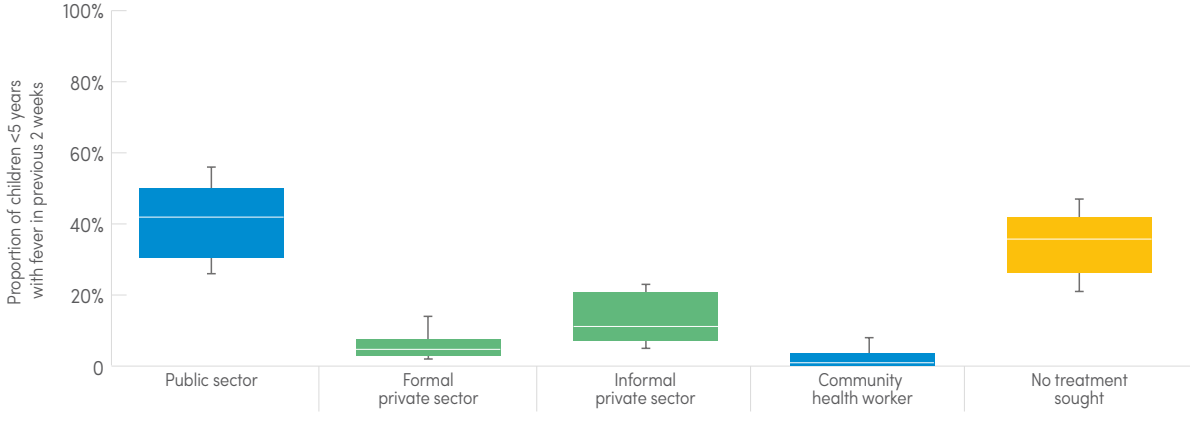
The ability of health systems to diagnose and treat cases is influenced by the extent to which patients with suspected malaria seek treatment, and by the proportion of patients who receive a diagnostic test and appropriate treatment after seeking health care. This section of the report discusses indicators covering care seeking, diagnostic testing and treatment, as listed in **Box 4.1**. It also considers the parasite's evolutionary responses to interventions; namely, the potential for selection of parasites that can evade diagnostic tests and the evolution of drug resistance.

4.1 Children aged under 5 years with fever for whom advice or treatment was sought from a trained provider

Evidence on the extent to which patients with suspected malaria seek treatment is derived mainly from household surveys that measure the proportion of children with fever for whom advice or treatment is sought. A disadvantage of this indicator is that it considers fever rather than confirmed malaria. Nonetheless, malaria should be suspected in febrile children who live in malaria endemic areas, and such children should be taken to a trained provider to obtain a diagnostic test and treatment, if appropriate. Although the indicator's measurement is largely confined to sub-Saharan Africa and children aged under 5 years, sub-Saharan Africa accounts for more than 90% of global malaria cases, with most cases occurring in children aged under 5 years.

Among 23 nationally representative surveys completed in sub-Saharan Africa between 2013 and 2015 (representing 61% of the population at risk), a higher proportion of febrile children sought care in the public sector (median: 42%, interquartile range [IQR]: 31–50%) than in the private sector (median: 20%, IQR: 12–28%), as shown in **Figure 4.1**. Most visits to the private sector were to the informal sector (median: 11%, IQR: 7–21%), which comprises pharmacies, kiosks and traditional healers, rather than to the formal private sector (median: 5%, IQR: 7–21%), which comprises private hospitals and clinics. Overall, a median of 54% (IQR: 41–59%) of febrile children were taken to a trained provider (i.e. to public sector health facilities, formal private sector facilities or community health workers). A large proportion of febrile children are not brought for care (median: 36%, IQR: 26–42%); possible reasons for this are poor access to health-care providers or a lack of awareness among caregivers about necessary care for febrile children.

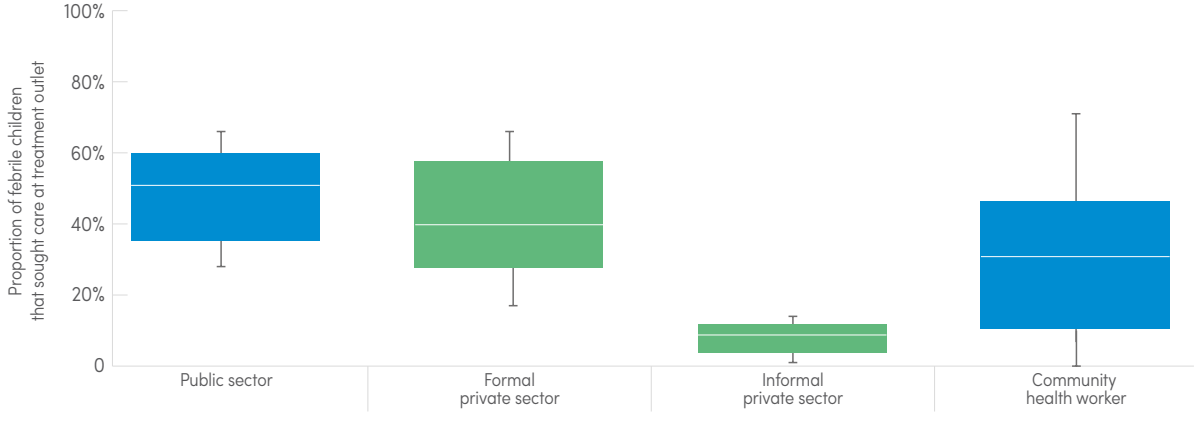
Figure 4.1 Proportion of febrile children seeking care, by health sector, sub-Saharan Africa, 2013–2015. Sources: Nationally representative household survey data from demographic and health surveys, and malaria indicator surveys



4.2 Suspected malaria cases receiving a parasitological test

Since 2010, WHO has recommended that all persons with suspected malaria should undergo malaria diagnostic testing, by either microscopy or RDT. Household surveys can provide information on diagnostic testing among febrile children aged under 5 years across all sources of care. Among 22 nationally representative surveys completed in sub-Saharan Africa between 2013 and 2015 that asked questions on diagnostic testing, the proportion of febrile children who received a finger or a heel stick, indicating that a malaria diagnostic test was performed, was greater in the public sector (median: 51%, IQR: 35–60%) than in both the formal private sector (median: 40%, IQR: 28–57%) and the informal private sector (median: 9%, IQR: 4–12%), as shown in **Figure 4.2**. Although the proportion of children seeking care from a community health worker was low, about a third received a diagnostic test (median: 31%; IQR: 11–46%). Combining the proportions of febrile children aged under 5 years who sought care with the proportion who received a parasitological test among those who sought care, a median of 31% of febrile children received a parasitological test among the 22 nationally representative household surveys analysed between 2013 and 2015 (IQR: 16–37%).

Figure 4.2 Proportion of febrile children receiving a blood test, by health sector, sub-Saharan Africa, 2013–2015. Proportions shown are among those that sought care. Sources: Nationally representative household survey data from demographic and health surveys, and malaria indicator surveys

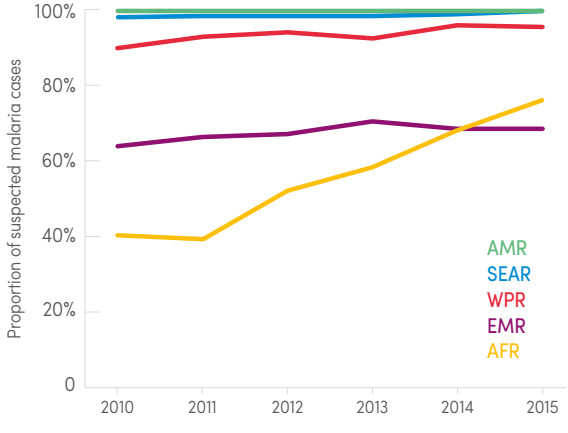


4.3 Suspected malaria cases attending public health facilities and receiving a parasitological test

Data reported by NMCPs indicate that the proportion of suspected malaria cases receiving a parasitological test among patients presenting for care in the public sector has increased in most WHO regions since 2010 (**Figure 4.3**). The largest increase has been in the WHO African Region, where diagnostic testing increased from 40% of suspected malaria cases in 2010 to 76% in 2015, mainly owing to an increase in the use of RDTs, which accounted for 74% of diagnostic testing among suspected cases in 2015.

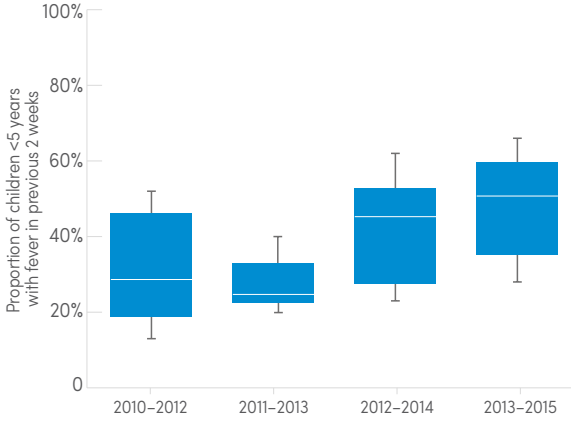
The reported testing rate may overestimate the true extent of diagnostic testing in the public sector, because, among other factors, the rate relies on accurate reporting of suspected malaria cases, and reporting completeness may be higher in countries with stronger surveillance systems and higher testing rates. A trend of increased testing in the public sector is also evident in the results of household surveys, where the proportion of febrile children who received a malaria diagnostic test in the public sector rose from a median of 29% in 2010 (IQR: 19–46%) to a median of 51% in 2015 (IQR: 35–60%) (**Figure 4.4**). However, the two sources of information are not directly comparable because the numbers reported by NMCPs relate to all age groups, and because household surveys are undertaken in only a limited number of countries each year.

Figure 4.3 Proportion of suspected malaria cases attending public health facilities who receive a diagnostic test, by WHO region, 2010–2015. Source: National malaria control programme reports



AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

Figure 4.4 Proportion of febrile children attending public sector health facilities who receive a blood test, sub-Saharan Africa, 2010–2015. Sources: Nationally representative household survey data from demographic and health surveys, and malaria indicator surveys

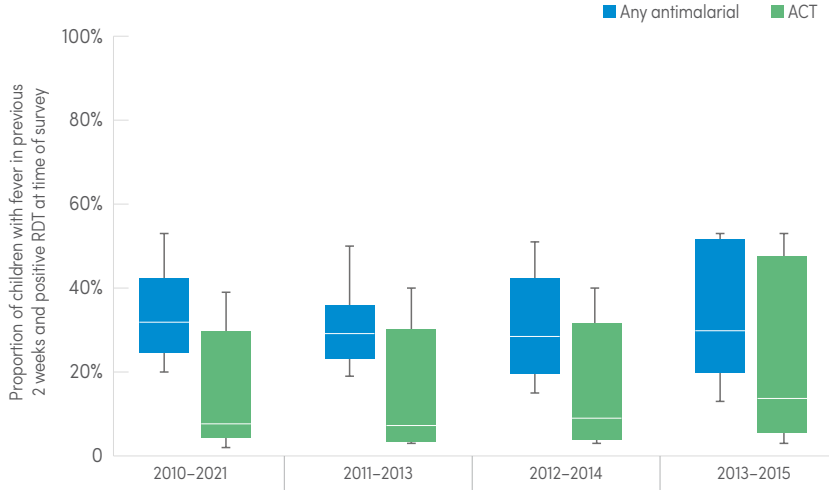


4.4 Malaria cases receiving first-line antimalarial treatment according to national policy

In recent years, more nationally representative household surveys have administered an RDT to children included in the survey. Thus, it is now possible to examine the treatment received by children with both a fever in the previous 2 weeks and a positive RDT at the time of survey (**Figure 4.5**).

The median proportion of children aged under 5 years with evidence of recent or current *P. falciparum* infection and a history of fever, and who received any antimalarial drug was 30% among 11 household surveys conducted in sub-Saharan Africa in 2013–2015 (IQR: 20–51%). The median proportion receiving an ACT was 14% (IQR: 5–45%). The low values can be attributed to two factors: many febrile children are not taken for care to a qualified provider (**Section 4.2**) and, in cases where children are taken for care, a significant proportion of antimalarial treatments dispensed are not ACTs (**Section 4.6**). The apparent proportions and trends indicated are uncertain because the interquartile ranges of the medians are wide, indicating considerable variation among countries. Moreover, the number of household surveys is comparatively small, covering an average of 37% of the population at risk in sub-Saharan African in any one 3-year period. Further investments are needed to better track malaria treatment at health facilities (through routine reporting systems and surveys) and at community level, to gain a greater understanding of the extent of barriers to accessing malaria treatment.

Figure 4.5 Proportion of febrile children with a positive RDT at time of survey who received antimalarial medicines, sub-Saharan Africa, 2010–2015. Sources: Nationally representative household survey data from demographic and health surveys, and malaria indicator surveys



ACT, artemisinin-based combination therapy; RDT, rapid diagnostic test

4.5 ACT treatments among all malaria treatments

Based on nationally representative household surveys, the proportion of antimalarial treatments that are ACTs (for children with both a fever in the previous 2 weeks and a positive RDT at the time of survey) increased from a median of 29% in 2010–2012 (IQR: 17–55%) to 80% in 2013–2015 (IQR: 29–95%) (**Figure 4.6**). However, the ranges associated with the medians are wide, indicating large variation between countries, and the number of household surveys covering any one 3-year period is comparatively small. Antimalarial treatments are more likely to be ACTs if children seek treatment at public health facilities or via community health workers than if they seek treatment in the private sector (**Figure 4.7**).

4.6 Parasite resistance

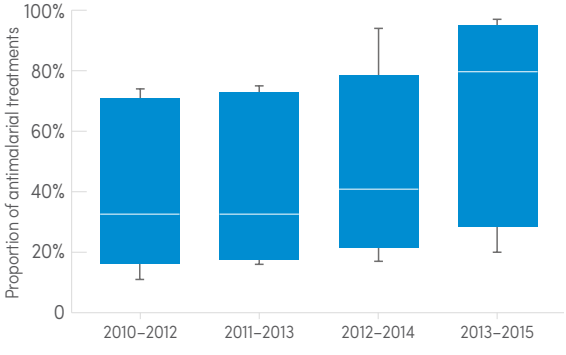
As the coverage of malaria programmes increases, malaria parasites respond to the selection pressure applied and parasite evolution can potentially compromise the effectiveness of current tools to diagnose and treat malaria.

Diagnostic testing

Some malaria parasites lack the HRP2 protein, the most common target antigen used in RDTs for detection of *P. falciparum*. Hence, the parasites can evade detection by diagnostic tests and subsequent treatment with an ACT. This not only prevents a patient from receiving appropriate treatment, but also enables the parasite to survive, reproduce and increase in prevalence.

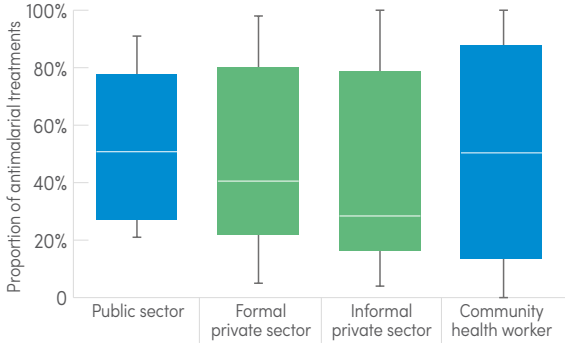
In 2014–2015, HRP2 or 3 deletions were reported in studies from the China–Myanmar border, Ghana and South America (Bolivia, Brazil, Colombia and Suriname). Other studies have reported HRP2 or 3 gene deletions in Democratic

Figure 4.6 Proportion of antimalarial treatments that are ACTs received by febrile children that are RDT positive at the time of survey, sub-Saharan Africa, 2005–2015. Sources: Nationally representative household survey data from demographic and health surveys, and malaria indicator surveys



ACT, artemisinin-based combination therapy; RDT, rapid diagnostic test

Figure 4.7 Proportion of antimalarial treatments that are ACTs received by febrile children, by health sector, sub-Saharan Africa, 2013–2015. Sources: Nationally representative household survey data from demographic and health surveys, and malaria indicator surveys



ACT, artemisinin-based combination therapy

Republic of the Congo, Eritrea, India, Mozambique, Uganda, the United Republic of Tanzania, western Indonesia and western Kenya. Populations of *P. falciparum* lacking one or both of the HRP2 or 3 genes are now present outside South America in both high and low transmission areas, and with varying prevalence across narrow geographical ranges. In South America, deletions were observed in parasite samples collected before HRP2-based RDTs were introduced; deletions have spread due to human migration.

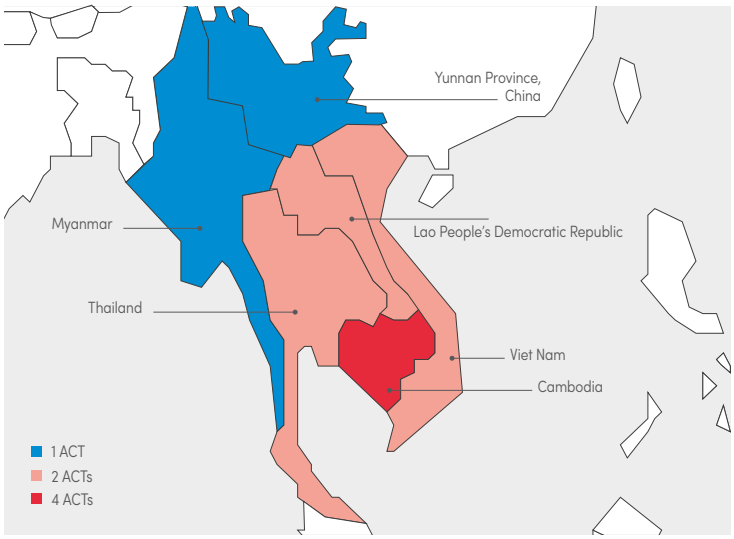
To ensure detection of non-HRP2-expressing parasites, only RDTs that specifically target Pf-pLDH (i.e. pan-pLDH-only tests) should be used. Currently, only a few non-HRP2-based RDTs meet WHO's recommended procurement criteria.

Treatment

Plasmodium falciparum resistance to artemisinin has been detected in five countries in the Greater Mekong subregion. Artemisinin resistance is defined as delayed clearance of the parasites; it represents a partial resistance. Most patients who have delayed parasite clearance after treatment with an ACT are still able to clear their infections, except where the parasites are also resistant to the ACT partner drug.

Resistance to ACT partner drugs can pose a challenge to the treatment of malaria in some areas. In Cambodia, high failure rates after treatment with an ACT have been detected for four different ACTs (**Figure 4.8**). Resistance to dihydroartemisinin-piperaquine, first detected in Cambodia in 2008, has spread eastwards and was detected in Viet Nam in 2015. Selection of an appropriate antimalarial medicine is based on the efficacy of the medicine against the malaria parasite. Monitoring the therapeutic efficacy of antimalarial medicine is therefore a fundamental component of treatment strategies. WHO recommends that all malaria endemic countries conduct therapeutic efficacy studies at least every 2 years to inform national treatment policy (*22*). Studies of molecular markers of drug resistance can provide important additional information for detecting and tracking antimalarial drug resistance. WHO collects information on therapeutic efficacy and molecular markers in a global database.

Figure 4.8 Distribution of malarial multidrug resistance 2016. Source: WHO database



ACT, artemisinin-based combination therapy

5. Malaria surveillance systems

Effective surveillance of malaria cases and deaths is essential for identifying which areas or population groups are most affected by malaria, and for targeting resources to communities most in need. Such surveillance also alerts ministries of health to epidemics, enabling control measures to be intensified when necessary. The transformation of surveillance into a core intervention constitutes the third pillar of the GTS, and recommendations for establishing effective surveillance systems have been published by WHO (*23,24*).

Surveillance systems do not detect all malaria cases for several reasons. First, not all malaria patients seek care or, if they do, they may not seek care at health facilities that are covered by a country's surveillance system (**Section 5.1**). Second, not all patients seeking care receive a diagnostic test (**Section 5.2**). Finally, recording and reporting within the surveillance system is not always complete. This section of the report summarizes indicators covering surveillance of malaria cases, listed in **Box 5.1**.

Box 5.1 Indicators related to malaria surveillance systems

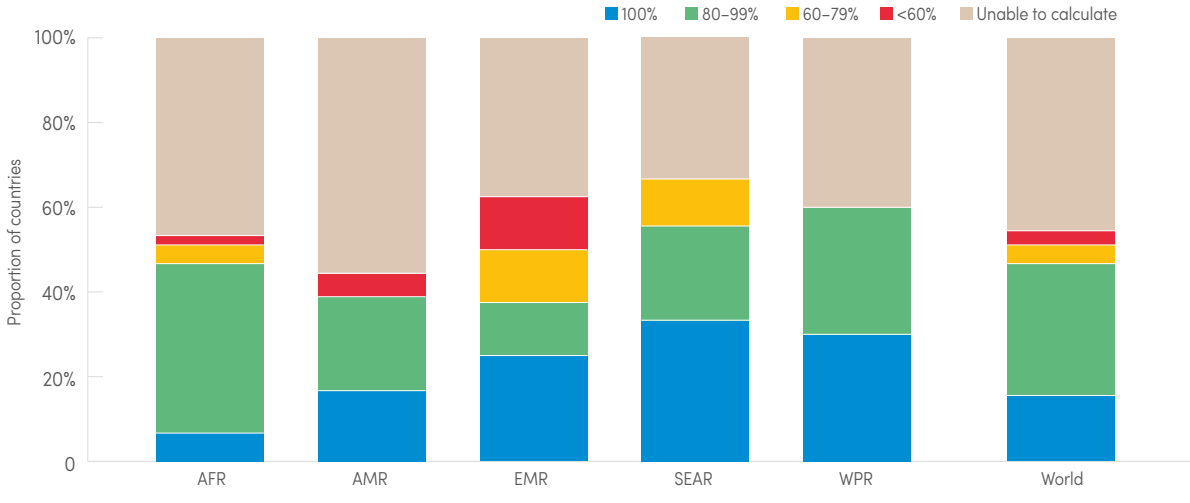
- Proportion of expected health facility reports received at the national level
- Proportion of malaria cases detected by surveillance systems

5.1 Health facility reports received at national level

The completeness of health facility reporting is a good indicator of a surveillance system's performance, because achieving a high reporting rate requires health facilities to adhere to several processes. These processes include the enumeration of a complete list of reporting units, compliance with reporting requirements and monitoring of that compliance. A high reporting rate is also critical to the eventual interpretation of indicators. Health facility reporting rates become less relevant as countries progress towards elimination and begin to report individual cases. Nonetheless, to ensure that coverage of surveillance systems is complete, the number of health facilities testing for malaria should continue to be tracked.

In 2015, among the countries that could report on this indicator, most (40 of 47) reported health facility reporting rates of over 80% (**Figure 5.1**). However, this indicator could not be calculated for about half of the countries in which malaria was endemic in 2015, either because the number of health facilities that were expected to report was not specified (two countries) or because the number of reports submitted was not stated (17 countries), or both (24 countries). A total of 23 countries received reports from private health facilities, but these comprised a minority of all reports received in those countries (median: 2.1%, IQR: 0.6–13%).

Figure 5.1 Health facility reporting rates by WHO region, 2015. Source: National malaria control programme reports

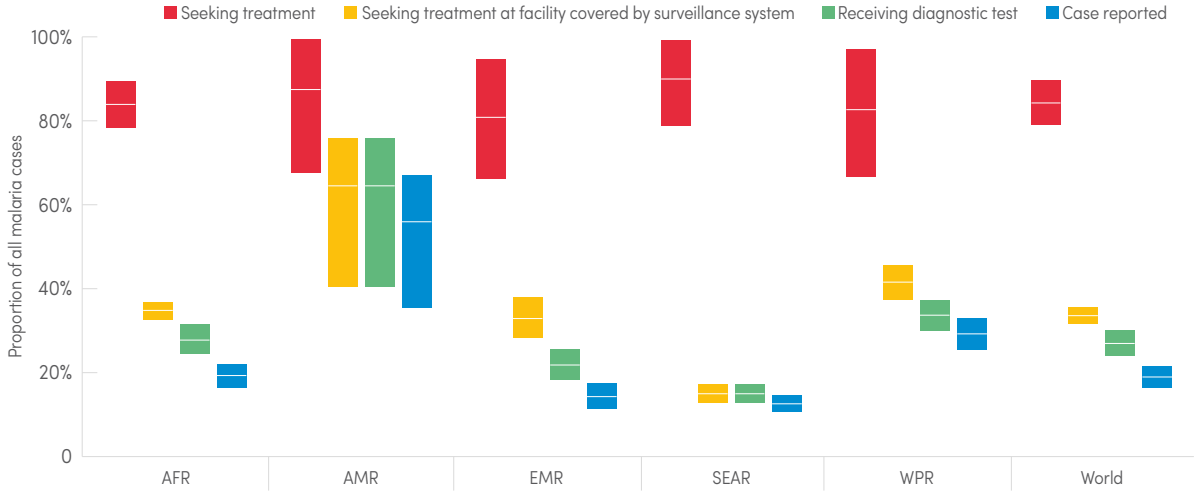


AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

5.2 Malaria cases detected by surveillance systems

It is estimated that, in 2015, malaria surveillance systems detected 19% of cases that occur globally (UI: 16–21%) (**Figure 5.2**). The bottlenecks in case detection vary by WHO region. In the WHO African Region, the WHO Eastern Mediterranean Region, the WHO South-East Asia Region and the WHO Western Pacific Region, a large proportion of patients seek treatment in the private sector, and these cases are not captured by existing surveillance systems. Also, in the WHO African Region, the WHO Eastern Mediterranean Region and the WHO Western Pacific Region, a relatively low proportion of patients attending public health facilities also receive a diagnostic test. The regional patterns are sometimes dominated by individual countries with the highest number of cases; for instance, a large proportion of patients in India seek treatment in the private sector. Case detection rates have increased by 10% since 2010, with most of this improvement being due to increased diagnostic testing in sub-Saharan Africa.

Figure 5.2 Bottlenecks in case detection 2015, by WHO region. Sources: Nationally representative household survey data and national malaria control programme reports



AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

Box 6.1 Indicators related to impact

- Parasite prevalence: proportion of population with evidence of infection with malaria parasites
- Malaria case incidence: number and rate per 1000 persons per year
- Malaria mortality rate: number and rate per 100 000 persons per year
- Number of countries that have newly eliminated malaria since 2015
- Number of countries that were malaria free in 2015 in which malaria has been re-established

6. Impact

The GTS set ambitious yet achievable targets for 2030; namely, to reduce malaria incidence and mortality rates globally by at least 90% by 2030, with a milestone of at least a 40% reduction by 2020 (*2*). The GTS also set a target to eliminate malaria from at least 35 countries by 2030 (with a milestone of elimination in at least 10 countries by 2020), and simultaneously to prevent the re-establishment of malaria in all countries that were malaria free in 2015.

To assess progress towards the targets and milestones of the GTS, this section of the report reviews the total number of malaria cases and deaths estimated to have occurred in 2015, and reviews progress according to the indicators listed in **Box 6.1**. It also considers the gains in life expectancy that have occurred owing to a reduction in malaria mortality rates, and the economic value of such gains.

The prevalence of infections with malarial parasites in people of all ages, including children, can provide information on the level of malaria transmission in a country. Parasite prevalence is most relevant for sub-Saharan Africa, where it is measured through nationally representative household surveys. Such surveys can be brought together in a geospatial model to facilitate the mapping of parasite prevalence and the analysis of trends over time (see **Annex 1**). This form of analysis is restricted to sub-Saharan Africa.

Malaria case incidence and mortality rates are relevant in all settings. Surveillance systems do not capture all malaria cases and deaths that occur; hence, it is necessary to use estimates of the number of cases or deaths in a country to make inferences about global trends in malaria case incidence and mortality rates (as described in **Annex 1**). The methods for producing estimates either adjust the number of reported cases to account for the estimated proportion of cases that are not captured by a surveillance system, or model the relationship between parasite prevalence and case incidence or mortality. The latter method is used for countries in sub-Saharan Africa for which surveillance data are lacking. The estimates aim to fill gaps in reported data; however, because they rely on relationships between variables that are uncertain, and draw on data that may be imprecisely measured, the estimates have a considerable degree of uncertainty.

6.1 Estimated number of malaria cases by WHO region, 2000–2015

In 2015, an estimated 212 million cases of malaria occurred worldwide (UI: 148–304 million), a fall of 22% since 2000 and of 14% since 2010 (**Table 6.1**). Most of the cases in 2015 were in the WHO African Region (90%), followed by the WHO South-East Asia Region (7%) and the WHO Eastern Mediterranean Region (2%) (**Table 6.2**, **Figure 6.1**). About 4% of estimated cases globally are caused by *P. vivax*, but outside the African continent this proportion increases to 41% (**Table 6.2**). Most cases of malaria caused by *P. vivax* occur in the WHO South-East Asia Region (58%), followed by the WHO Eastern Mediterranean Region (16%) and the WHO African Region (12%). About 76% of estimated malaria cases in 2015 occurred in just 13 countries (**Figure 6.2**). Four countries (Ethiopia, India, Indonesia and Pakistan) accounted for 78% of *P. vivax* cases.

Table 6.1 Estimated malaria cases, 2000–2015. Estimated cases are shown with 95% upper and lower uncertainty intervals. Source: WHO estimates

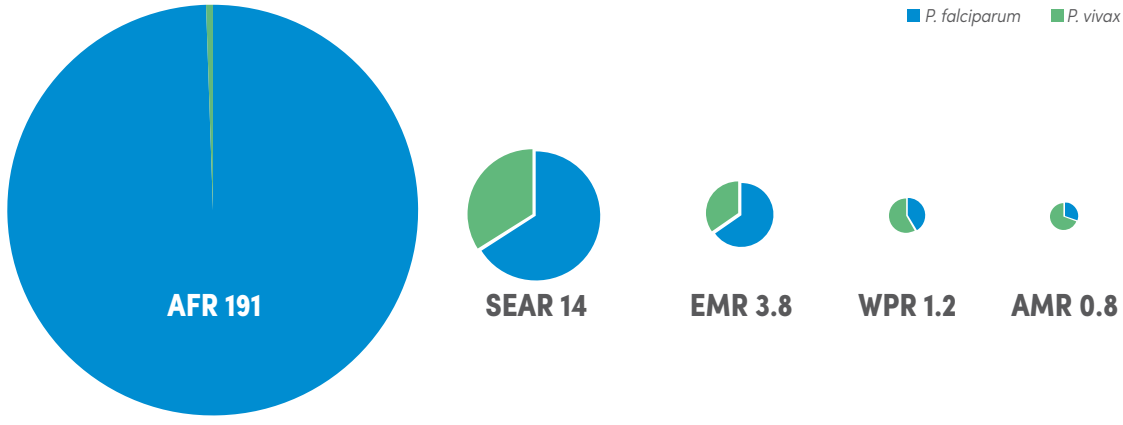
	Number of cases (000's)								% change 2010–2015
	2000	2005	2010	2011	2012	2013	2014	2015	
Lower	202 000	202 000	192 000	183 000	171 000	158 000	152 000	148 000	
Estimated total	**271 000**	**266 000**	**245 000**	**235 000**	**224 000**	**217 000**	**212 000**	**212 000**	**-14%**
Upper	314 000	313 000	287 000	276 000	272 000	271 000	306 000	304 000	
Lower	18 000	18 700	13 700	13 100	11 200	9 200	8 000	6 600	
Estimated *P. vivax*	**28 900**	**25 700**	**17 500**	**16 600**	**14 200**	**11 300**	**9 100**	**8 500**	**-51%**
Upper	37 400	32 300	22 100	21 000	17 400	14 300	12 200	10 800	
% cases *P. vivax*	8%	10%	7%	7%	6%	5%	4%	4%	

Table 6.2. Estimated malaria cases by WHO region, 2015. Estimated cases are shown with 95% upper and lower uncertainty intervals. Source: WHO estimates

	Number of cases (000's)							
	AFR	AMR	EMR	EUR	SEAR	WPR	World	Outside sub-Saharan Africa
Lower	131 000	500	2 400	0	13 300	1 000	148 000	16 300
Estimated total	**191 000**	**800**	**3 800**	**0**	**14 400**	**1 200**	**212 000**	**18 100**
Upper	258 000	1 200	7 500	0	35 200	2 200	304 000	40 300
Lower	300	400	1 100	0	3 400	500	6 600	5 800
Estimated *P. vivax*	**1 000**	**500**	**1 400**	**0**	**4 900**	**700**	**8 500**	**7 400**
Upper	2 100	800	1 700	0	6 800	900	10 800	9 300
% cases *P. vivax*	1%	69%	35%		34%	58%	4%	41%

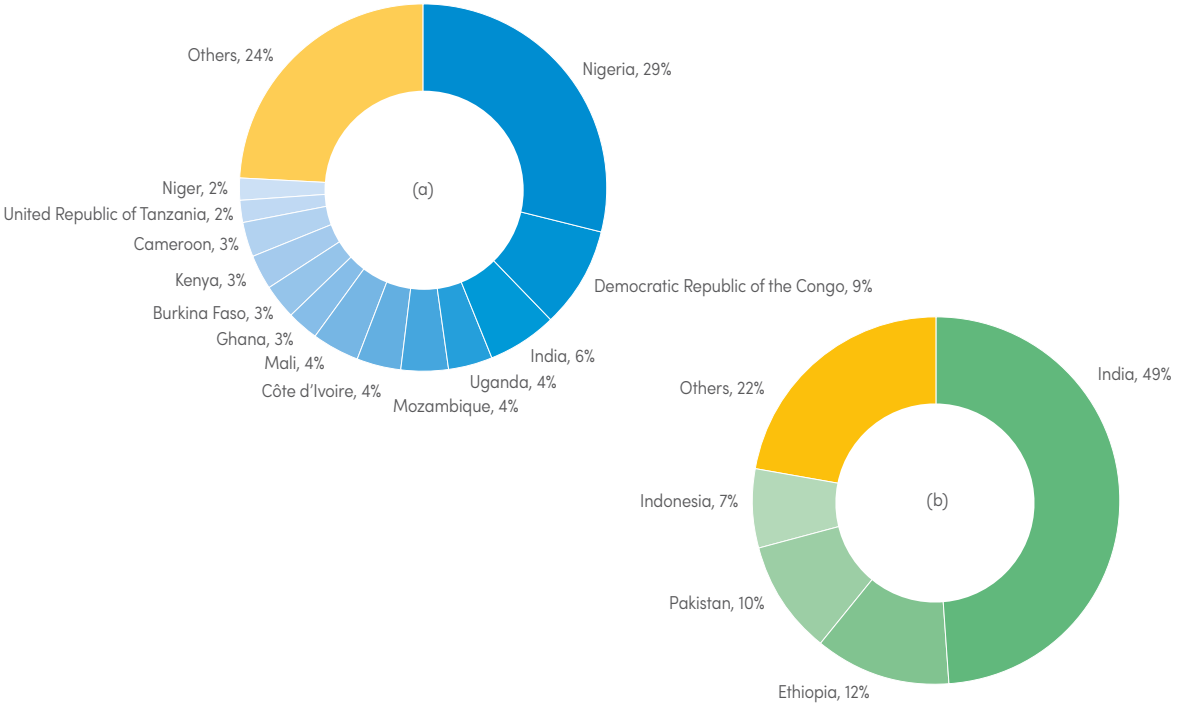
AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

Figure 6.1 Estimated malaria cases (millions) by WHO region, 2015. The area of the circles is proportional to the estimated number of cases in each region. Source: WHO estimates



AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

Figure 6.2 Estimated country share of (a) total malaria cases and (b) *P. vivax* malaria cases, 2015. Source: WHO estimates



6.2 Estimated number of malaria deaths by WHO region, 2000–2015

In 2015, it was estimated that 429 000 deaths from malaria occurred globally (UI: 235 000–639 000), a decrease of 50% since 2000 and of 22% since 2010 (**Table 6.3**). Most deaths in 2015 were estimated to have occurred in the WHO African Region (92%), followed by the WHO South-East Asia Region (6%) and the WHO Eastern Mediterranean Region (2%) (**Table 6.4**, **Figure 6.3**). Almost all deaths (99%) resulted from *P. falciparum* malaria. *Plasmodium vivax* is estimated to have been responsible for 3100 deaths in 2015 (range: 1800–4900), with most (86%) occurring outside Africa.

In 2015, 303 000 malaria deaths (range: 165 000–450 000) were estimated to have occurred in children aged under 5 years, equivalent to 70% of the global total (**Table 6.4**). The number of malaria deaths in children aged under 5 years is estimated to have decreased by 60% since 2000 and by 29% since 2010. Nevertheless, malaria remains a major killer of children, and is estimated to take the life of a child every 2 minutes.

Table 6.3 Estimated malaria deaths 2000–2015. Estimated deaths are shown with 95% upper and lower uncertainty intervals. Source: WHO estimates

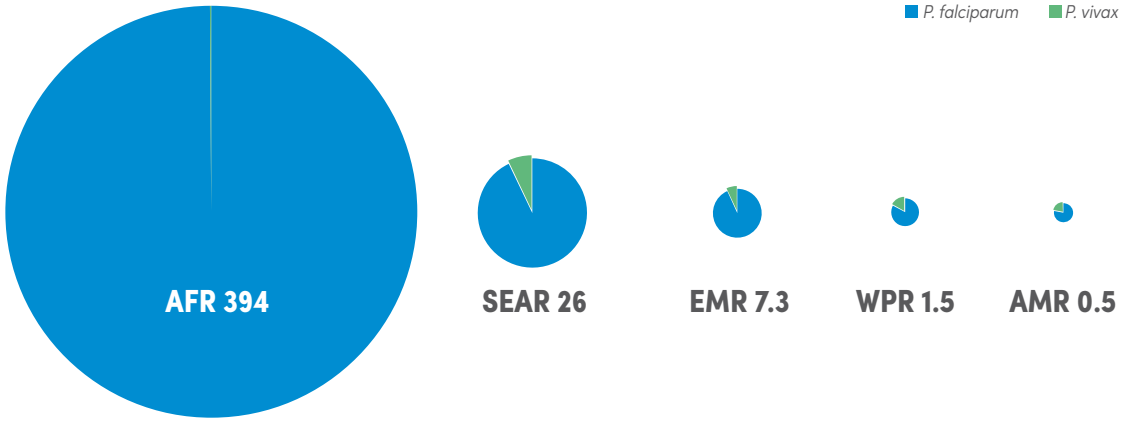
	Number of deaths								% change 2010–2015
	2000	2005	2010	2011	2012	2013	2014	2015	
Lower	655 000	525 000	370 000	334 000	303 000	287 000	248 000	235 000	
Estimated deaths	**864 000**	**741 000**	**554 000**	**511 000**	**474 000**	**452 000**	**435 000**	**429 000**	**-22%**
Upper	1 087 000	955 000	740 000	687 000	635 000	610 000	656 000	639 000	
Lower	4 600	4 600	3 300	3 300	2 800	2 400	2 200	1 800	
Estimated *P. vivax* deaths	**11 100**	**9 700**	**6 400**	**6 100**	**5 200**	**4 100**	**3 300**	**3 100**	**-52%**
Upper	15 700	14 300	10 700	9 500	8 200	6 300	5 200	4 900	
Lower	571 000	437 000	286 000	253 000	224 000	210 000	180 000	165 000	
Estimated deaths <5 years	**753 000**	**616 000**	**428 000**	**387 000**	**351 000**	**330 000**	**315 000**	**303 000**	**-29%**
Upper	947 000	794 000	573 000	520 000	470 000	446 000	476 000	450 000	
% deaths *P. vivax*	**1.3%**	**1.3%**	**1.2%**	**1.2%**	**1.1%**	**0.9%**	**0.8%**	**0.7%**	
% deaths <5 years	87%	83%	77%	76%	74%	73%	73%	70%	

Table 6.4 Estimated malaria deaths by WHO region, 2015. Estimated deaths are shown with 95% upper and lower uncertainty intervals. Source: WHO estimates

	Number of deaths							
	AFR	AMR	EMR	EUR	SEAR	WPR	World	Outside sub-Saharan Africa
Lower	230 000	90	900	0	4 100	300	235 000	6 000
Estimated total deaths	**394 000**	**490**	**7 300**	**0**	**26 200**	**1 500**	**429 000**	**30 000**
Upper	549 000	1 100	14 600	0	67 100	6 800	639 000	77 000
Lower	70	60	250	0	700	120	1 800	1 500
Estimated *P. vivax* deaths	**380**	**110**	**510**	**0**	**1 800**	**260**	**3 100**	**2 700**
Upper	1 000	190	830	0	3 400	420	4 900	4 300
Lower	171 000	20	300	0	1 100	100	165 000	2 000
Estimated deaths <5 years	**292 000**	**130**	**2 400**	**0**	**7 100**	**500**	**303 000**	**8 000**
Upper	408 000	280	4 700	0	18 300	2 300	450 000	21 000
% deaths *P. vivax*	**0,1%**	**22%**	**7%**		**7%**	**17%**	**0,7%**	**9%**
% deaths <5 years	74%	26%	32%		27%	34%	70%	27%

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; WPR, WHO Western Pacific Region

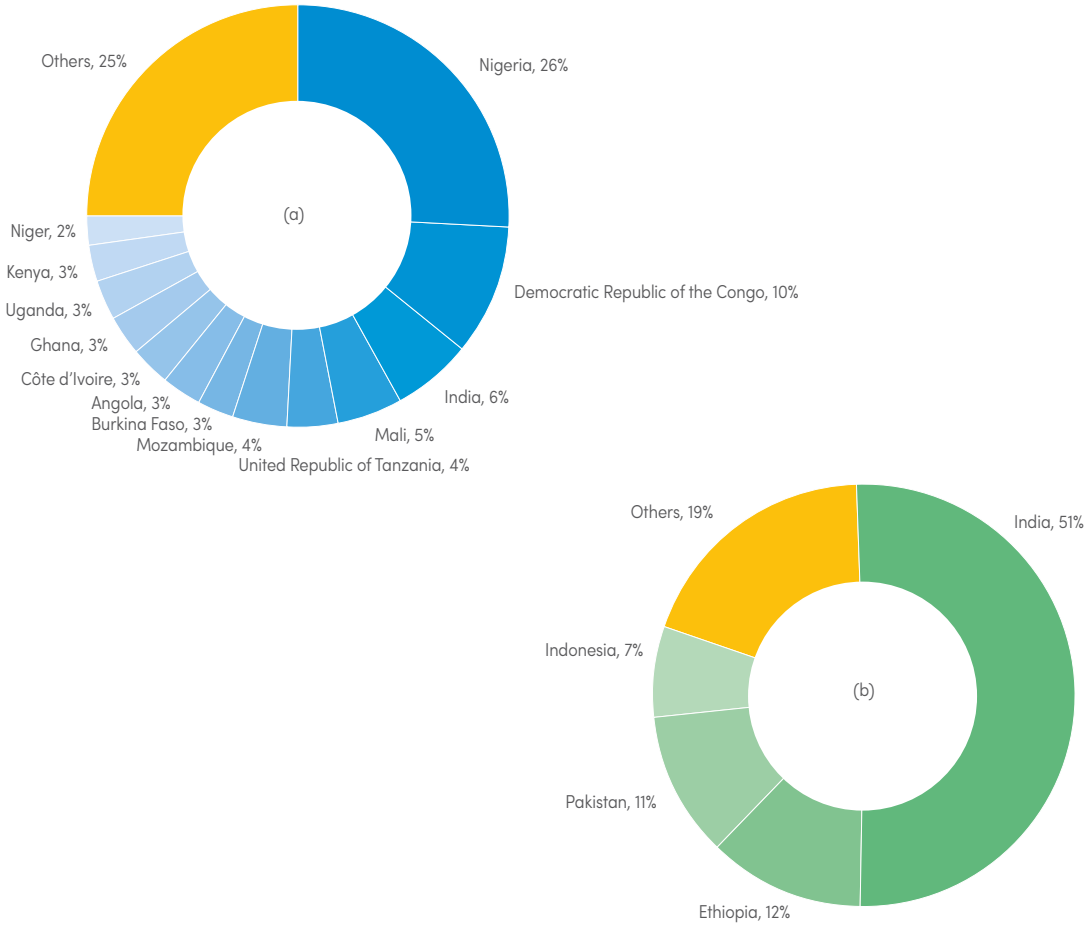
Figure 6.3 Estimated malaria deaths (thousands) by WHO region, 2015. The area of the circles is proportional to the estimated number of cases in each region. Source: WHO estimates



AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

In 2015, it is estimated that 13 countries accounted for 75% of malaria deaths (**Figure 6.4**). The global burden of mortality is dominated by countries in sub-Saharan Africa, with Democratic Republic of the Congo and Nigeria together accounting for more than 36% of the global total of estimated malaria deaths. Four countries accounted for 81% of estimated deaths due to *P. vivax* malaria (Ethiopia, India, Indonesia and Pakistan).

Figure 6.4 Estimated country share of (a) total malaria deaths and (b) *P. vivax* malaria deaths, 2015. Source: WHO estimates

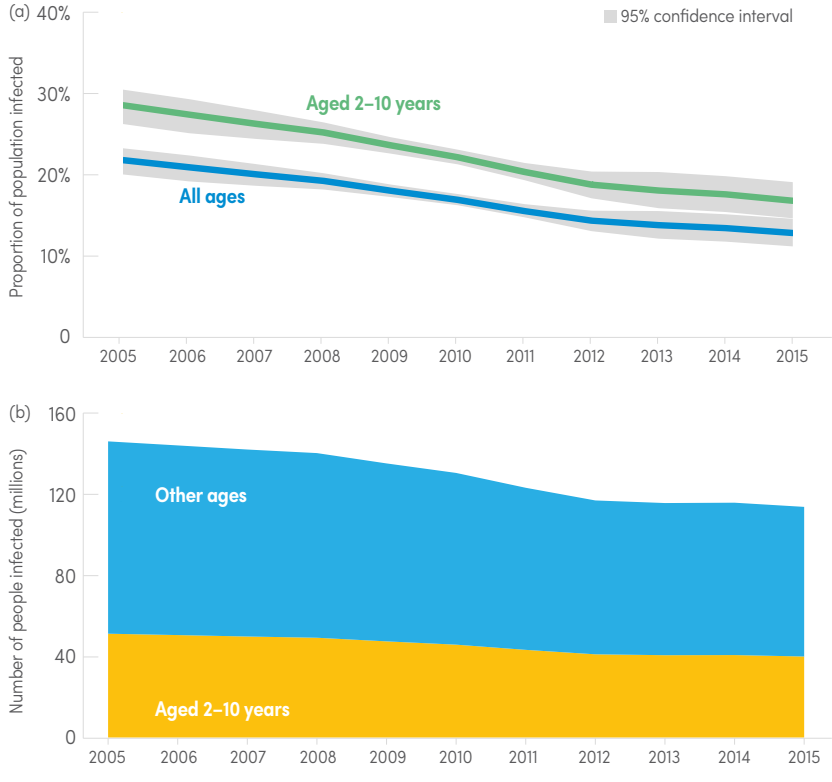


6.3 Parasite prevalence

The proportion of the population at risk in sub-Saharan Africa who are infected with malaria parasites is estimated to have declined from 22% in 2005 (UI: 20–23%) to 17% in 2010 (UI: 16–18%), and to 13% in 2015 (UI: 11–15%) (**Figure 6.5**). The number of people infected in sub-Saharan Africa is also estimated to have decreased, from 146 million in 2005 (UI: 135–156 million) to 131 million in 2010 (UI: 126–136 million), and to 114 million in 2015 (UI: 99–130 million). Infection rates are higher in children aged 2–10, but the majority of infected people are in other age groups.

In 2015, it is estimated that 7 of the 43 countries in sub-Saharan Africa with malaria transmission had more than 25% of their population infected with malaria parasites (Burkina Faso, Cameroon, Equatorial Guinea, Guinea, Mali, Sierra Leone and Togo); this number has decreased from 12 countries in 2010. Outside Africa, surveys of parasite prevalence conducted in Papua New Guinea showed a fall in the proportion of children infected, from 12.4% in 2009 to 1.8% in 2014 (*25*).

Figure 6.5 Estimated (a) parasite prevalence and (b) number of people infected, sub-Saharan Africa, 2005–2015. Source: Malaria Atlas Project (http://www.map.ox.ac.uk/) (*1*)



6.4 Malaria case incidence rate

The incidence rate of malaria, which takes into account population growth, is estimated to have decreased by 41% globally between 2000 and 2015, and by 21% between 2010 and 2015 (**Figure 6.6**). Reductions in incidence rates need to be accelerated if the GTS milestone of a 40% reduction by 2020 is to be achieved (*2*). Decreases in incidence rates are estimated to have been greatest in the WHO European Region (100%) and the WHO South-East Asia Region (54%).

Of 91 countries and territories with malaria transmission in 2015, 40 are estimated to have achieved a reduction in incidence rates of 40% or more between 2010 and 2015, and can be considered on track to achieve the GTS milestone of a further reduction of 40% by 2020 (**Figure 6.7**). Another 20 countries achieved reductions of 20–40%. Most of the 40 countries with reductions of more than 40% had fewer than 1 million cases in 2010; countries with more than 1 million cases had smaller reductions. These data suggest that the GTS milestone of a 40% reduction in case incidence by 2020 will be achieved only if reductions in case incidence are accelerated in countries with high case numbers.

Incidence rates changed by less than or equal to ±20% in 18 countries, and increased by more than 20% in 13 countries between 2010 and 2015 (**Figure 6.7**). The proportion of countries with fewer than 10 000 cases that reported increased incidence rates (21%) was higher than the proportion of countries with 10 000 to 1 million cases (15%) and of countries with more than 1 million cases (9%). These figures may be related to the greater variability in case incidence in low-transmission settings. In addition, countries with fewer cases that previously had high levels of malaria transmission may be more prone to resurgences if the coverage of their malaria control programme is reduced.

Figure 6.6 Reduction in malaria case incidence rate by WHO region, 2010–2015. No indigenous cases were recorded in the WHO European Region in 2015. Source: WHO estimates

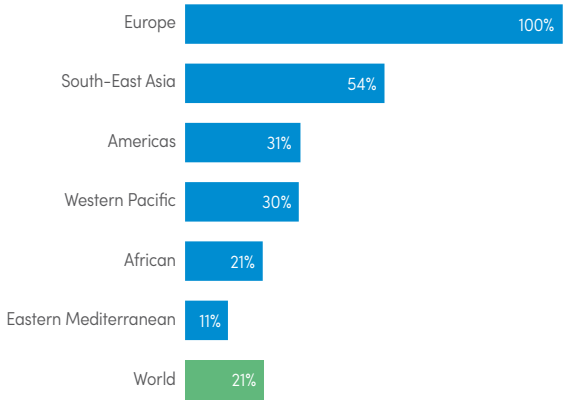
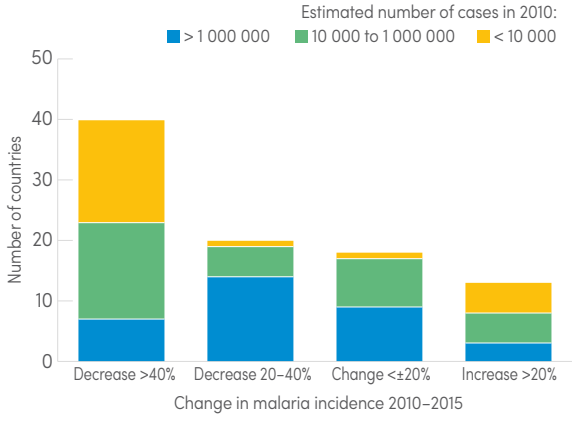


Figure 6.7 Country-level changes in malaria case incidence rate 2010–2015, by number of cases in 2010. Source: WHO estimates



6.5 Malaria mortality rate

Malaria mortality rates are estimated to have declined by 62% globally between 2000 and 2015, and by 29% between 2010 and 2015 (**Figure 6.8**). The rate of decline between 2010 and 2015 has been fastest in the WHO Western Pacific Region (58%) and the WHO South-East Asia Region (46%). In children aged under 5 years, malaria mortality rates are estimated to have fallen by 69% globally between 2000 and 2015 and by 35% globally between 2010 and 2015. They fell by 38% in the WHO African Region between 2010 and 2015.

Of 91 countries and territories with malaria transmission in 2015, 39 are estimated to have achieved a reduction of 40% or more in mortality rates between 2010 and 2015, 14 had reductions of 20–40% and 8 experienced increases in mortality rates of >20%. A further 10 countries reported no deaths in 2010 and in 2015 (the remaining 20 countries experienced changes <±20%). Reductions in mortality rates were generally faster in countries with a smaller initial number of malaria deaths (**Figure 6.9**). For the GTS milestone of a 40% reduction in mortality rates to be achieved by 2020, rates of reduction will need to increase in those countries that have higher numbers of deaths.

Figure 6.8 Reduction in malaria mortality rate, by WHO region, 2010–2015. No deaths from indigenous malaria were recorded in the WHO European Region from 2010 to 2015. Source: WHO estimates

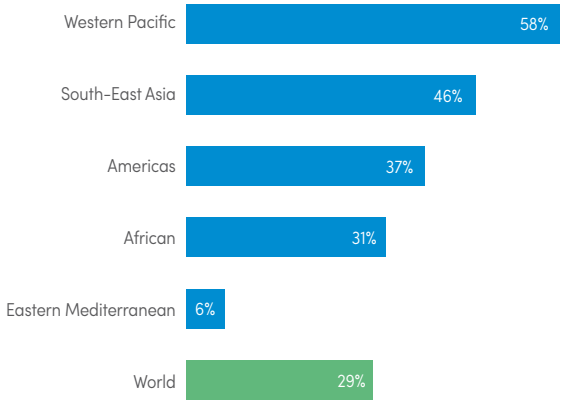
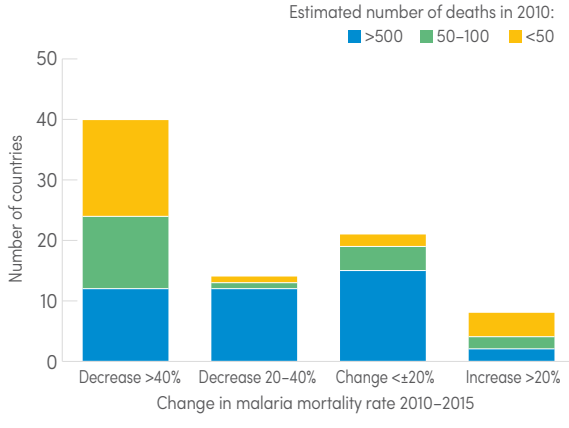


Figure 6.9 Country-level changes in malaria mortality rate 2010–2015, by number of deaths in 2010. Source: WHO estimates



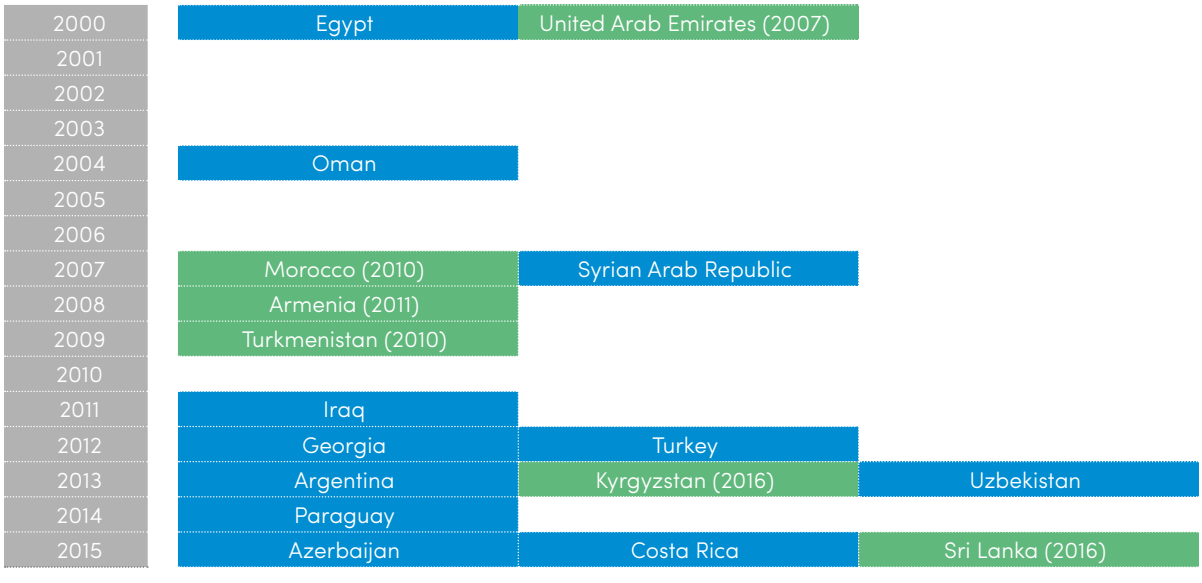
6.6 Malaria elimination and prevention of re-establishment

A target of the GTS is, by 2030, to eliminate malaria from 35 countries in which malaria was transmitted in 2015, and a milestone is to eliminate malaria in at least 10 countries by 2020 (*2*). A further target of the strategy is to prevent re-establishment of malaria in all countries that are malaria free.

A country must report zero indigenous cases of malaria for 3 consecutive years before it is considered to have eliminated the disease. Between 2000 and 2015, 17 countries attained zero indigenous cases for 3 years or more (**Figure 6.10**), and 10 of these countries attained zero indigenous cases for 3 years within the period 2011–2015. Malaria has not re-established in any of these countries.

Countries that have attained zero indigenous cases for 3 years or more, and that have sufficiently robust surveillance systems in place to demonstrate this achievement, are eligible to request WHO to initiate procedures for certification that they are malaria free. The process of certification is optional. Between 2000 and 2015, six of the 17 countries that attained zero indigenous cases for 3 years or more were certified as free of malaria by WHO (**Figure 6.10**).

Figure 6.10 Countries attaining zero indigenous malaria cases since 2000. Countries are shown by the year that they attained 3 consecutive years of zero indigenous cases. Countries that have been certified as free of malaria are shown in green, with the year of certification in brackets. Source: Country reports



In progressing to malaria elimination, the 17 countries reported a median of 184 indigenous cases 5 years before attaining zero cases (IQR: 78–728), and a median of 1748 cases 10 years before attaining zero cases (IQR: 423–5731) (**Figure 6.11**). However, three countries (Cabo Verde, El Salvador and Saudi Arabia) did not reach zero cases by 2015, despite having fewer than 500 indigenous cases in 2000–2005.

In 2015, 10 countries and territories reported fewer than 150 indigenous cases,[1] and a further 9 countries reported between 150 and 1000 indigenous cases (**Figure 6.12**). Thus, there appears to be a good prospect of attaining the GTS milestone of eliminating malaria from 10 countries by 2020. In April 2016, WHO published an assessment of the likelihood of countries achieving malaria elimination by 2020. The assessment was based not only on the number of cases but also on the declared malaria objectives of affected countries and on the informed opinions of WHO experts in the field (*26*).

1. Excludes Tajikistan, which reported zero indigenous cases in 2015 but has not yet attained 3 years of zero indigenous cases.

Figure 6.11 Indigenous malaria cases in the years before attaining zero indigenous cases for the 17 countries that eliminated malaria, 2000–2015. Median number of cases is shown as a blue line. Interquartile range is shaded in light blue. Source: Country reports

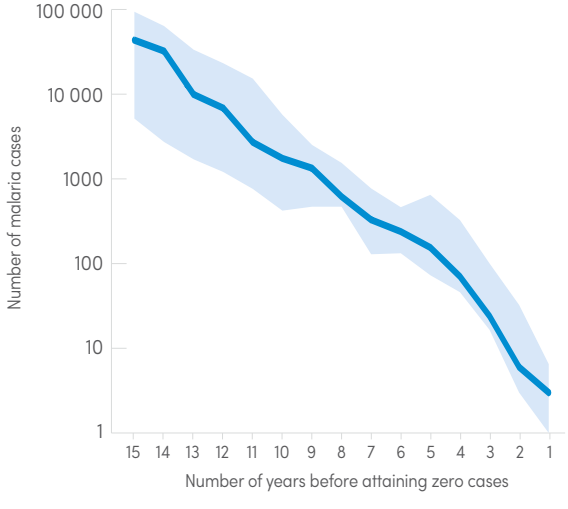
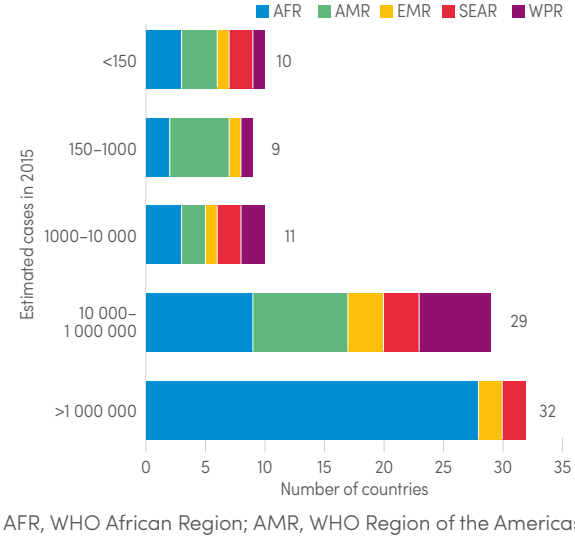


Figure 6.12 Number of indigenous malaria cases for countries endemic for malaria in 2015, by WHO region. Source: WHO estimates



AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

6.7 Malaria cases and deaths averted since 2000 and change in life expectancy

It is estimated that a cumulative 1.3 billion fewer malaria cases and 6.8 million fewer malaria deaths occurred globally between 2001 and 2015 than would have occurred had incidence and mortality rates remained unchanged since 2000. The highest proportion of cases and deaths were averted in the WHO African Region (94%). Of the estimated 6.8 million fewer malaria deaths between 2001 and 2015, about 6.6 million (97%) were for children aged under 5 years.

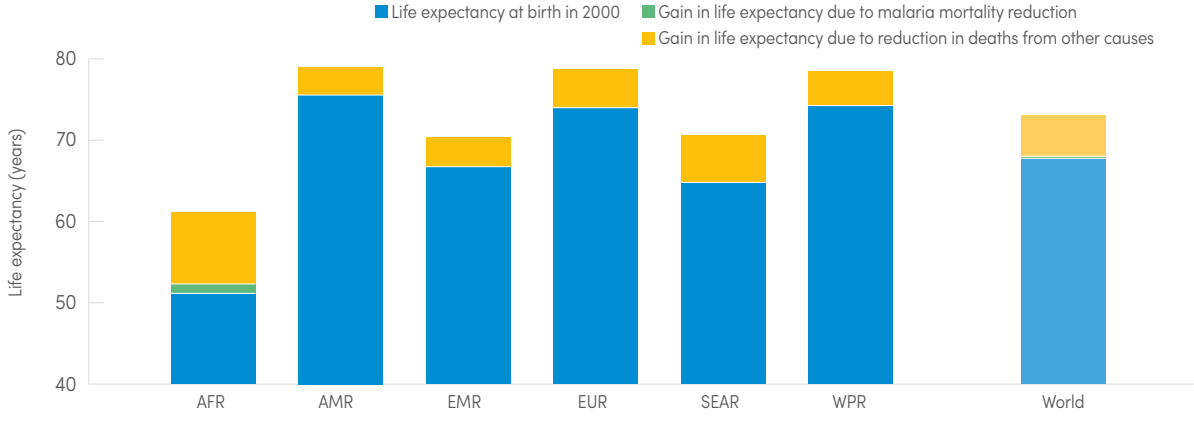
Not all of the cases and deaths averted can be attributed to malaria control efforts. Some progress is probably related to increased urbanization and overall economic development, which has led to improved housing and nutrition. However, it has previously been estimated that 70% of the cases averted between 2001 and 2015 were due to malaria interventions (*1*).

In the WHO African Region, reduced malaria mortality rates, particularly among children aged under 5 years, have led to a rise in life expectancy at birth of 1.2 years, accounting for 12% of the total increase in life expectancy of 9.4 years from 50.6 years in 2000 to 60 years in 2015. Across all malaria endemic countries, the contribution of malaria mortality reduction was 0.26 years or 5% of the total increase in life expectancy between 2000 and 2015, from 66.4 years to 71.4 years (**Table 6.5**, **Figure 6.13**).

6.8 Economic value of reduced malaria mortality risk, estimated by full income approach

The "full income approach" attempts to assign a value to gains in life expectancy by considering the importance that individuals and society place on reductions

Figure 6.13. Gains in life expectancy in malaria endemic countries, 2000–2015. 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; WPR, WHO Western Pacific Region

in mortality (i.e. increased longevity). In monetary terms the method places a value of US$ 1810 billion on the life-expectancy gains observed in sub-Saharan Africa between 2000 and 2015, and US$ 2040 billion globally (**Table 6.6**). This is equivalent to 44% of the gross domestic product (GDP) of the affected countries in the WHO Africa Region in 2015, and 3.6% in affected countries globally. The economic value of longer life is expressed here as a percentage of GDP in order to provide a convenient and well-known comparison, but is not meant to suggest that the value of longevity is itself a component of domestic output (i.e. GDP), or that the value of these gains should enter directly into the national income accounts (*27*). Nonetheless, the comparison suggests that the value of the gains in life expectancy due to reduction in malaria mortality are substantial, and that the total investments called for in the GTS in order to achieve the 2030 target of a reduction in the malaria mortality rate of at least 90% would be repaid many times over.

Table 6.5. Gains in life expectancy in malaria endemic countries, 2000–2015. Source: WHO estimates

	Life expectancy at birth		Gain in life expectancy due to reductions in mortality from		% gain due to malaria
	2000	2015	Malaria	Other causes	
AFR	50.6	60.0	1.159	8.2	12.3%
AMR	73.7	76.9	0.003	3.2	0.1%
EMR	65.4	68.8	0.045	3.4	1.3%
EUR	72.3	76.8	0.000	4.5	0.0%
SEAR	63.5	69.0	0.034	5.4	0.6%
WPR	72.5	76.6	0.018	4.0	0.4%
World	**66.4**	**71.4**	**0.255**	**4.8**	**5.0%**

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; WPR, WHO Western Pacific Region

Table 6.6. Economic value of reduced malaria mortality risk, estimated by full income approach, 2000–2015. Source: WHO estimates

	Value of malaria mortality risk reduction 2000–2015 (US$ 2015, PPP, billions)			Value of malaria mortality risk reduction as % of GDP		
	Estimate	Lower	Upper	Estimate	Lower	Upper
AFR	1 830	1 330	2 520	44.4%	32.6%	60.9%
AMR	15	13	17	0.1%	0.1%	0.1%
EMR	52	41	63	1.3%	1.1%	1.5%
EUR				0.0%	0.0%	0.0%
SEAR	93	66	127	1.0%	0.8%	1.3%
WPR	23	19	27	0.1%	0.1%	0.1%
World	**2 012**	**1 510**	**2 710**	**3.6%**	**2.8%**	**4.8%**

AFR, WHO African Region; AMR, WHO Region of the Americas; EMR, WHO Eastern Mediterranean Region; EUR, WHO European Region; GDP, gross domestic product; PPP, purchasing power parity; SEAR, WHO South-East Asia Region; WPR, WHO Western Pacific Region

Conclusions

The *World Malaria Report 2016* is the first such report to be released during the era of the GTS 2016–2030 (*2*). Because the latest data included in the report are mostly from 2015, direct reporting on the progress of the GTS is not possible. However, the *World Malaria Report 2016* provides a baseline against which progress since 2015 can be assessed in the future. Also, by looking at trends in indicators since 2010, the report can give an indication of where programmes are on track to meet the GTS 2020 milestones and where progress needs to be accelerated.

Although malaria funding increased considerably between 2000 and 2010, it has remained relatively stable since 2010. It totalled US$ 2.9 billion in 2015, representing only 45% of the GTS funding milestone for 2020. Governments of malaria endemic countries provided 31% of total funding in 2015, and the Global Fund accounted for about half of international financing. Pledges to the Global Fund for financing for 2017–2019 have increased by 8% compared to 2014–2016 pledges. Total funding must increase substantially if the GTS 2020 milestone of US$ 6.4 billion is to be achieved.

The coverage of malaria interventions rose between 2010 and 2015. More than half of the population of sub-Saharan Africa (57%) now benefits from vector-control interventions (IRS or ITNs), and an increased proportion of pregnant women receive three doses of IPTp (31% in 2015). More than half of suspected malaria cases attending public health facilities in the WHO African Region receive a diagnostic test, and the proportion of malaria cases treated with effective antimalarial drugs is increasing.

Nevertheless, significant gaps in programme coverage remain. Access to vector control has been greatly extended through mass-distribution campaigns; however, increasing the coverage of chemoprevention, diagnostic testing and treatment requires these interventions to be delivered through health systems that are frequently under-resourced and poorly accessible to those most at risk of malaria. Moreover, the potential for strengthening health systems in malaria endemic countries is often constrained by low national incomes and per capita domestic spending on health and malaria control. The limited ability to strengthen systems in order to deliver interventions remains a significant challenge for ensuring universal access to malaria prevention, diagnosis and treatment, as called for in Pillar 1 of the GTS (*2*).

Pillar 2 of the GTS calls for countries to accelerate efforts towards malaria elimination and attainment of malaria free status (*2*). Ten countries eliminated

malaria between 2010 and 2015, and malaria has not been re-established in any malaria free country since 2000. In 2015, 10 countries had fewer than 150 indigenous cases, and another nine had between 150 and 1000 cases. Thus, there appear to be good prospects of attaining the GTS milestone of eliminating malaria from at least 10 countries by 2020 and preventing re-establishment of malaria in all countries that are malaria free.

Malaria surveillance systems detected a higher proportion of malaria cases globally in 2015 (20% of cases) than in 2010 (10%). Most of this improvement resulted from increased diagnostic testing in sub-Saharan Africa. However, a large proportion of people with malaria either do not seek treatment or seek treatment in the private sector, where they are less likely to receive a diagnostic test or to be reported in a malaria surveillance system. Although patients may seek care at public health facilities, diagnostic testing is not yet universal, nor is reporting complete. Addressing the bottlenecks in case detection, diagnosis and reporting is critical in order to transform malaria surveillance into a core intervention, as envisaged in Pillar 3 of the GTS.

Malaria case incidence rates are estimated to have decreased by 21% globally between 2010 and 2015, and malaria mortality rates by 29%. If the GTS milestone of a 40% reduction in case incidence and mortality rates by 2020 is to be achieved globally, reductions in case incidence and mortality rates must be accelerated in countries with high numbers of cases and deaths. However, these countries are currently furthest from the per capita spending milestone for 2020 in the GTS (*2*).

Target 3.3 of the SDGs – End the epidemics of AIDS, TB, malaria and NTDs by 2030 – is interpreted by WHO as the attainment of the GTS targets. The analysis summarized above indicates that the world is not on track to meet Target 3.3. for malaria. In addition to SDG Target 3.3, reaching the GTS targets will also contribute to other health-related goals of SDG 3, which are to ensure healthy lives and promote well-being for all at all ages. It will also contribute to other SDGs, particularly Goal 1 (end poverty in all its forms everywhere), Goal 4 (ensure inclusive and equitable quality education and promote lifelong learning opportunities for all), Goal 5 (achieve gender equality and empower all women and girls), Goal 8 (promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all) and Goal 10 (reduce inequality within and among countries).

Although it will be challenging to reach the 2020 milestones of the GTS, recent experience in combatting malaria has shown that much progress is possible, and that such progress can greatly improve the health and well-being of populations. Reduced malaria mortality rates have led to an increase of 1.2 years in life expectancy at birth in the WHO African Region. This increase represents 12% of the total increase in life expectancy seen in sub-Saharan Africa, from 50.6 years in 2000 to 60 years in 2015, a highly significant contribution. Although placing a monetary value on malaria mortality reductions or increased life expectancy is difficult, current methodologies suggest that the change observed can be valued at US$ 1810 billion (UI: US$ 1330–2480 billion), which is equivalent to 44% of the GDP of the affected countries in 2015. Thus, the benefits of pursuing the goals and milestones of the GTS are considerable, and make it worth overcoming the challenges presented.

References

1. 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):207–211.
2. WHO. Global Technical Strategy for Malaria 2016–2030. Geneva: World Health Organization (WHO); 2015 (http://www.who.int/malaria/areas/global_technical_strategy/en, accessed 16 November 2016).
3. Roll Back Malaria Partnership. Action and investment to defeat malaria 2016–2030. For a Malaria free World. Geneva: World Health Organization (WHO); 2015 (http://www.rollbackmalaria.org/files/files/aim/RBM_AIM_Report_A4_EN-Sept2015.pdf, accessed 16 November 2016).
4. UN. Sustainable development goals: 17 goals to transform our world [website]. United Nations; 2015 (http://www.un.org/sustainabledevelopment/sustainable-development-goals, accessed 15 November 2016).
5. Lengeler C. Insecticide-treated bed nets and curtains for preventing malaria. Cochrane Database Syst Rev. 2004;(2):CD000363 (http://www.ncbi.nlm.nih.gov/pubmed/15106149, accessed 30 November 2015).
6. Eisele TP, Larsen D, Steketee RW. Protective efficacy of interventions for preventing malaria mortality in children in *Plasmodium falciparum* endemic areas. Int J Epidemiol. 2010;39:i88–i101.
7. Pluess B, Tanser FC, Lengeler C, Sharp BL. Indoor residual spraying for preventing malaria. Cochrane Database Syst Rev. 2010;(4):CD006657 (http://www.ncbi.nlm.nih.gov/pubmed/20393950, accessed 30 November 2016).
8. WHO. Larval source management – a supplementary measure for malaria vector control. An operational manual. Geneva: World Health Organization; 2013 (http://apps.who.int/iris/bitstream/10665/85379/1/9789241505604_eng.pdf?ua=1, accessed 16 November 2015).
9. Aponte JJ, Schellenberg D, Egan A, Breckenridge A, Carneiro I, Critchley J et al. Efficacy and safety of intermittent preventive treatment with sulfadoxine-pyrimethamine for malaria in African infants: a pooled analysis of six randomised, placebo-controlled trials. Lancet. 2009;374(9700):1533–1542 (http://www.ncbi.nlm.nih.gov/pubmed/19765816, accessed 15 November 2016).
10. Wilson AL, IPTc Taskforce. A systematic review and meta-analysis of the efficacy and safety of intermittent preventive treatment of malaria in children (IPTc). PLoS One. 2011;6(2):e16976.
11. Meremikwu MM, Donegan S, Sinclair D, Esu E, Oringanje C. Intermittent preventive treatment for malaria in children living in areas with seasonal transmission. Cochrane Database Syst Rev. 2012;2(2):CD003756.

12. 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.
13. WHO. Tables of malaria vaccine projects globally: «The Rainbow Tables» (last update 5 October 2016) [website]. World Health Organization; 2016 (http://www.who.int/vaccine_research/links/Rainbow/en/index.html, accessed 15 November 2016).
14. Committee for Medicinal Products for Human Use (CHMP), European Medicines Agency. Assessment Report. Mosquirix (TM). (2015)
15. WHO. Malaria vaccine: WHO position paper-January 2016. Wkly. Epidemiol. Rec. 91, 33–51; 2016 (http://www.who.int/wer/2016/wer9104.pdf, accessed 23 November 2016).
16. Bhatt S, Gething P. Insecticide-treated nets (ITNs) in Africa 2000–2016: coverage, system efficiency and future needs for achieving international targets. Malar J. 2014;13(Suppl 1):029.
17. WHO. WHO recommendations for achieving universal coverage with long-lasting insecticidal nets in malaria control (revised March 2014). 2013 (http://www.who.int/malaria/publications/atoz/who_recommendations_universal_coverage_llins.pdf?ua=1, accessed 15 November 2016).
18. Theiss-Nyland K, Lynch M, Lines J. Assessing the availability of LLINs for continuous distribution through routine antenatal care and the Expanded Programme on Immunizations in sub-Saharan Africa. Malar J. 2016;15(1):255.
19. WHO. Implications of insecticide resistance for malaria vector control. World Health Organization; 2016 (http://www.who.int/malaria/news/2016/iir-malaria-vector-control-evaluation-nov2016.pdf, accessed 30 November 2016).
20. WHO. Guidelines for the treatment of malaria, third edition. World Health Organization; 2015 (http://www.who.int/malaria/publications/atoz/9789241549127/en, accessed 15 November 2016).
21. Thwing J, Eisele TP, Steketee RW. Protective efficacy of malaria case management and intermittent preventive treatment for preventing malaria mortality in children: a systematic review for the Lives Saved Tool. BMC Public Health. 2011;11:S14 (http://www.ncbi.nlm.nih.gov/pubmed/21501431, accessed 19 November 2014).
22. WHO. Methods for surveillance of antimalarial drug efficacy. World Health Organization; 2009 (http://www.who.int/malaria/publications/atoz/9789241597531/en, accessed 15 November 2016).
23. WHO. Disease surveillance for malaria control: operational manual. World Health Organization; 2012 (http://www.who.int/malaria/areas/surveillance/operationalmanuals/en, accessed 15 November 2016).
24. WHO. Disease surveillance for malaria elimination: operational manual. World Health Organization; 2012 (http://www.who.int/malaria/areas/surveillance/operationalmanuals/en, accessed 15 November 2016).
25. Department of Health. Papua New Guinea Malaria Programme review 2014. Port Moresby: Government of Papua New Guinea; 2014.
26. WHO. Eliminating malaria. World Health Organization; 2016 (http://www.who.int/malaria/publications/atoz/eliminating-malaria/en, accessed 15 November 2016).
27. The World Bank, Institute for Health Metrics and Evaluation (IHME). The cost of air pollution: strengthening the economic case for action. Washington (DC): The World Bank; 2016 (https://openknowledge.worldbank.org/bitstream/handle/10986/25013/108141.pdf?sequence=4, accessed 15 November 2015).

Annexes

Annex 1 - Data sources and methods

Annex 2 - Regional profiles

- A - West Africa
- B - Central Africa
- C - East and Southern Africa
- D - Region of the Americas
- E - Eastern Mediterranean Region
- F - South-East Asia Region
- G - Western Pacific Region

Annex 3 - Country trends in selected indicators

- A - Funding per capita for malaria control and elimination (in US$)
- B - Proportion of population at risk sleeping under an ITN
- C - Estimated malaria case incidence rate (cases per 1000 population at risk)
- D - Estimated malaria mortality rate (deaths per 100 000 population at risk)
- E - Estimated change in malaria incidence and mortality rates, 2010–2015

Annex 4 - Data tables

- A - Policy adoption, 2015
- B - Antimalarial drug policy, 2015
- C - Funding for malaria control, 2013–2015
- D - Commodities distribution, 2013–2015
- E - Household survey results, 2013–2015
- F - Estimated malaria cases and deaths, 2000–2015
- G - Population at risk and reported malaria cases by place of care, 2015
- H - Reported malaria cases by method of confirmation, 2000–2015
- I - Reported malaria cases by species, 2000–2015
- J - Reported malaria deaths, 2000–2015

Figure 1.1 Countries endemic for malaria in 2000 and 2016

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

Table 1.1 Global targets for 2030 and milestones for 2020 and 2025

Targets and milestones are as described in the *Global Technical Strategy for Malaria 2016–2030* (GTS) (*1*) and *Action and investment to defeat malaria 2016–2030* (AIM) (*2*).

Table 1.2 Indicators reviewed in *World Malaria Report 2016*

Indicators are as described in *Monitoring and evaluation of the Global Technical Strategy for Malaria 2016–2030 and Action and investment to defeat malaria 2016–2030* (*3*).

Figure 2.1 Investments in malaria control activities by funding source, 2005–2015

Contributions from governments of endemic countries are estimated as the sum of NMCP expenditures reported by NMCPs for the *World Malaria Report* of the relevant year plus the estimated costs of delivery of patient-care services at government health facilities. If data on NMCP expenditures were missing for 2015, data from previous years were used after conversion to the equivalent 2015 US$ value. The number of malaria cases attending outpatient services at government facilities was derived from WHO estimates of malaria cases (see methods notes for Table 6.1) multiplied by the proportion of estimated cases seeking care at government facilities. Between 1% and 3% of uncomplicated cases were assumed to have moved to the severe stage of disease, and 50–80% of these severe cases were assumed to have been admitted to secondary or tertiary level hospitals. Outpatients were assumed to have been treated at health centres (with or without beds) or at primary level hospitals (e.g. district hospitals). Inpatients were assumed to have been admitted to primary, secondary or teaching hospitals. Costs of outpatient visits and inpatient bed-stays were estimated from the perspective of the public health-care provider, using WHO-CHOICE estimates.[1] The estimates were updated for 2005–2015 by rerunning the regression model using the relevant gross domestic product (GDP) per capita in each year. When no GDP data were available for a given year, outpatient department and inpatient unit costs were imputed using the values from the most recent year with available unit-cost data, and were adjusted with the GDP deflator. When no unit-cost data were available for the full period, a unit cost was imputed from the median unit cost in that year in countries within the same World Bank income group. Uncertainty around case and cost parameters was estimated through probabilistic uncertainty analysis; that is, by assigning a uniform distribution informed by lower and upper estimates for each parameter. The figure shows the mean total costs of service delivery for patient care from 1000 estimations.

International financing data were obtained from several sources. The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) provided disbursed amounts by year and country for 2005–2015. Data on funding from the government of the United States of America (USA) were sourced from the US Foreign Aid Dashboard, with the technical assistance of the Kaiser Family Foundation. Funding data were available for the US Agency for International Development (USAID), the US Centers for Disease Control (CDC) and the US Department of Defense. Country-level data were available for USAID for 2006–2015. Financing data for other international funders included annual disbursement flows for 2005–2014, obtained from the Organisation for Economic Co-operation and Development (OECD) creditor reporting system (CRS) database on aid activity. For each year and each funder, the country-level and regional-level project-type interventions and other technical assistance were extracted. The 2014 value for international annual contributions was used as the 2015 value, except for contributions from the United Kingdom of Great Britain and Northern Ireland; for this value, a linear increase was assumed based on trends from 2012

1. http://www.who.int/choice/en/

to 2014. To measure funding in real terms (i.e. correct for inflation), all values were converted to 2015 US$ values, using the GDP implicit price deflators published by the World Bank. Estimates of total spent on malaria control and elimination exclude household spending on malaria prevention and treatment.

Figure 2.2 Annual flow of funding for malaria control and elimination, 2014–2015

See methods notes for Figure 2.1 for sources of information on funding from governments of malaria endemic countries and on international flows to endemic countries. Contributions from individual countries to the Global Fund are shown when their 2014 and 2015 annual average core contributions to the fund accounted for 3% or more of the total amount of contributions received by the fund in 2014 and 2015. Contributions from funding sources to multilateral channels were estimated by calculating the proportion of the total contributions received by a multilateral in 2014 (2014 and 2015 in the case of the Global Fund) that was contributed by a funding source, then multiplying that figure by the multilateral's estimated investment in malaria in 2015. These data were sourced from the Global Fund and, for other funders, from the OECD.Stat website[2] using the CRS and the Development Assistance Committee (DAC) members' total use of the multilateral system. Contributions from non-DAC countries and other sources were not available and were therefore not included in this figure. All funding flows were converted to 2015 equivalents in US$ (millions).

Figure 2.3 Malaria financing, 2013–2015, by type of expenditure

The Global Fund provided expenditure data by category for 2013–2015. Expenditure categories were health-system strengthening, supportive environment, prevention and treatment. Expenditures related to health-system strengthening included communication and advocacy, human resources and technical assistance, training, monitoring and evaluation (M&E), procurement and supply management, and planning. Expenditures related to supportive environment included spending on policy development, civil-society strengthening, stigma-reduction efforts, and management and administration. For Figure 2.3, expenditures on health-system strengthening and supportive environment were combined. For expenditures of the US President's Malaria Initiative (PMI), all operational plans that included planned obligations for 2013–2015 were reviewed and categorized as health-system strengthening, prevention or treatment. PMI health-system-strengthening categories included communications, capacity-building, surveillance, M&E, and research and strategic information. Prevention expenditures included those for long-lasting insecticidal nets (LLINs), indoor residual spraying (IRS) and chemoprevention, which encompass, for example, expenditures on commodities, human resources, distribution and transport. Treatment expenditures included any resources used for malaria case management. Costs for in-country mission staffing were excluded from the analysis (representing 12% of total average spending). Government expenditures included data reported by NMCPs for the relevant *World Malaria Report*, in similar categories to those used by the Global Fund. We included data from 36 countries that had data for the expenditure categories for at least 2 years between 2013 and 2015.

Figure 2.4 Funding for malaria-related research and development, 2010–2014

Data on funding for malaria-related research and development for 2010–2014 were collected directly from the G-Finder Public Search tool.[3] All data were converted to 2015 equivalents in US$.

Figure 2.5 Source of funding for malaria-related research and development, 2014

See methods notes for Figure 2.4.

Figure 2.6 Malaria financing per person at risk, 2013–2015, by estimated number of malaria cases, 2015

See methods notes for Figure 2.1 for sources of information on malaria financing. The total population of each country was taken from the 2015 revision of the *World population prospects* (*4*) and the proportion at

2. http://stats.oecd.org/

3. https://gfinder.policycures.org/PublicSearchTool

risk of malaria was derived from NMCP reports. Funding milestones for 2020 were derived from the costing of the GTS (*1*).

Figure 2.7 Number of ITNs delivered by manufacturers and distributed by NMCPs, 2009–2016

Data on the number of insecticide-treated mosquito nets (ITNs) delivered by manufacturers to countries were provided to WHO by Milliner Global Associates. Data from NMCP reports were used for the number of ITNs distributed within countries.

Figure 2.8 Number of RDTs sold by manufacturers and distributed by NMCPs, 2010–2015

The numbers of rapid diagnostic tests (RDTs) distributed by WHO region are the annual totals reported as having been distributed by NMCPs. Numbers of RDT sales were reported by 41 manufacturers that participated in RDT product testing by WHO, the Foundation for Innovative New Diagnostics, the CDC and the Special Programme for Research and Training in Tropical Diseases. The number of RDTs reported by manufacturers represents total sales to the public and private sectors worldwide.

Figure 2.9 Number of ACT treatment courses delivered by manufacturers and distributed by NMCPs, 2010–2015

Data on artemisinin-based combination therapy (ACT) sales were provided by eight manufacturers eligible for procurement by WHO or the United Nations Children's Fund (UNICEF). ACT sales were categorized as being to either the public sector or the private sector. Data on ACTs distributed within countries through the public sector were taken from NMCP reports to WHO.

Figure 2.10 Ratio of ACT treatment courses distributed to diagnostic tests performed (RDTs or microscopy), WHO African Region 2010–2015

The ratio was calculated using the number of ACTs distributed, the number of microscopic examinations of blood slides, and the number of RDTs performed in the WHO African Region, as reported by NMCPs to WHO. The test positivity rate was calculated as the total number of positive tests (i.e. slide examinations or RDTs) divided by the total number of tests undertaken, as reported by countries in the WHO African Region.

Figure 3.1 Proportion of population at risk with access to an ITN and sleeping under an ITN, and proportion of households with at least one ITN and enough ITNs for all occupants, sub-Saharan Africa, 2005–2015

Estimates of ITN coverage were derived from a model developed by the Malaria Atlas Project,[4] using a two-stage process. First, we defined a mechanism for estimating net crop (i.e. the total number of ITNs in households in a country at a given point in 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). We then used empirical modelling to translate estimated net crops 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 NMCPs; and
- data from nationally representative household surveys from 39 countries in sub-Saharan Africa, from 2001 to 2015.

Countries and populations at risk

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 Namibia, Sao Tome and Principe, South Africa and Swaziland, for which ITNs comprise a small proportion of vector control. Analyses were limited to populations categorized by NMCPs as being at risk.

Estimating national net crops through time

As described by Flaxman et al. (*5*), national ITN systems were represented using a discrete-time stock-and-flow

4. http://www.map.ox.ac.uk/

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 NMCP or 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 NMCP-reported value (i.e. the assumed minimum distribution) as the lower end. New nets reaching households joined older nets remaining from earlier time steps to constitute the total household net crop, with the duration of net retention by households governed by a loss function. Rather than fitting the loss function to a small external dataset, as was done by Flaxman et al. (*5*), 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 to 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 to not only estimate net crop, but also to generate a histogram that summarizes the household net ownership pattern (i.e. the proportion of households with zero nets, one net, two nets and so on). In this way, the size of the net crop was linked to distribution patterns among households while accounting for household size in order 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 number of both ITNs and people in each household was available, it was possible to directly calculate the 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 ($\text{ITN use}_{\text{all ages}} = 0.8133 * \text{ITN access}_{\text{all ages}} + 0.0026$, $R^2 = 0.773$). This relationship was applied to the Malaria Atlas Project's country–year estimates of household access in order 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 ($\text{ITN use}_{\text{children under five}} = 0.9327x + 0.0282$, $R^2 = 0.754$).

Figure 3.2 Proportion of ITNs distributed through different delivery channels in sub-Saharan Africa, 2013–2015

Data on the number of ITNs distributed within countries were as reported to WHO by 39 countries where ITNs are the primary method of vector control.

Figure 3.3 Proportion of the population at risk protected by IRS by WHO region, 2010–2015

The number of persons protected by IRS was reported to WHO by NMCPs. The total population of each country was taken from the 2015 revision of the *World population prospects* (*4*) and the proportion at risk of malaria was derived from NMCP reports.

Figure 3.4 Insecticide class used for indoor residual spraying, 2010–2015

Data on the type of insecticide used for IRS were reported to WHO by NMCPs. Insecticides were

classified into pyrethroids or other classes (carbamates, organochlorines or organophosphates). If data were not reported for a particular year, data from the most recent year were used. For the period 2010–2015 this method of imputation was used for an average of 19 countries each year.

Figure 3.5 Proportion of the population at risk protected by IRS or sleeping under an ITN in sub-Saharan Africa, 2010–2015

The proportion of the population at risk sleeping under an ITN was derived as described for Figure 3.1, and the proportion benefiting from IRS was derived as for Figure 3.4. In combining these proportions, the extent to which populations benefit from one or both of these interventions must be estimated. Analysis of household survey data indicates that about half of the people in IRS-sprayed households are also protected by ITNs, but the extent of overlap between intervention coverage can vary from 0% to 100% (if the proportions sum to <1). To reflect this uncertainty, we assumed the combined coverage to have a rectangular distribution with the range of maximum (0%, $ITN_{coverage}$ + $IRS_{coverage}$ –100%) to minimum ($ITN_{coverage}$, $IRS_{coverage}$). Palisade's *@Risk* software (version 6.0)[5] was used to sample from the distributions for each country, and a continental estimate of vector-control coverage was obtained by summing the combined ITN and IRS coverage of all countries.

Figure 3.6 Insecticide resistance and monitoring status for malaria endemic countries (2015), by insecticide class and WHO region, 2010–2015

Insecticide resistance monitoring results were collected from NMCP reports to WHO, the African Network for Vector Resistance, the Malaria Atlas Project, PMI and the published literature. In these studies, confirmed resistance was defined as mosquito mortality <90% in bioassay tests with standard insecticide doses. Where multiple insecticide classes or types, mosquito species or time points were tested, the highest resistance status was considered.

Figure 3.7 Proportion of pregnant women receiving IPTp, by dose, sub-Saharan Africa, 2010–2015

The total number of pregnant women eligible for intermittent preventive treatment in pregnancy (IPTp) was calculated by adding total live births calculated from the United Nations (UN) population data and spontaneous pregnancy loss (specifically, miscarriages and stillbirths) after the first trimester. Spontaneous pregnancy loss has previously been calculated by Dellicour et al. (*6*). Country-specific estimates of IPTp coverage were calculated as the ratio of pregnant women receiving IPTp at antenatal care (ANC) clinics to the estimated number of IPTp-eligible pregnant women in a given year. ANC attendance rates were derived in the same way, using the number of initial ANC visits reported through routine information systems. Local linear interpolation was used to compute missing values. Annual aggregate estimates exclude countries for which a report or interpolation was not available for the specific year. Among 34 countries with IPTp policy, IPTp1 dose coverage could be calculated for 34 countries, IPTp2 for 33 countries, and IPTp3 for 20 countries. Aggregate estimates of IPTp1 and IPTp2 coverage for 20 countries with IPTp3 estimates were similar to estimates of IPT1 and IPTp2 coverage using data from all countries.

Figure 4.1 Proportion of febrile children seeking care, by health sector, sub-Saharan Africa, 2013–2015

Estimates were derived from 23 nationally representative household surveys (demographic health surveys and malaria indicator surveys) conducted between 2013 and 2015. The surveys asked caregivers whether their child had had a fever in the 2 weeks preceding the survey, whether care was sought for the fever and, if so, where care was sought.

Figure 4.2 Proportion of febrile children receiving a blood test, by health sector, sub-Saharan Africa, 2013–2015

Estimates were derived from 22 nationally representative household surveys (demographic health surveys and malaria indicator surveys) conducted between 2013 and

5. https://www.palisade.com/risk/

2015. The surveys asked caregivers whether their child had had a fever in the 2 weeks preceding the survey; whether care was sought for the fever and, if so, where care was sought; they also asked whether the child had received a finger or heel stick as part of the care (indicating that a malaria diagnostic test was performed).

Figure 4.3 Proportion of suspected malaria cases attending public health facilities who receive a diagnostic test, by WHO region, 2010–2015

The proportion of suspected malaria cases receiving a malaria diagnostic test in public facilities was calculated from NMCP reports to WHO. The number of malaria diagnostic tests performed comprised the number of RDTs and the number of microscopic slide examinations. Few countries reported the number of suspected malaria cases as an independent value. For countries reporting the total number of malaria cases as the sum of presumed malaria cases (i.e. cases classified as malaria without undergoing malaria parasitological testing) and confirmed malaria cases, the number of suspected cases was calculated by adding the number of negative diagnostic tests to the number of presumed and confirmed cases. Using this method, for countries that reported only confirmed malaria cases as the total number of malaria cases, the number of suspected cases is equal to the number of cases tested. This value is not informative in determining the proportion of suspected cases tested; therefore, countries were excluded from the regional calculation for the years in which they reported only confirmed cases as total malaria cases.

Figure 4.4 Proportion of febrile children attending public health facilities who receive a blood test, sub-Saharan Africa, 2010–2015

Estimates were derived from 41 nationally representative household surveys (demographic health surveys and malaria indicator surveys) conducted between 2010 and 2015. The surveys asked caregivers whether their child had had a fever in the 2 weeks preceding the survey; whether care was sought for the fever and, if so, where care was sought; and whether the child had received a finger or heel stick as part of the care (indicating that a malaria diagnostic test was performed). Median values and interquartile ranges were calculated from available surveys in 3 year moving averages.

Figure 4.5 Proportion of febrile children with a positive RDT at time of survey who received antimalarial medicines, sub-Saharan Africa, 2010–2015

Data from nationally representative household surveys were used to examine the treatment received by children who had had both a fever in the previous 2 weeks and a positive RDT at the time of survey. Estimates were derived from 29 nationally representative household surveys (demographic health surveys and malaria indicator surveys). The surveys must have undertaken diagnostic testing with a histidine rich protein 2 (HRP2) RDT at the time of the survey; also, they must have asked caregivers whether their child had had a fever in the 2 weeks preceding the survey, where care was sought, and what treatment was received for the fever, particularly whether the child received an ACT or other antimalarial medicine.

Figure 4.6 Proportion of antimalarial treatments that are ACTs received by febrile children that are RDT positive at the time of survey, sub-Saharan Africa, 2010–2015

See methods notes for Figure 4.5.

Figure 4.7 Proportion of antimalarial treatments that are ACTs received by febrile children, by health sector, sub-Saharan Africa, 2013–2015

See methods notes for Figure 4.5.

Figure 4.8 Distribution of multidrug resistance, 2016

Information was derived from WHO's database on antimalarial treatment efficacy.[6]

Figure 5.1 Health facility reporting rates by WHO region, 2015

Using data provided by NMCPs, reporting rates of health facilities were calculated as follows: (the number of health facility reports received in 2015) ÷ (number of

6. http://www.who.int/malaria/areas/drug_resistance/drug_efficacy_database/en/

health facilities providing treatment for uncomplicated malaria × reporting frequency).

Figure 5.2 Bottlenecks in case detection 2015, by WHO region

The procedure for estimating the proportion of cases detected by surveillance systems follows the method by which WHO estimates the number of malaria cases in a country using data reported by NMCPs (*7*,*8*). The procedure considers four proportions: the proportion of cases that seek treatment, the proportion of cases that seek treatment in health facilities covered by a country's malaria surveillance system, the proportion of cases in these facilities that receive a diagnostic test and the proportion of cases in these facilities that are reported through the system. The proportion of malaria cases seeking treatment was estimated using the latest nationally representative household survey for a country. If no household survey was available, the proportion was derived by sampling at random from results for other countries and areas in the region that had a household survey: Bolivia (Plurinational State of), Botswana, Cabo Verde, French Guiana, Guatemala, South Sudan, Suriname, Thailand and Venezuela (Bolivarian Republic of). For 13 countries approaching malaria elimination (Algeria, Belize, Bhutan, China, Democratic People's Republic of Korea, Ecuador, El Salvador, Iran [Islamic Republic of], Malaysia, Mexico, Panama, Republic of Korea and Saudi Arabia), it was assumed that 99% of cases sought treatment. The proportion of cases seeking treatment at a facility covered by a country's surveillance system was derived in a similar way; the types of facility covered by a country's surveillance system were provided through NMCP reports. Reporting rates of health facilities were calculated according to the methods notes for Figure 5.1. The reporting rates were assigned to three ranges (<50%, 50–80% and >80%) to reflect uncertainty about the number of cases represented in facility reports. The rates were assigned a triangular distribution in the outer ranges and a uniform distribution in mid-range, with expected values in the low, mid and high ranges of 33%, 65% and 87%, respectively. If the reporting completeness was not available for 2015, the value from the most recent year reported was used. If this value was missing for all years, it was assumed to lie between 50% and 80%. Countries that were approaching elimination were assigned a value of more than 80%.

Table 6.1 Estimated malaria cases, 2000–2015

The number of malaria cases was estimated by one of two methods. The first method was used for countries outside Africa and for low-transmission countries in Africa. 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* (*7*,*8*), combines data reported by NMCPs (reported cases, reporting completeness and likelihood that cases are parasite positive) with data obtained from nationally representative household surveys on health-service use. The number of malaria cases caused by *Plasmodium vivax* in each country was estimated by multiplying the country's reported proportion of *P. vivax* cases by the total number of estimated cases for the country. The second method was used for high-transmission countries in Africa in which the quality of surveillance data did not permit a robust estimate from the number of reported cases. Estimates of the number of malaria cases were derived from information on parasite prevalence obtained from household surveys. First, data on parasite prevalence from 27 573 georeferenced population clusters between 1995 and 2014 were assembled within a spatiotemporal Bayesian geostatistical model, along with environmental and sociodemographic covariates, and data on both the use of ITNs and access to ACTs. The geospatial model enabled predictions of *P. falciparum* prevalence in children aged 2–10 years, at a resolution of 5 × 5 km^2, throughout all malaria endemic African countries for each year from 2000 to 2015. Second, an ensemble model was developed to predict malaria incidence as a function of parasite prevalence. The model was then applied to the estimated parasite prevalence in order to obtain estimates of the malaria case incidence at 5 × 5 km^2 resolution for each year from 2000 to 2015. 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 (*9*).

Table 6.2 Estimated malaria cases by WHO region, 2015

See methods notes for Table 6.1.

Figure 6.1 Estimated malaria cases (millions) by WHO region, 2015

See methods notes for Table 6.1.

Figure 6.3 Estimated country share of (a) total malaria cases and (b) *P. vivax* malaria cases, 2015

See methods notes for Table 6.1.

Table 6.3 Estimated malaria deaths, 2000–2015

Numbers of malaria deaths were estimated by two main categories of method.

Category 1 methods

Category 1 methods were used for countries outside Africa and for low-transmission countries in Africa.

Method 1(a). For countries in which vital registration is estimated to capture more than 50% of all deaths, and a high proportion of malaria cases are confirmed by parasite testing, reported malaria deaths are adjusted for completeness of death reporting.

Method 1b. For countries considered in the elimination programme phase as described in the *World Malaria Report 2015* (*10*), reported malaria deaths are adjusted for completeness of case reporting.

Method 1c. For other countries for which a Category 1 method was used, 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 (*11-13*) and rates from unpublished data from Indonesia, 2004–2009 (Dr Ric Price, Menzies School of Health Research, personal communication). 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. (*14*).

Category 2 method

A Category 2 method was used for countries in Africa with a high proportion of deaths due to malaria. In this method, child malaria deaths were estimated using a verbal autopsy multicause model developed by the Maternal and Child Health Epidemiology Estimation Group to estimate causes of death in children aged 1–59 months (*15*). Mortality estimates were derived for seven causes of post-neonatal death (pneumonia, diarrhoea, malaria, 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 mortality envelope of 1–59 months (excluding HIV/AIDS and measles deaths) for corresponding years. Estimated prevalence of malaria parasites (see methods notes for Table 6.1) was used as a covariate within the model. The malaria mortality rate in children aged under 5 years that was estimated with this method was then used to infer malaria-specific mortality in those aged over 5 years, using the relationship between levels of malaria mortality in a series of age groups and the intensity of malaria transmission (*16*).

Table 6.4 Estimated malaria deaths by WHO region, 2015

See methods notes for Table 6.3.

Figure 6.3 Estimated malaria deaths (thousands) by WHO region, 2015

See methods notes for Table 6.3.

Figure 6.4 Estimated country share of (a) total malaria deaths and (b) *P. vivax* malaria deaths, 2015

See methods notes for Table 6.3.

Figure 6.5 Estimated (a) parasite prevalence and (b) number of people infected, sub-Saharan Africa, 2005–2015

See methods notes for Table 6.1.

Figure 6.6 Reduction in malaria case incidence rate by WHO region, 2010–2015

See the methods notes for Table 6.1 for the estimation of the number of malaria cases. Incidence rates were derived by dividing estimated malaria cases by the population at

risk of malaria within each country. The total population of each country was taken from the 2015 revision of the *World population prospects* (*4*), and the proportion at risk of malaria was derived from NMCP reports.

Figure 6.7 Country-level changes in malaria case incidence rate, 2010–2015, by number of cases in 2010

See methods notes for Figure 6.6 for estimates of case incidence. See methods notes for Table 6.1 for estimates of number of cases.

Figure 6.8 Reduction in malaria mortality rate by WHO region, 2010–2015

See methods notes for Table 6.3 for estimation of number of deaths. Malaria death rates were derived by dividing annual malaria deaths by the midyear population at risk of malaria within each country. The total population of each country was taken from the 2015 revision of the *World population prospects* (*4*), and the proportion at risk of malaria was derived from NMCP reports. Where death rates were quoted for children aged under 5 years, the number of deaths estimated in children aged under 5 years was divided by the estimated number of children aged under 5 years at risk of malaria.

Figure 6.9 Country-level changes in malaria mortality rate 2010–2015, by number of deaths in 2010

See methods notes for Figure 6.8 for estimates of mortality rates. See methods notes for Table 6.3 for estimates of number of deaths.

Figure 6.10 Countries attaining zero indigenous malaria cases since 2000

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

Figure 6.11 Indigenous malaria cases in the years before attaining zero indigenous cases, for the 17 countries that eliminated malaria, 2000–2015

For the 17 countries that attained zero indigenous cases for 3 consecutive years between 2000 and 2015, the number of NMCP-reported indigenous cases was tabulated according to the number of years preceding the attainment of zero cases. Data from years before the peak number of cases were excluded. Thus, if a country had experienced zero cases and malaria returned, cases were only included from the year in which they peaked. This inclusion criterion generates a slope that is steeper than if cases from all years were included (because some increases are excluded). In some earlier years where data on indigenous case were not available, the total number of reported cases was used (i.e. for country years with larger numbers of cases, in which the proportion of imported cases is expected to be low).

Figure 6.12 Number of indigenous malaria cases for countries endemic for malaria in 2015, by WHO region

See methods notes for Table 6.1 for the estimation of number of cases. For 18 countries (Algeria, Belize, Bhutan, Cabo Verde, China, Democratic People's Republic of Korea, Dominican Republic, Ecuador, El Salvador, Iran [Islamic Republic of], Malaysia, Mexico, Panama, Republic of Korea, Saudi Arabia, Suriname, Swaziland and Tajikistan), estimates were based on indigenous cases only; these values were very close to the reported numbers of cases. For other countries in which the numbers of locally transmitted and imported cases were not individually available, estimates included imported cases; however, imported cases were expected to comprise only a small proportion of the large total number of cases in these countries.

Figure 6.13 and Table 6.5 Gains in life expectancy in malaria endemic countries, 2000–2015

The relative contribution of the decline in malaria mortality risk to total life expectancy gain between 2000 and 2015 was estimated using WHO annual life tables for 2000–2015 for countries with malaria transmission in 2000, and WHO estimates of malaria age-specific death rates (*17*). A cause-decomposition of life expectancy gain approach was followed, with the analysis conducted at WHO regional level (*18*).

Table 6.6 Economic value of reduced malaria mortality risk, estimated by full income approach, 2000–2015

Malaria mortality risk reductions between 2000 and 2015 were valued using a full income approach. The

analysis, which covered 106 countries with malaria transmission in 2000, was conducted from the current perspective by estimating how much individuals would need to be compensated in 2015 to accept malaria mortality risks at their year 2000 levels.

Changes in malaria mortality risk were valued as the payment that individuals would need to receive to accept an increase in mortality risk (*19*). This approach, referred to as value of a statistical life (VSL), is a common method for valuing mortality risks in public policy studies in high-income settings. It involves asking individuals about their willingness to accept (WTA) compensation for an increase in mortality risk, in "stated-preference" surveys (*20*). These surveys have placed a value of US$ 380 (range: US$ 189–569) on a 1 in 10 000 increase in mortality risk for a given year for individuals aged 50 years with an average life expectancy of 33 years, living in OECD countries that had an average GDP per capita of US$ 37 787 (in 2015 purchasing power parity [PPP] adjusted US$) (*20,21*). For this reference VSL to be applied to other settings, it is necessary to take into account differences in life expectancy and the GDP per capita using the following formula:

$$VSL_c = VSL_r \times \frac{e_{c50}}{33} \times \left(\frac{GDP_{pc}}{GDP_r}\right)^{\varepsilon}$$

Where:

VSL_c = VSL in country c;
e_{c50} = life expectancy at age 50 in country c;
33 = average remaining life expectancy, in years, at age 50 in OECD reference countries;
VSL_r = VSL in OECD reference countries;
GDP_c = 2015 GDP per capita in country c;
GDP_r = average GDP per capita in group of OECD reference countries, converted to 2015 equivalent; and
ε = income elasticity of the VSL_c to changes in GDP.

The income elasticity ε – that is, the responsiveness of the VSL to a change in income – was assumed to range between 1 and 1.4 (*20-22*). An ε equal to 1 reflects situations where individuals require the same proportional change in income as compensation for an increase in mortality risk, irrespective of income level. An ε greater than 1 reflects situations where, as income decreases, individuals require a smaller percentage of their income to accept an increase in mortality risk, because of competing basic needs in lower income populations, although this can vary across individual and community characteristics (*21,22*).

Changes in malaria mortality risks were valued as the sum of WTA of all individuals assumed to experience these changes; 2015 life tables were used, and the calculations were as described in Jamison et al. (*19*). VSL conversions used the OECD consumer price index data.[7] Calculations were conducted in 2015 US$, at PPP with GDP data sourced from the World Bank.[8] Probabilistic uncertainty analysis through 1000 Monte Carlo simulations was used to determine the mean and 95% uncertainty range for the value of change in mortality risk across malaria endemic countries in 2000–2015. The reference VSL was assigned a uniform distribution (range: US$ 189–569), as were elasticity values (range: 1–1.4).

7. https://data.oecd.org/price/inflation-cpi.htm#indicator-chart (accessed 1 November 2016)
8. http://databank.worldbank.org/data/home.aspx (accessed 1 November 2016)

References

1. WHO. Global Technical Strategy for Malaria 2016–2030. Geneva: World Health Organization (WHO); 2015 (http://www.who.int/malaria/areas/global_technical_strategy/en, accessed 16 November 2016).
2. Roll Back Malaria Partnership. Action and investment to defeat malaria 2016–2030. For a Malaria free World. Geneva: World Health Organization (WHO); 2015 (http://www.rollbackmalaria.org/files/files/aim/RBM_AIM_Report_A4_EN-Sept2015.pdf, accessed 16 November 2016).
3. Malaria Policy Advisory Committee. Monitoring and evaluation of the *Global Technical Strategy for Malaria 2016–2030 and Action and investment to defeat malaria 2016–2030*. Background document for Session 8, Malaria Policy Advisory Committee Meeting, 14–16 September 2016, Geneva, Switzerland: World Health Organization; 2016 (http://www.who.int/malaria/mpac/mpac-sept2016-SME-recommendations-session8.pdf?ua=1l, accessed 17 November 2016).
4. UN. Revision of world population prospects [website]. United Nations; 2015 (http://esa.un.org/unpd/wpp, accessed 1 August 2015).
5. 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.
6. 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.
7. 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.
8. WHO. World Malaria Report. Geneva: World Health Organization; 2008 (http://www.who.int/malaria/publications/atoz/9789241563697/en, accessed 15 October 2013).
9. 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):207–211.
10. WHO. World Malaria Report. Geneva: World Health Organization; 2015 (http://www.who.int/malaria/publications/world-malaria-report-2015/report/en/, accessed 15 October 2013).
11. Alles HK, Mendis KN, Carter R. Malaria mortality rates in South Asia and in Africa: implications for malaria control. Parasitol Today. 1998;14(9):369–375.
12. 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):256–262.
13. Meek SR. Epidemiology of malaria in displaced Khmers on the Thai-Kampuchean border. Southeast Asian J Trop Med Public Health. 1988;19(2):243–252.
14. 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.
15. 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):430–440.

16. 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.

17. WHO. WHO methods and data sources for life tables 1990–2015. Department of Information, Evidence and Research, Global Health Estimates Technical Paper WHO/HIS/IER/GHE/2016.8, Geneva: World Health Organization (WHO); 2016.

18. Beltran-Sanchez H, Preston S, Canudas-Romo V. An integrated approach to cause-of-death analysis: cause-deleted life tables and decompositions of life expectancy. Demography Res. 2008;19:1323–1350.

19. Jamison DT, Summers LH, Alleyne G, Arrow KJ, Berkley S, Binagwaho A et al. Global health 2035: a world converging within a generation. Lancet. 2013;382(9908):1898-1955

20. OECD. Mortality risk valuation in environment, health and transport policies. OECD Publishing. 2012 (http://dx.doi.org/10.1787/9789264130807-en, accessed 30 November 2016).

21. Hammitt J, Robinson L. The income elasticity of the value per statistical life: transferring estimates between high and low income populations. J Benefit-Cost Anal. 2011;2(1).

22. Narain U, Sall C. Methodology for valuing the health impacts of air pollution: discussion of challenges and proposed solutions. Washington, World Bank Group 2016.

355 million
people at risk for malaria in 2015
297 million
at high risk

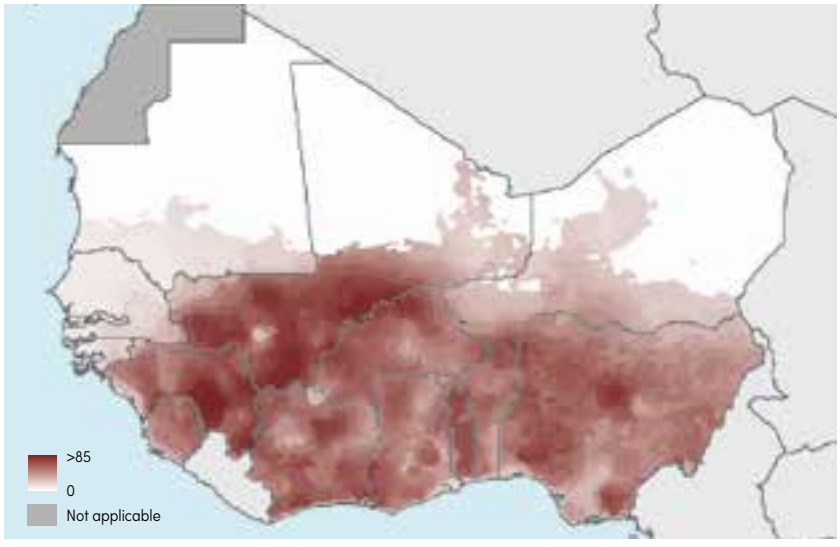
Funding for malaria increased from
US$ 233 million
to
US$ 262 million
between 2010 and 2015

Estimated malaria case incidence
decreased by 15%
between 2010 and 2015

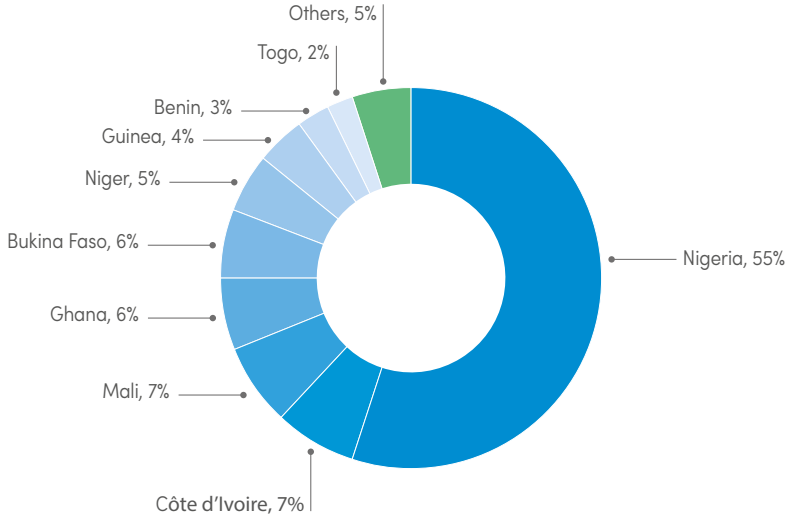
Estimated malaria mortality rate
reduced by 29%
between 2010 and 2015

Zero countries eliminated malaria
since 2010

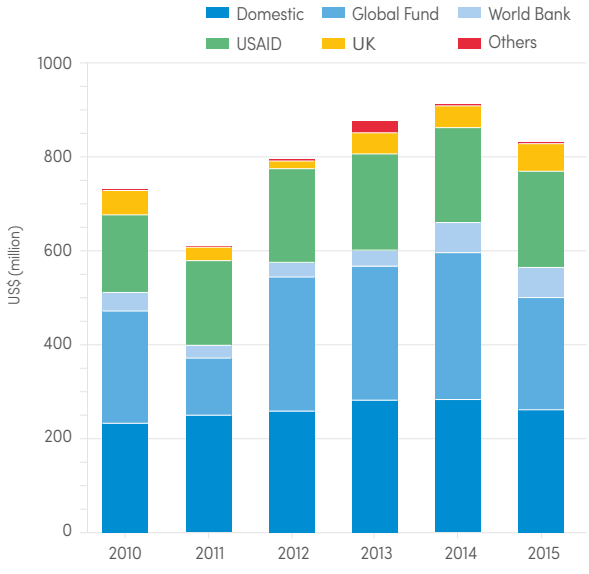
A. Parasite prevalence, 2015



B. Share of malaria cases, 2015

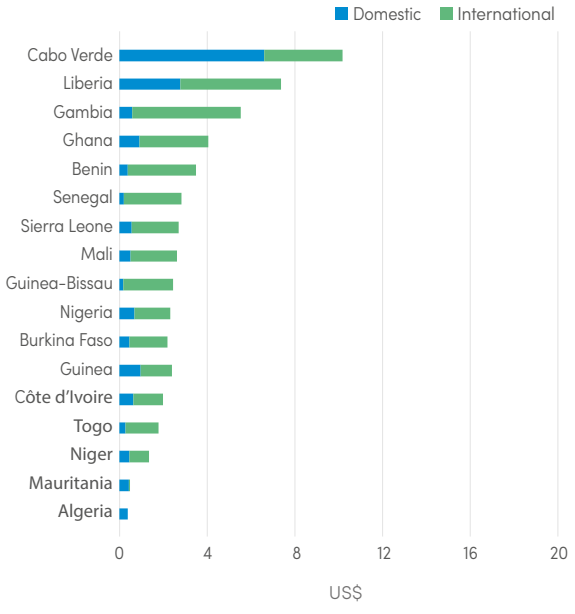


C. Malaria funding by source, 2010–2015

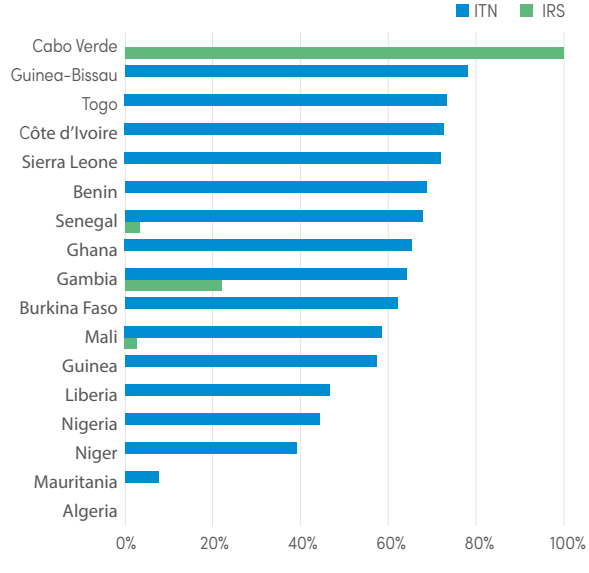


Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USAID, United States Agency for International Development

D. Malaria funding per person at risk, average 2013–2015

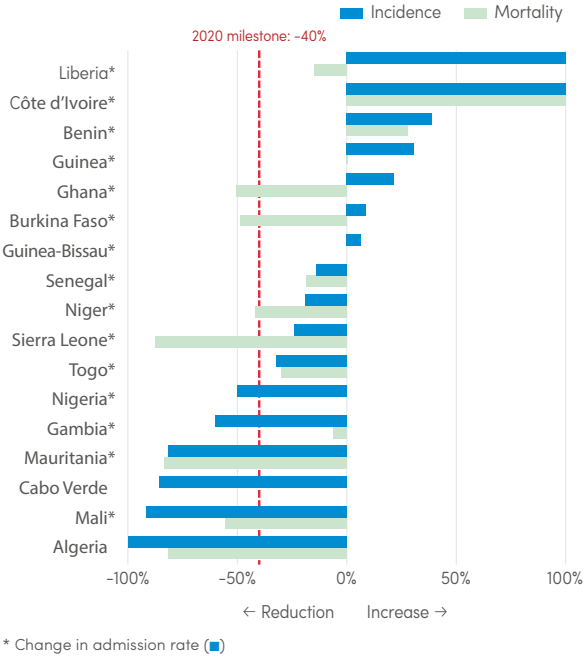


E. Proportion of population sleeping under an ITN or protected with IRS, 2015



IRS, indoor residual spraying; ITN, insecticide-treated mosquito net

F. Change in reported malaria incidence and mortality rates, 2010–2015



* Change in admission rate (■)

174 million
people at risk for malaria in 2015
161 million
at high risk

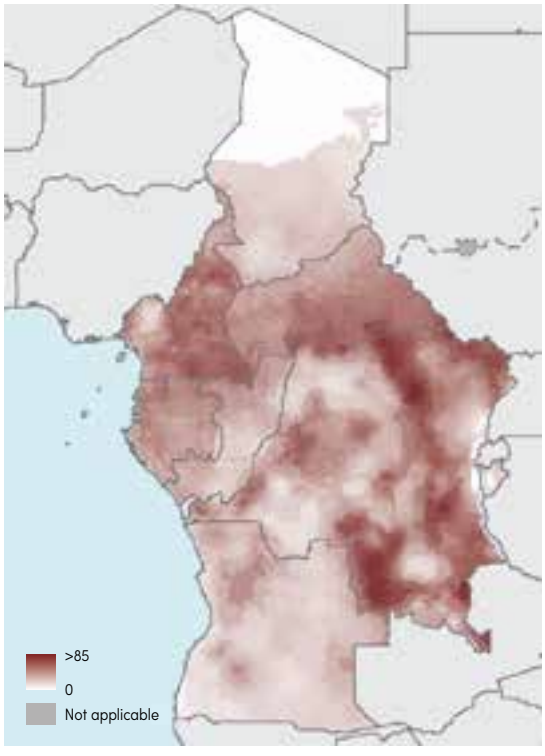
Funding for malaria increased from
US$ 65 million
to
US$ 116 million
between 2010 and 2015

Estimated malaria case incidence
decreased by 33%
between 2010 and 2015

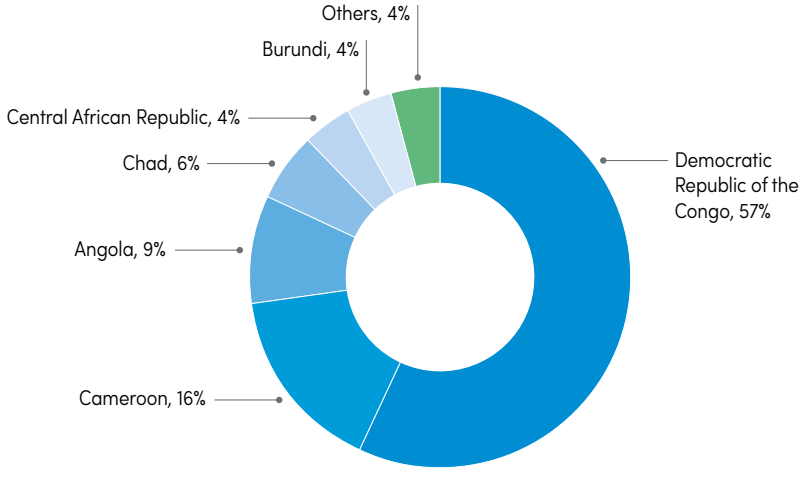
Estimated malaria mortality rate
reduced by 42%
between 2010 and 2015

Zero countries eliminated malaria
since 2010

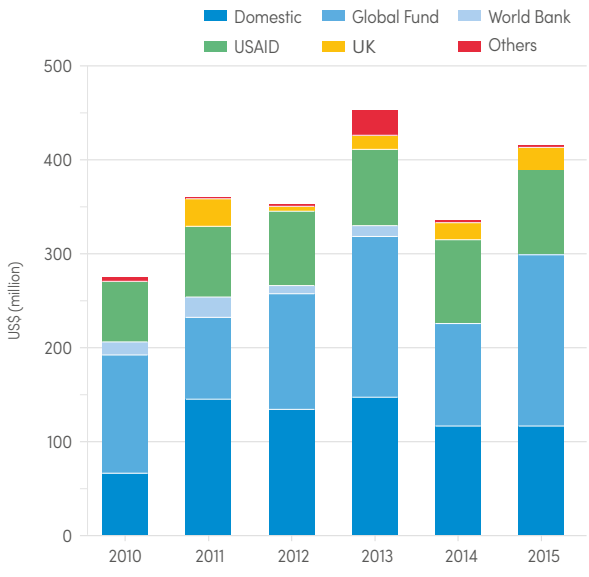
A. Parasite prevalence, 2015



B. Share of malaria cases, 2015

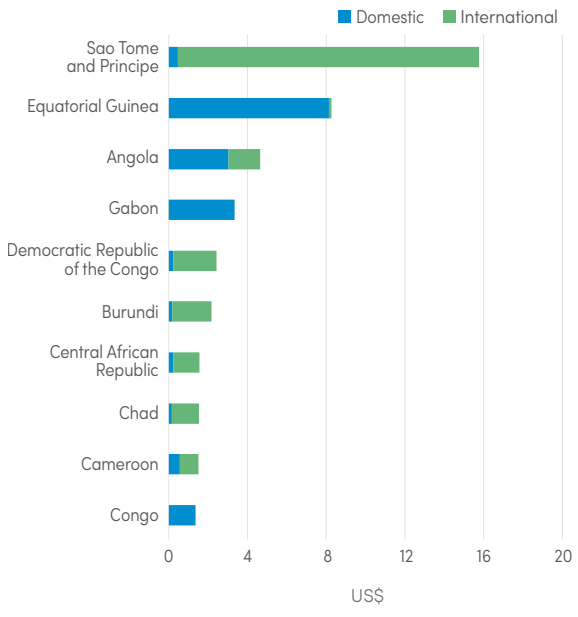


C. Malaria funding by source, 2010–2015

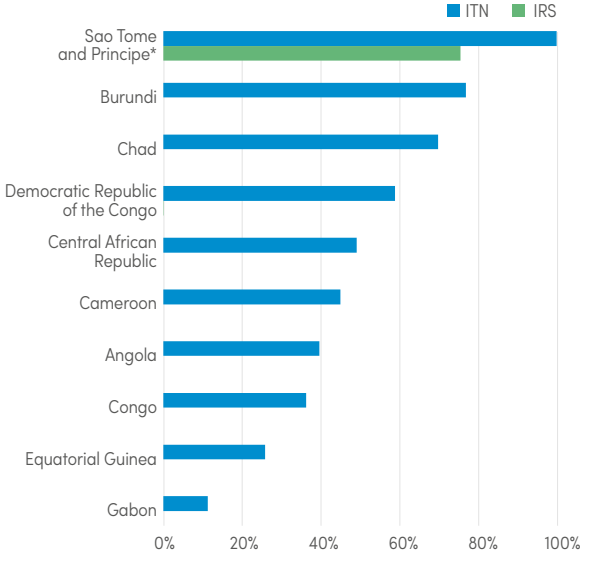


Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USAID, United States Agency for International Development

D. Malaria funding per person at risk, average 2013–2015



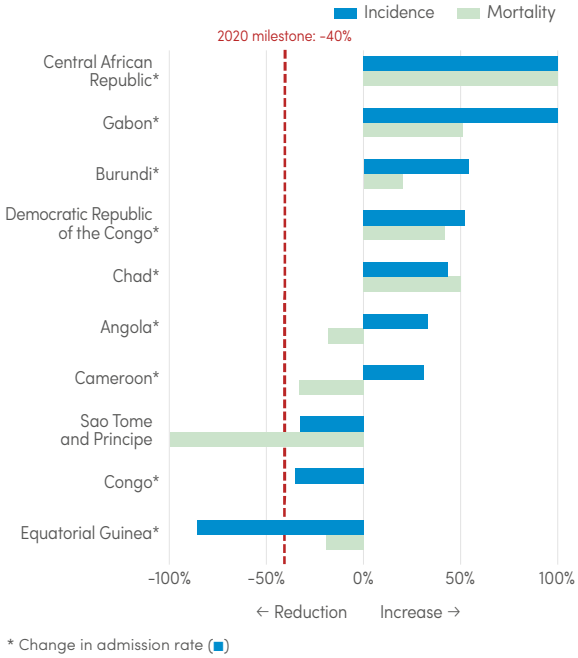
E. Proportion of population sleeping under an ITN or protected with IRS, 2015



IRS, indoor residual spraying; ITN, insecticide-treated mosquito net

* Administrative ITN coverage

F. Change in reported malaria incidence and mortality rates, 2010–2015



* Change in admission rate (■)

319 million
people at risk for malaria in 2015
232 million
at high risk

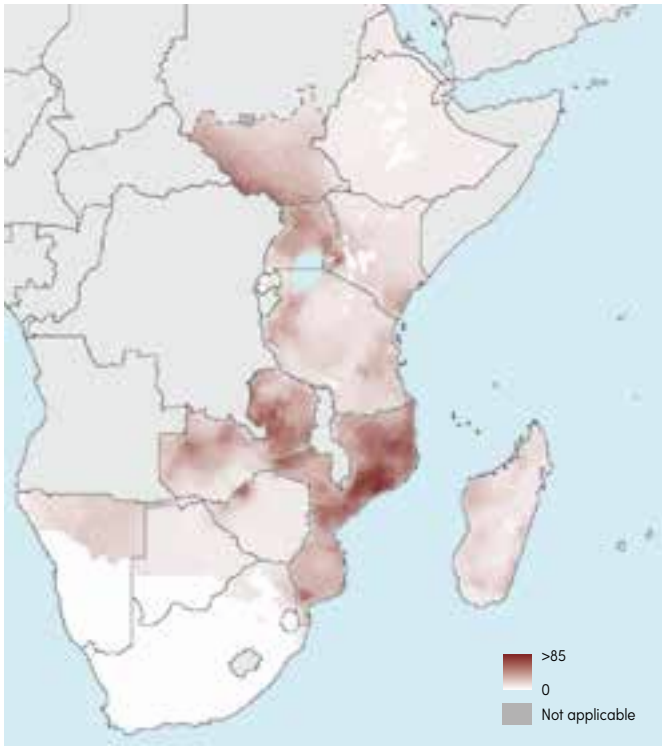
Funding for malaria decreased from **US$ 156 million to US$ 150 million** between 2010 and 2015

Estimated malaria case incidence **decreased by 22%** between 2010 and 2015

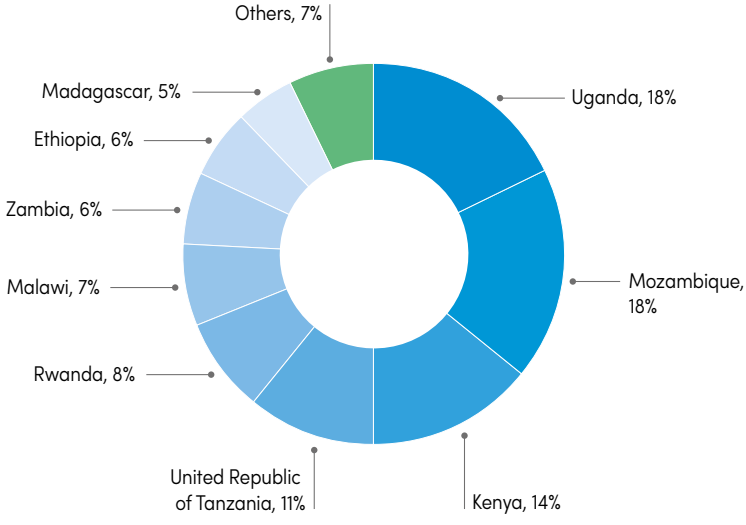
Estimated malaria mortality rate **reduced by 22%** between 2010 and 2015

Zero countries eliminated malaria since 2010

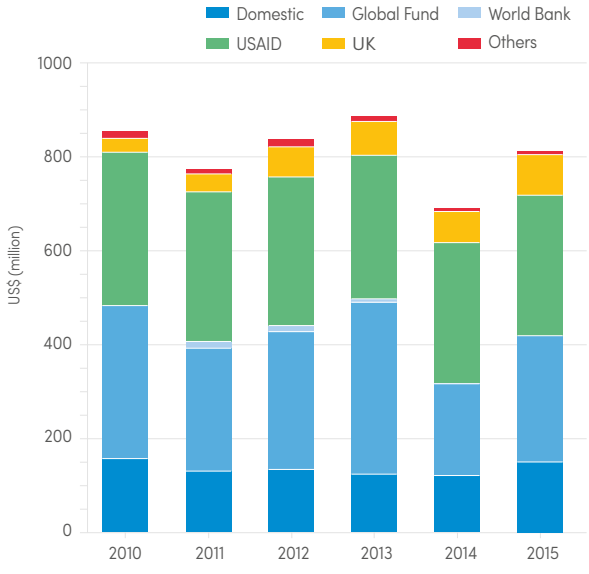
A. Parasite prevalence, 2015



B. Share of malaria cases, 2015

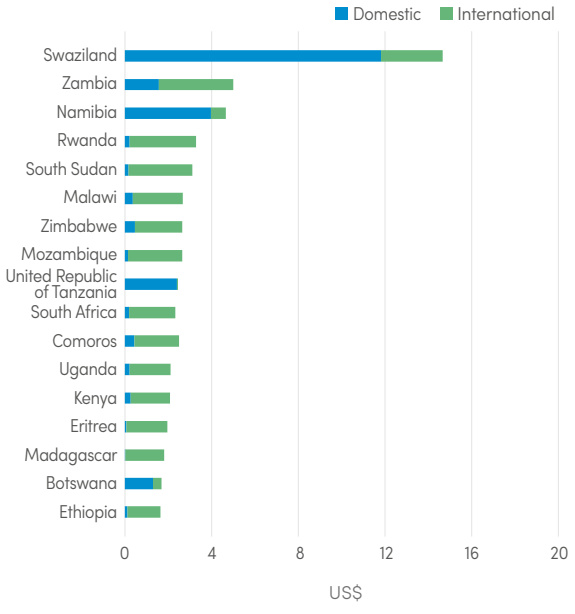


C. Malaria funding by source, 2010–2015

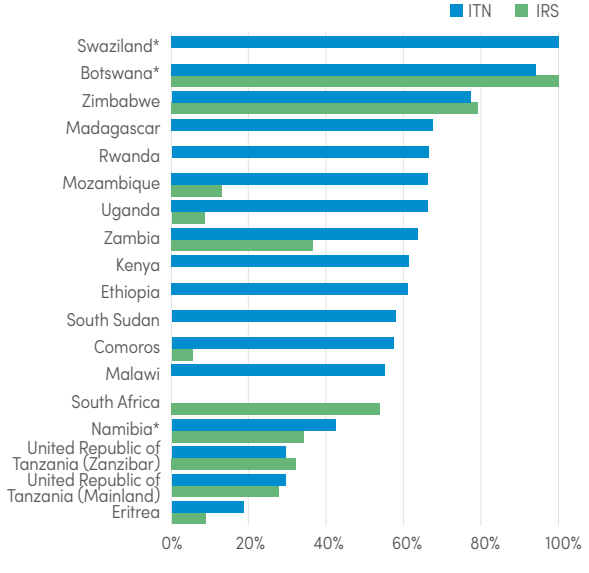


Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USAID, United States Agency for International Development

D. Malaria funding per person at risk, average 2013–2015



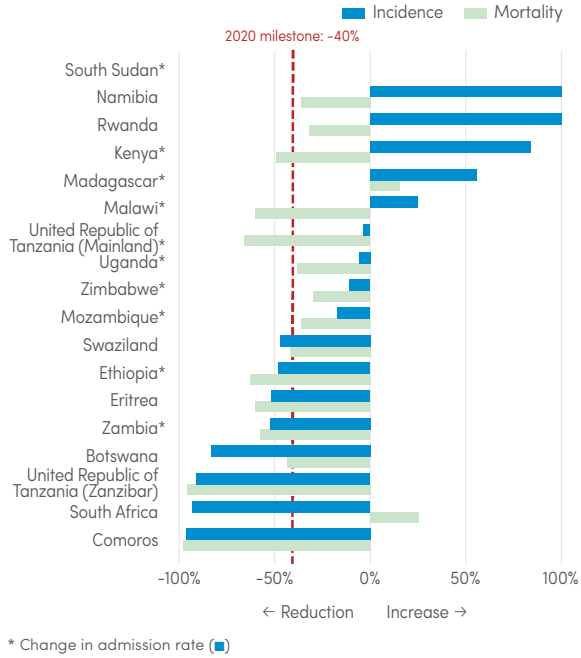
E. Proportion of population sleeping under an ITN or protected with IRS, 2015



IRS, indoor residual spraying; ITN, insecticide-treated mosquito net

* Administrative ITN coverage

F. Change in reported malaria incidence and mortality rates, 2010–2015



* Change in admission rate (■)

132 million
people at risk for malaria in 2015
21 million
at high risk

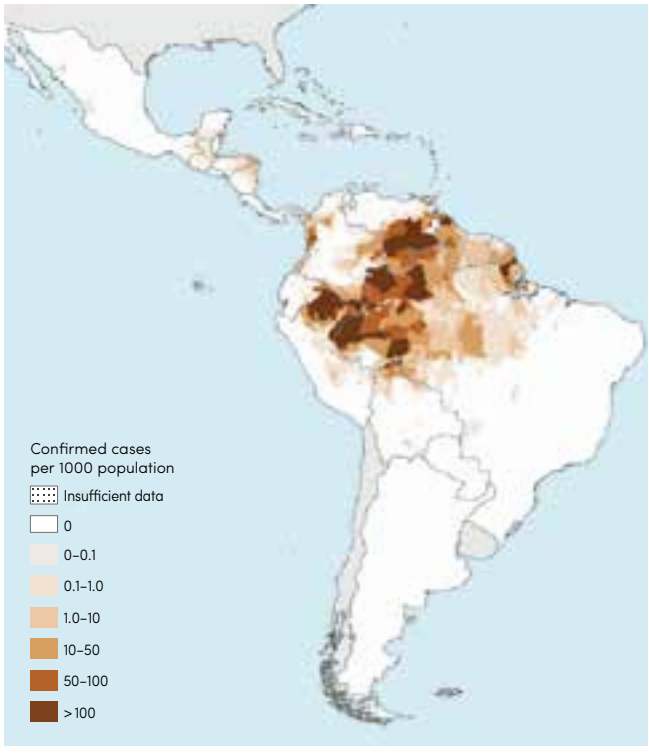
Funding for malaria increased from
US$ 170 million
to
US$ 201 million
between 2010 and 2015

Estimated malaria case incidence **decreased by 31%** between 2010 and 2015

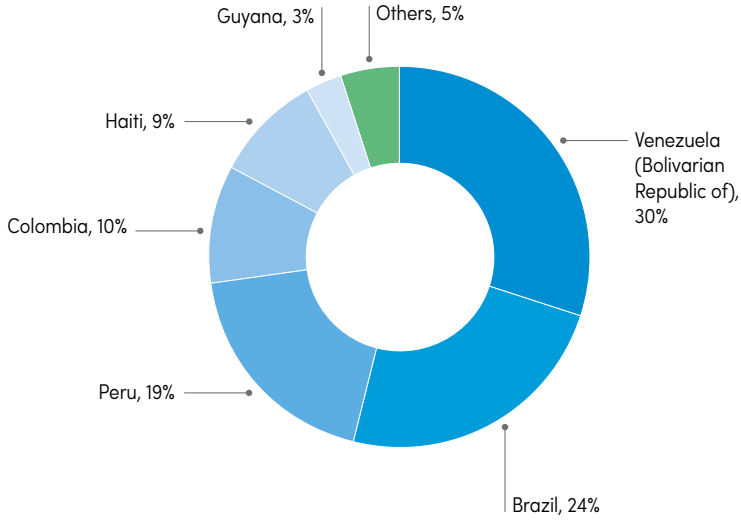
Estimated malaria mortality rate **reduced by 37%** between 2010 and 2015

Three countries achieved zero indigenous cases for 3 years
since 2010

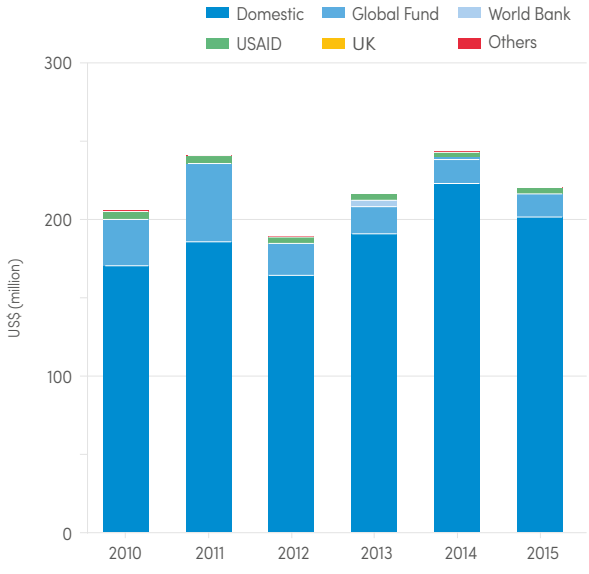
A. Confirmed malaria cases per 1000 population, 2015



B. Share of malaria cases, 2015

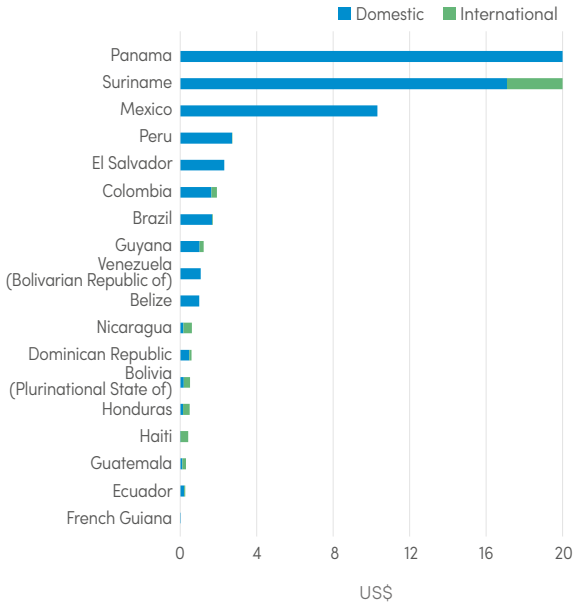


C. Malaria funding by source, 2010–2015

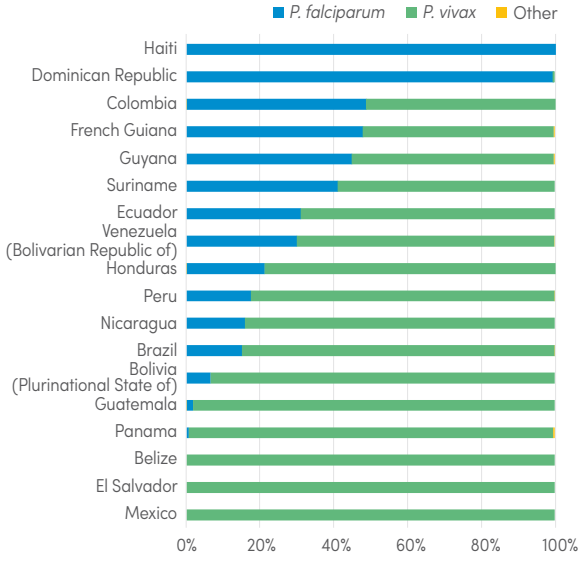


Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USAID, United States Agency for International Development

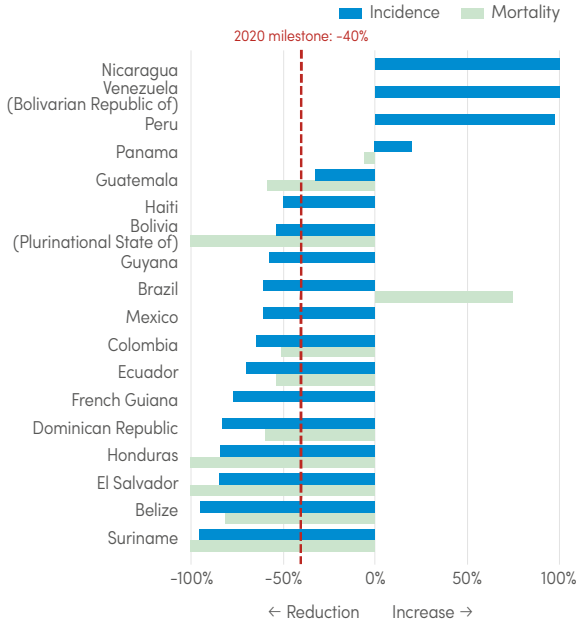
D. Malaria funding per person at risk, average 2013–2015



E. Proportion of cases due to *P. falciparum* and *P. vivax*, 2013–2015



F. Change in reported malaria incidence and mortality rates, 2010–2015



291 million
people at risk for malaria in 2015
111 million
at high risk

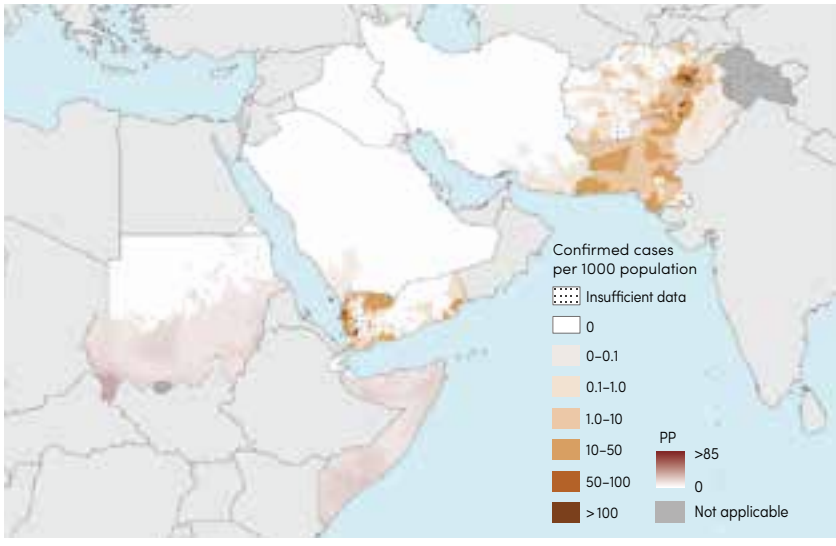
Funding for malaria decreased from **US$ 55 million to US$ 45 million** between 2010 and 2015

Estimated malaria case incidence **decreased by 11%** between 2010 and 2015

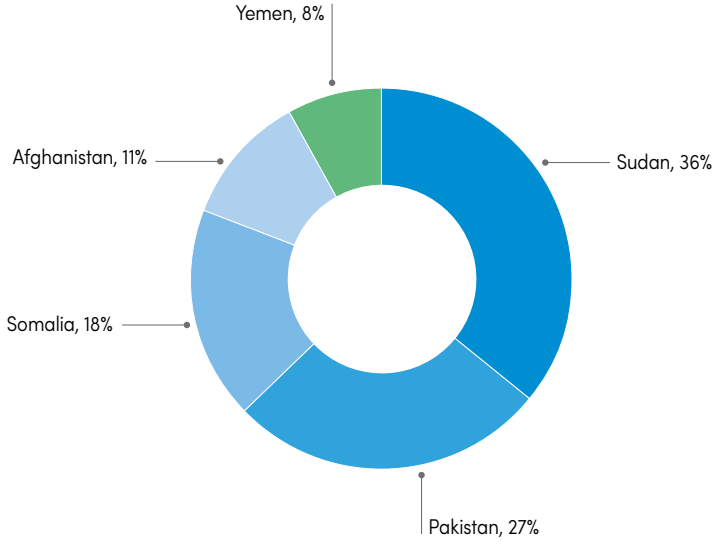
Estimated malaria mortality rate **reduced by 6%** between 2010 and 2015

One country achieved zero indigenous cases for 3 years since 2010

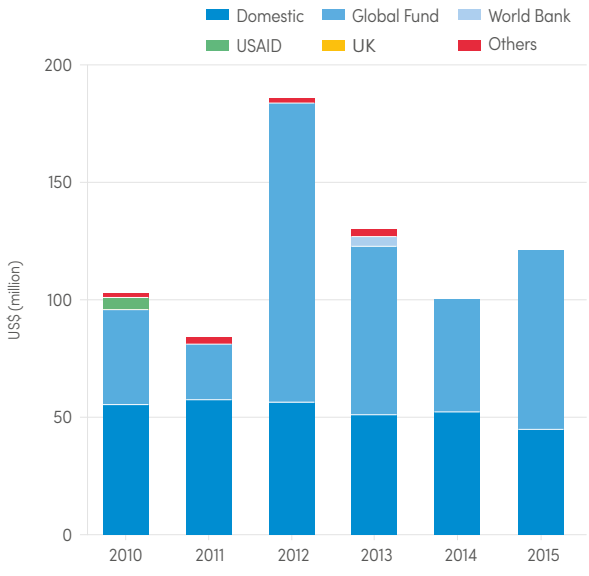
A. Confirmed malaria cases per 1000 population/parasite prevalence (PP), 2015



B. Share of malaria cases, 2015

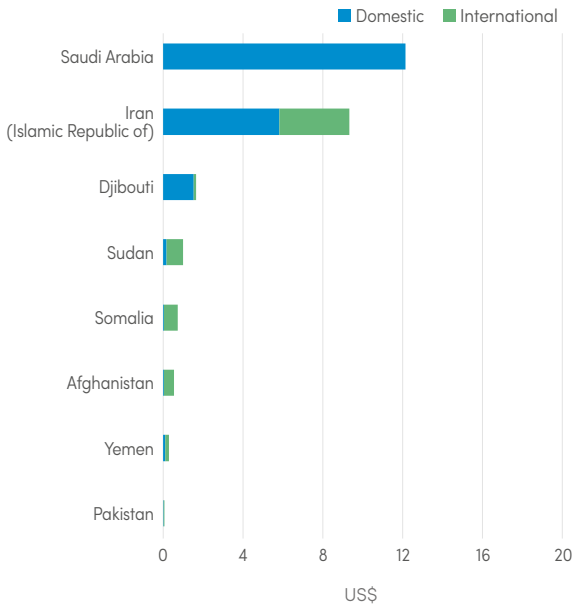


C. Malaria funding by source, 2010–2015

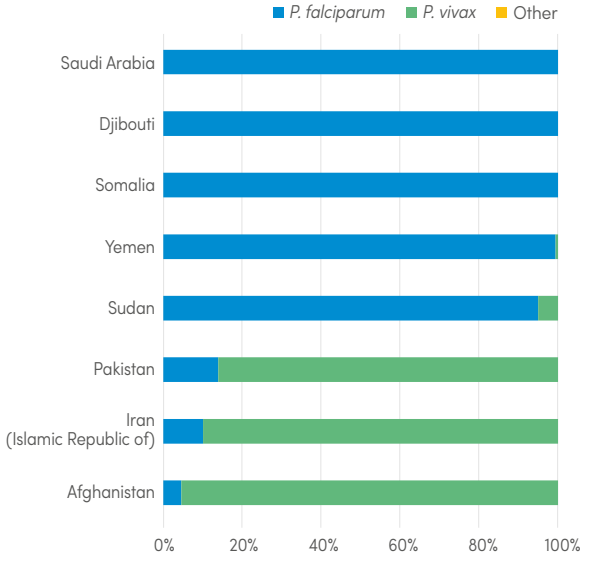


Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USAID, United States Agency for International Development

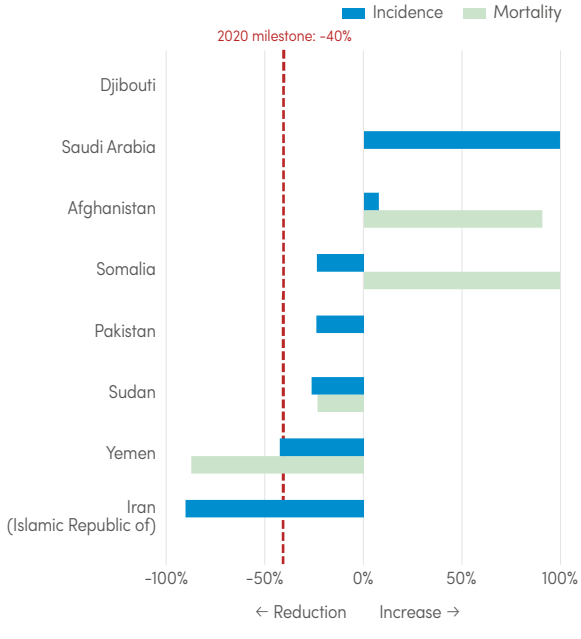
D. Malaria funding per person at risk, average 2013–2015



E. Proportion of cases due to *P. falciparum* and *P. vivax*, 2013–2015



F. Change in reported malaria incidence and mortality rates, 2010–2015



1.4 billion
people at risk for malaria in 2015
237 million
at high risk

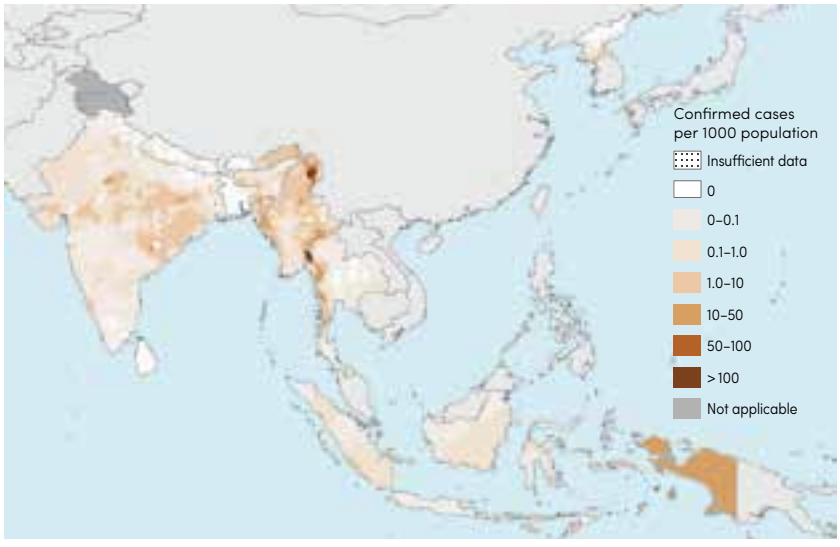
Funding for malaria decreased from **US$ 170 million to US$ 92 million** between 2010 and 2015

Estimated malaria case incidence **decreased by 54%** between 2010 and 2015

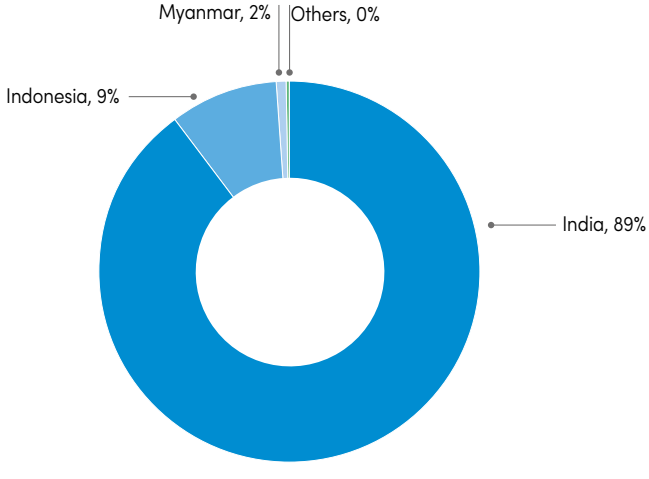
Estimated malaria mortality rate **reduced by 46%** between 2010 and 2015

One country achieved zero indigenous cases for 3 years since 2010

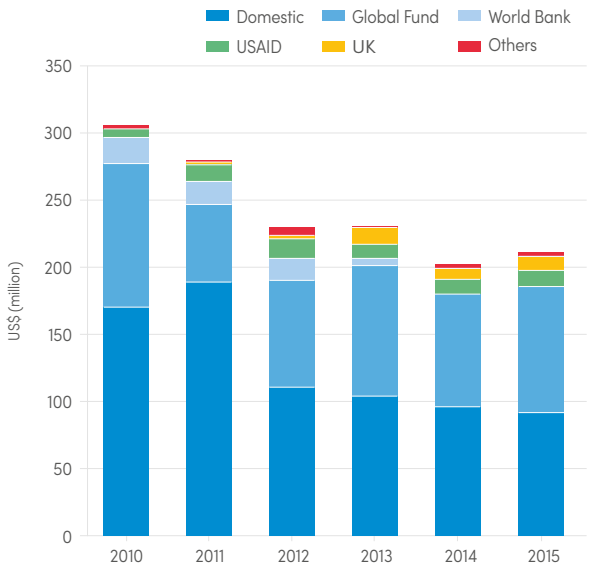
A. Confirmed malaria cases per 1000 population, 2015



B. Share of malaria cases, 2015

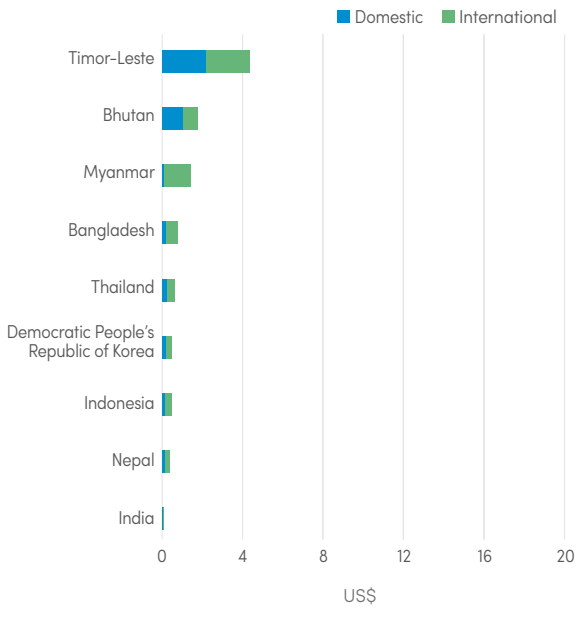


C. Malaria funding by source, 2010–2015

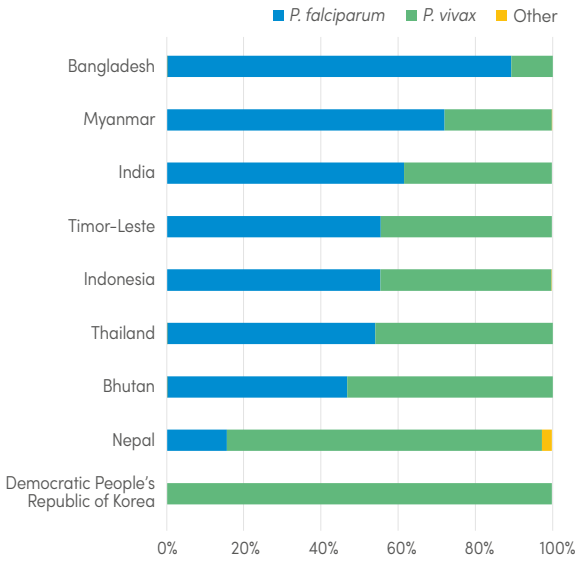


Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USAID, United States Agency for International Development

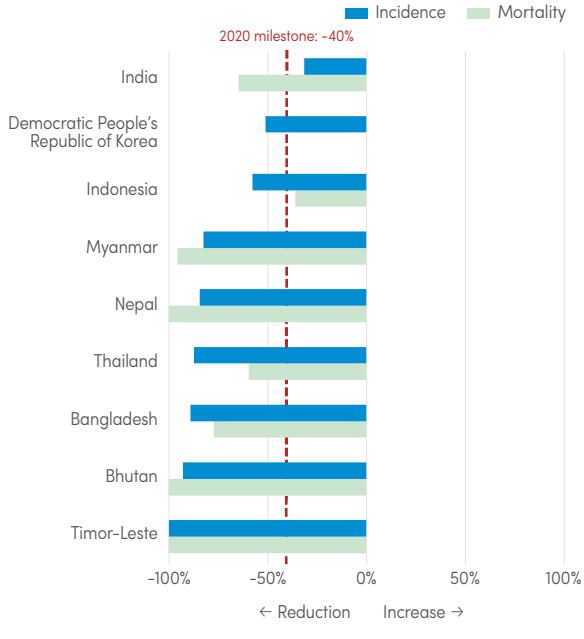
D. Malaria funding per person at risk, average 2013–2015



E. Proportion of cases due to *P. falciparum* and *P. vivax*, 2013–2015



F. Change in reported malaria incidence and mortality rates, 2010–2015



740 million
people at risk for malaria in 2015
32 million
at high risk

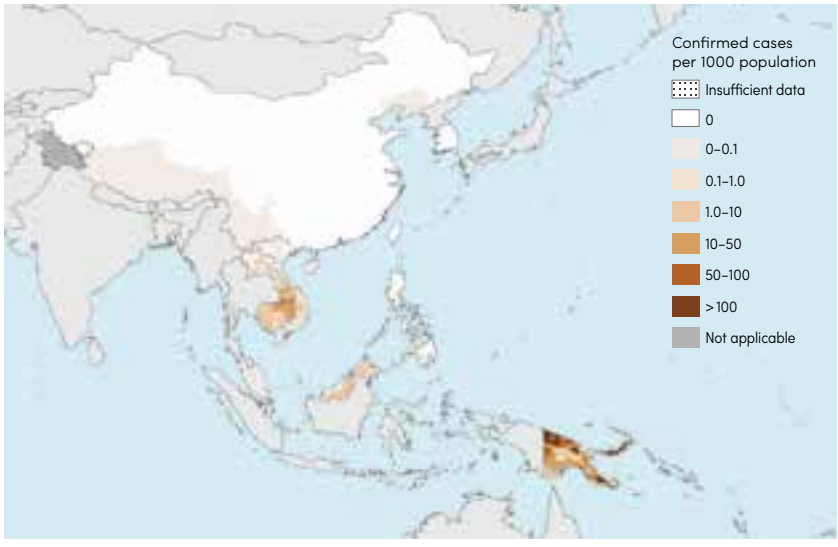
Funding for malaria increased from
US$ 29 million
to
US$ 50 million
between 2010 and 2015

Estimated malaria case incidence
decreased by 30%
between 2010 and 2015

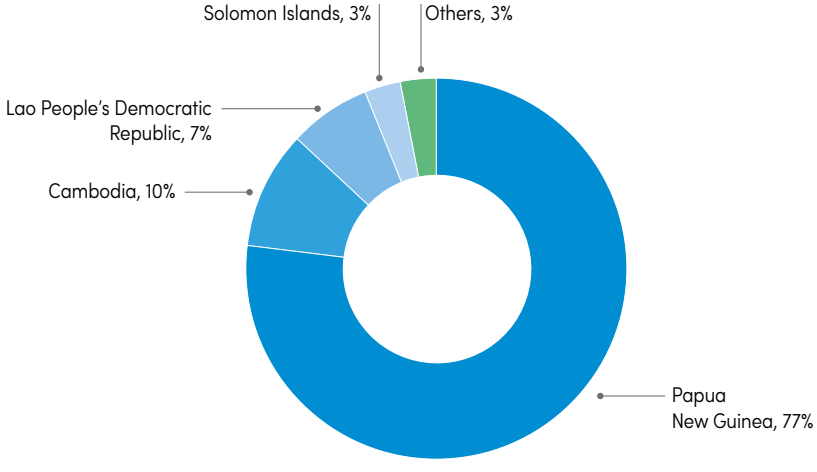
Estimated malaria mortality rate
reduced by 58%
between 2010 and 2015

Zero countries eliminated malaria
since 2010

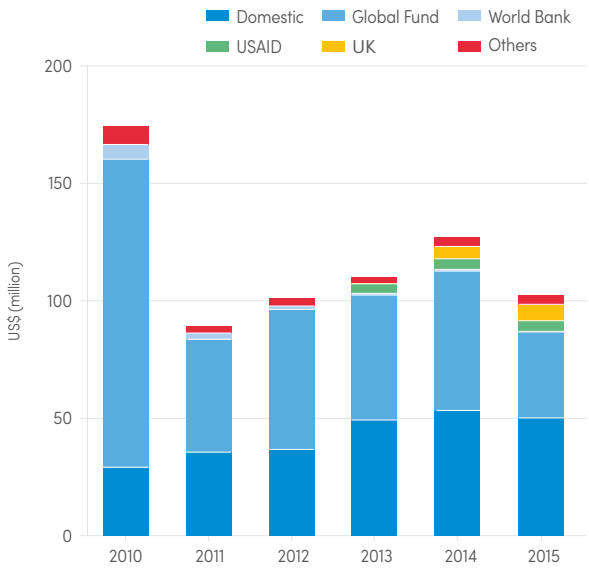
A. Confirmed malaria cases per 1000 population, 2015



B. Share of malaria cases, 2015

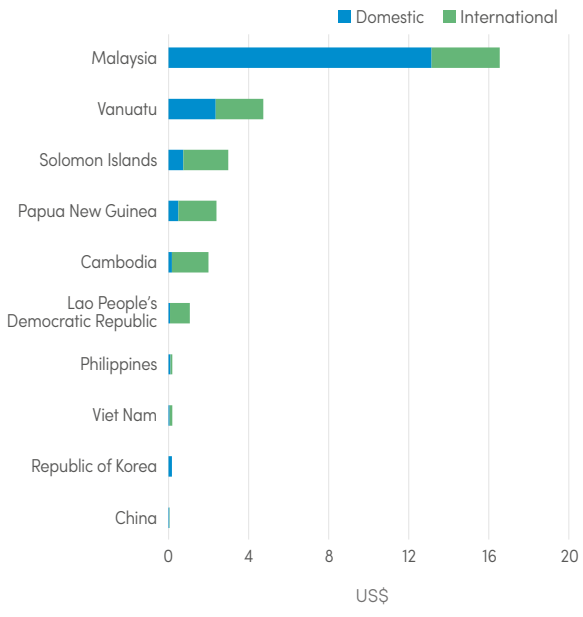


C. Malaria funding by source, 2010–2015

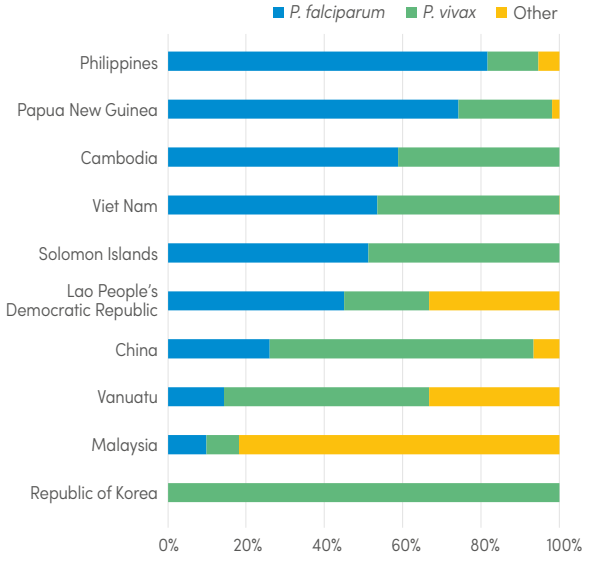


Global Fund, Global Fund to Fight AIDS, Tuberculosis and Malaria; UK, United Kingdom of Great Britain and Northern Ireland; USAID, United States Agency for International Development

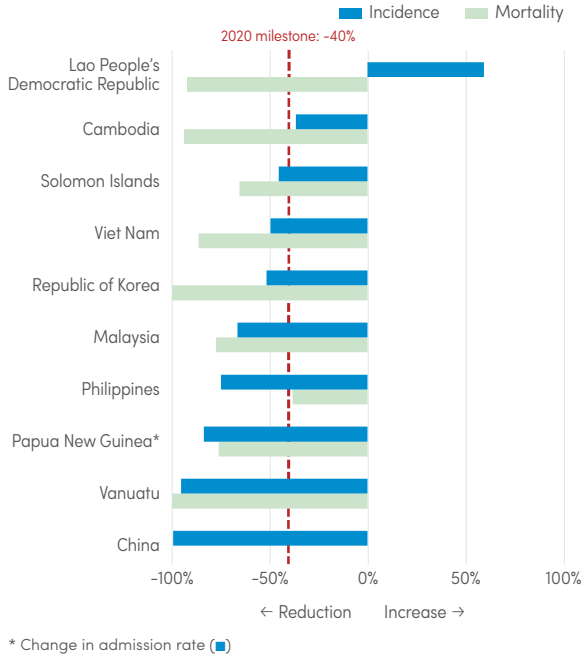
D. Malaria funding per person at risk, average 2013–2015



E. Proportion of cases due to *P. falciparum* and *P. vivax*, 2013–2015

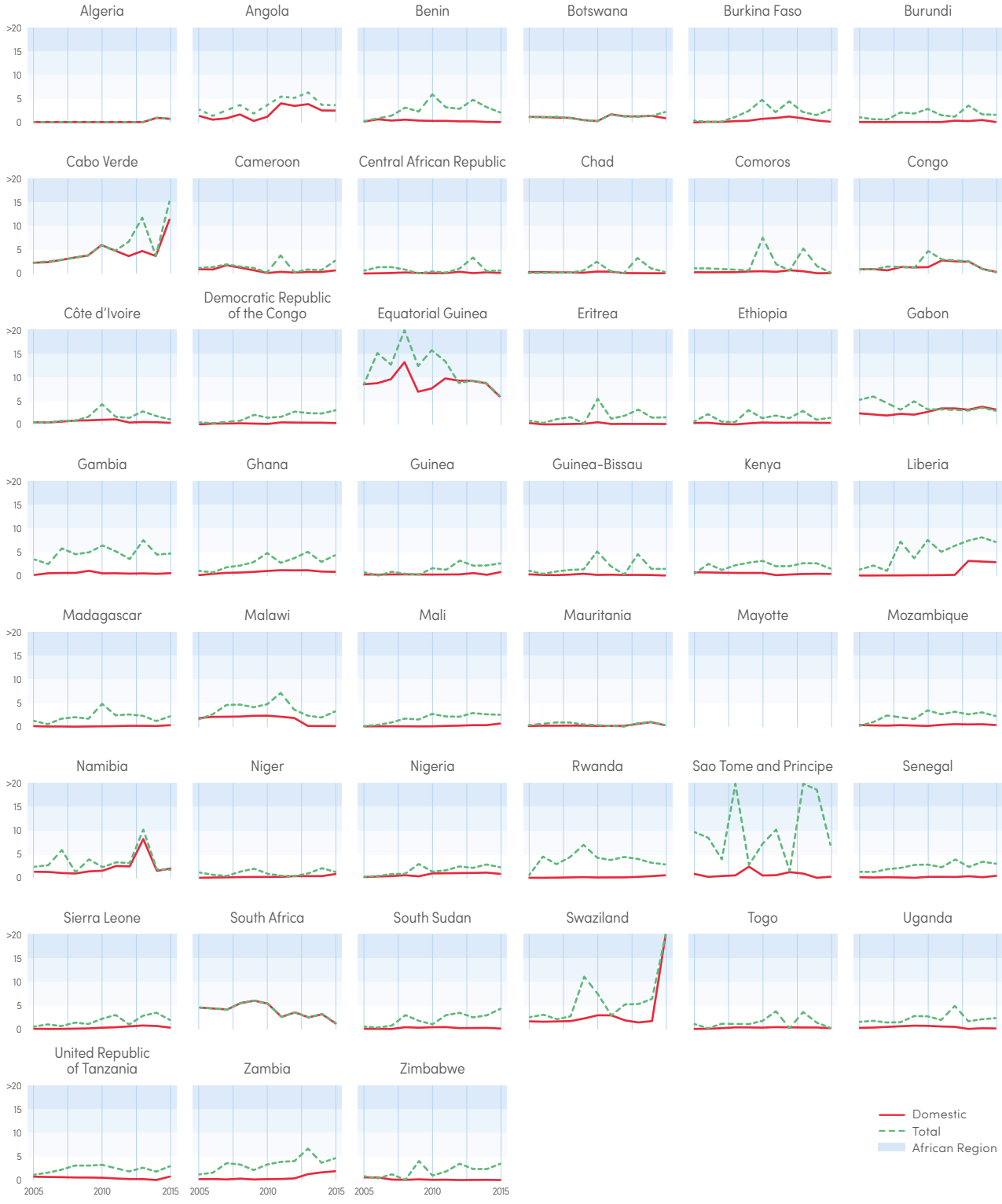


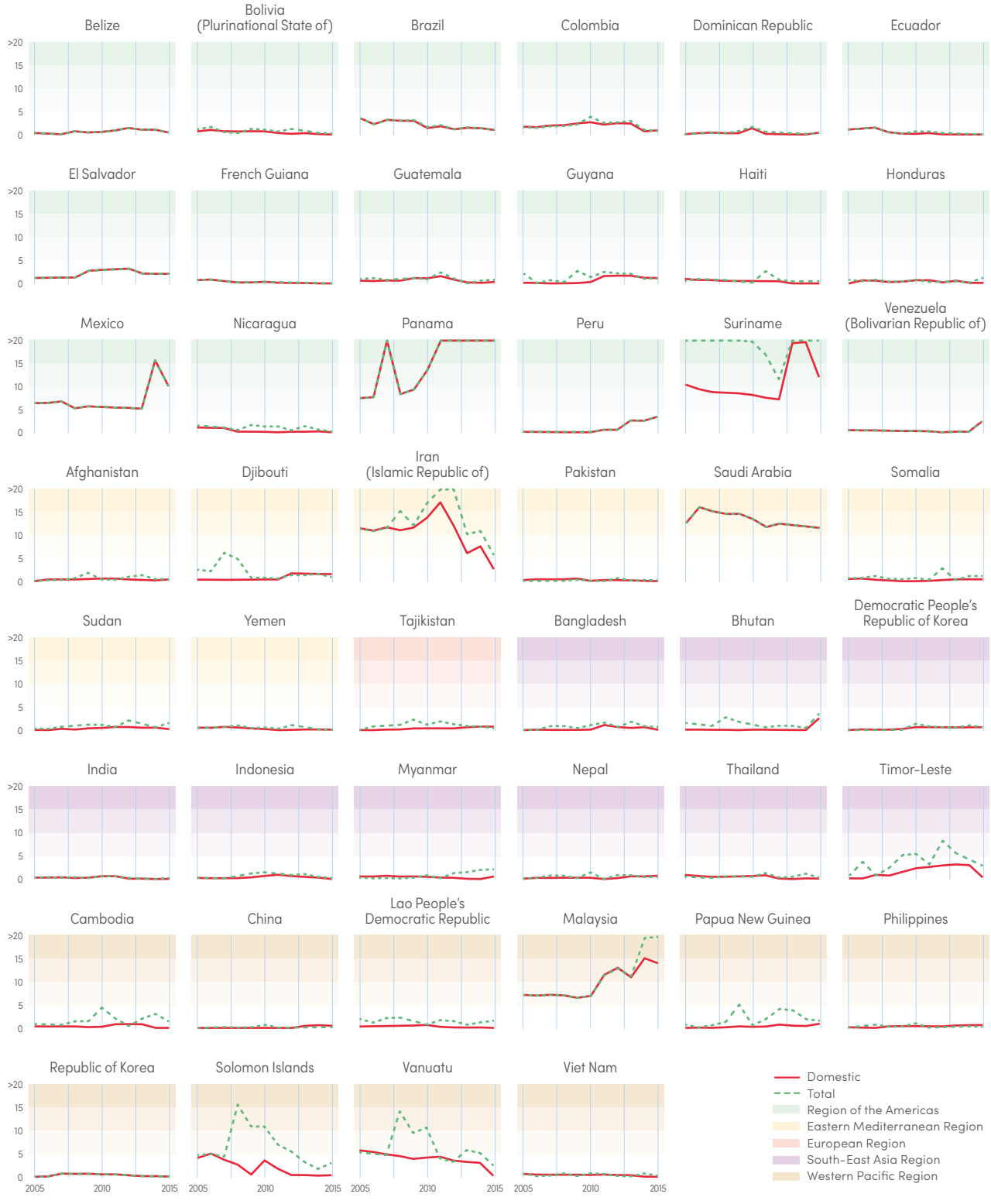
F. Change in reported malaria incidence and mortality rates, 2010–2015



* Change in admission rate (■)

Annex 3 – A. Funding per capita for malaria control and elimination
(in US$)

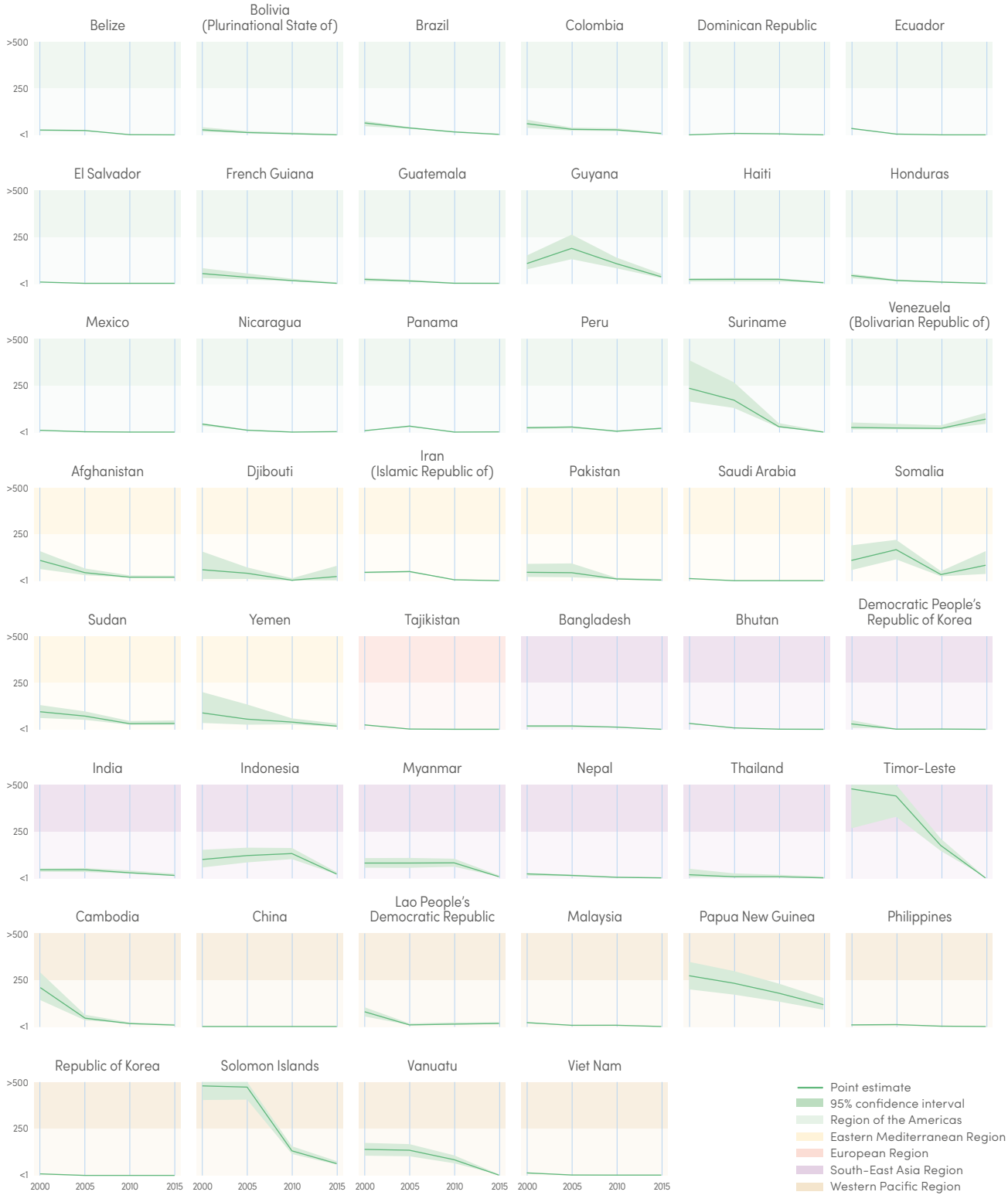



Belize
Bolivia (Plurinational State of)
Brazil
Colombia
Dominican Republic
Ecuador
El Salvador
French Guiana
Guatemala
Guyana
Haiti
Honduras
Mexico
Nicaragua
Panama
Peru
Suriname
Venezuela (Bolivarian Republic of)
Afghanistan
Djibouti
Iran (Islamic Republic of)
Pakistan
Saudi Arabia
Somalia
Sudan
Yemen
Tajikistan
Bangladesh
Bhutan
Democratic People's Republic of Korea
India
Indonesia
Myanmar
Nepal
Thailand
Timor-Leste
Cambodia
China
Lao People's Democratic Republic
Malaysia
Papua New Guinea
Philippines
Republic of Korea
Solomon Islands
Vanuatu
Viet Nam
>20
15
10
5
0
2005
2010
2015
Domestic
Total
Region of the Americas
Eastern Mediterranean Region
European Region
South-East Asia Region
Western Pacific Region

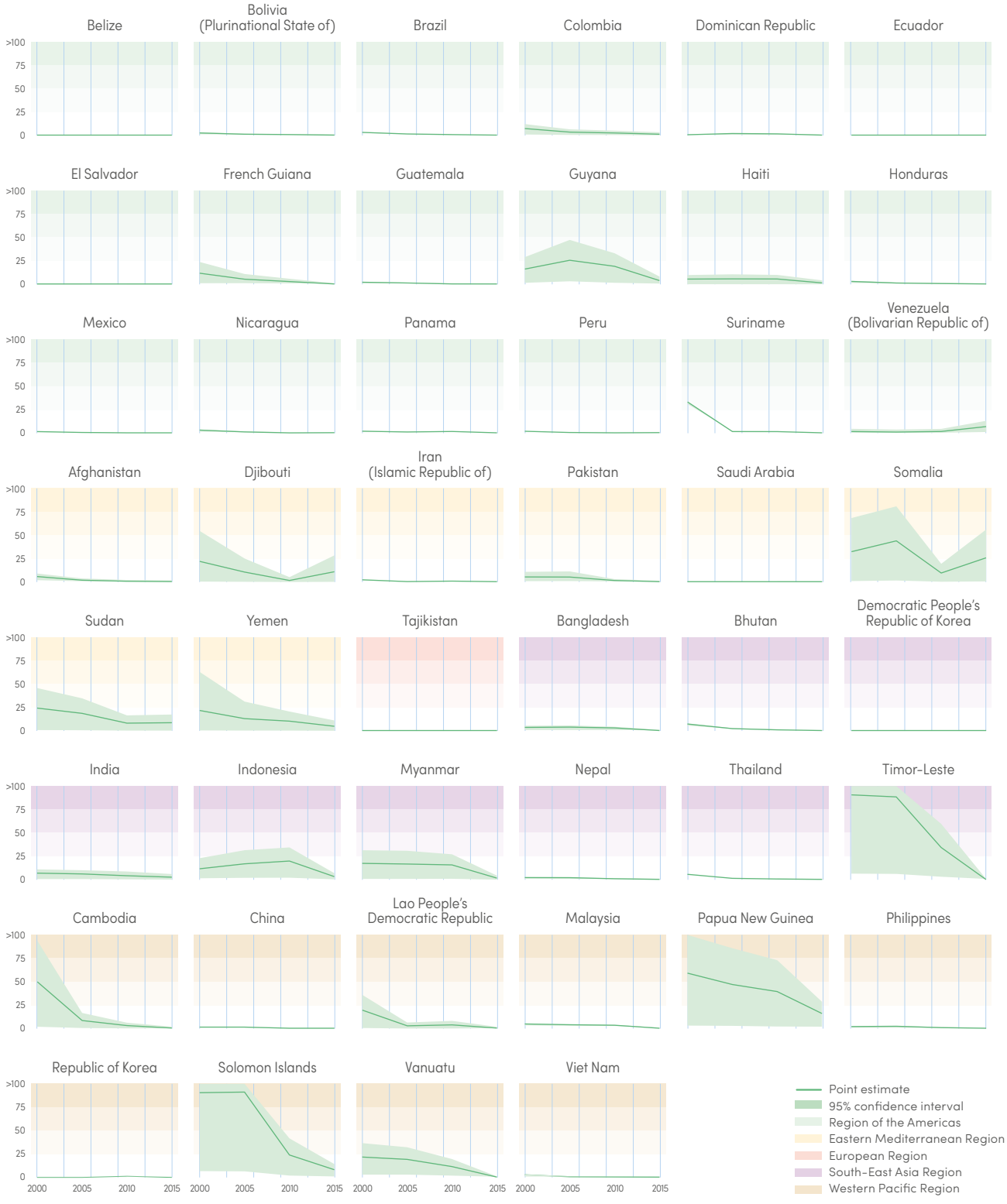
Annex 3 – B. Proportion of population at risk sleeping under an ITN

No model estimates are available for Algeria, Botswana, Cabo Verde, Mayotte, Namibia, Sao Tome and Principe, South Africa and Swaziland, because ITNs are not the primary method of vector control in these countries

Annex 3 – C. Estimated malaria case incidence rate
(cases per 1000 population at risk)


Belize
Bolivia (Plurinational State of)
Brazil
Colombia
Dominican Republic
Ecuador
El Salvador
French Guiana
Guatemala
Guyana
Haiti
Honduras
Mexico
Nicaragua
Panama
Peru
Suriname
Venezuela (Bolivarian Republic of)
Afghanistan
Djibouti
Iran (Islamic Republic of)
Pakistan
Saudi Arabia
Somalia
Sudan
Yemen
Tajikistan
Bangladesh
Bhutan
Democratic People's Republic of Korea
India
Indonesia
Myanmar
Nepal
Thailand
Timor-Leste
Cambodia
China
Lao People's Democratic Republic
Malaysia
Papua New Guinea
Philippines
Republic of Korea
Solomon Islands
Vanuatu
Viet Nam
>500
250
<1
2000
2005
2010
2015
Point estimate
95% confidence interval
Region of the Americas
Eastern Mediterranean Region
European Region
South-East Asia Region
Western Pacific Region

Annex 3 – D. Estimated malaria mortality rate
(deaths per 100 000 population at risk)


Belize
Bolivia (Plurinational State of)
Brazil
Colombia
Dominican Republic
Ecuador
El Salvador
French Guiana
Guatemala
Guyana
Haiti
Honduras
Mexico
Nicaragua
Panama
Peru
Suriname
Venezuela (Bolivarian Republic of)
Afghanistan
Djibouti
Iran (Islamic Republic of)
Pakistan
Saudi Arabia
Somalia
Sudan
Yemen
Tajikistan
Bangladesh
Bhutan
Democratic People's Republic of Korea
India
Indonesia
Myanmar
Nepal
Thailand
Timor-Leste
Cambodia
China
Lao People's Democratic Republic
Malaysia
Papua New Guinea
Philippines
Republic of Korea
Solomon Islands
Vanuatu
Viet Nam
>100
75
50
25
0
2000
2005
2010
2015
Point estimate
95% confidence interval
Region of the Americas
Eastern Mediterranean Region
European Region
South-East Asia Region
Western Pacific Region

Annex 3 – E. Estimated change in malaria incidence and mortality rates, 2010–2015

WHO region & subregion	Country	Decrease		Change <±20%	Increase >20%	Zero indigenous deaths in 2015
		>40%	20–40%			
African, West	Algeria	●				●
African, Central	Angola			● ●		
African, West	Benin		●	●		
African, South-East	Botswana	● ●				
African, West	Burkina Faso	●	●			
African, Central	Burundi		●	●		
African, Central	Cameroon		●	●		
African, West	Cabo Verde	● ●				
African, Central	Central African Republic		● ●			
African, Central	Chad			● ●		
African, South-East	Comoros	● ●				
African, Central	Congo		●	●		
African, West	Côte d'Ivoire	●	●			
African, Central	Democratic Republic of the Congo	● ●				
African, Central	Equatorial Guinea			● ●		
African, South-East	Eritrea		● ●			
African, South-East	Ethiopia	● ●				
African, Central	Gabon			●	●	
African, West	Gambia			● ●		
African, West	Ghana		● ●			
African, West	Guinea		●	●		
African, West	Guinea-Bissau			● ●		
African, South-East	Kenya			●	●	
African, West	Liberia		● ●			
African, South-East	Madagascar				● ●	
African, South-East	Malawi	●	●			
African, West	Mali			●	●	
African, West	Mauritania			● ●		
African	Mayotte	●				●
African, South-East	Mozambique		● ●			
African, South-East	Namibia				● ●	
African, West	Niger		● ●			
African, West	Nigeria		●	●		
African, South-East	Rwanda			●	●	
African, Central	Sao Tome and Principe		●	●		
African, West	Senegal		●	●		
African, West	Sierra Leone	●	●			
African, South-East	South Africa		●		●	
African, South-East	South Sudan		●	●		
African, South-East	Swaziland	● ●				
African, West	Togo	●	●			
African, South-East	Uganda	● ●				
African, South-East	United Republic of Tanzania		●	●		
African, South-East	Zambia			● ●		
African, South-East	Zimbabwe			● ●		

● Change in estimated incidence rate ● Change in estimated mortality rate

WHO region & subregion	Country	Decrease		Change <±20%	Increase >20%	Zero indigenous deaths in 2015
		>40%	20–40%			
Americas	Belize	●				●
	Bolivia (Plurinational State of)	● ●				
	Brazil	● ●				
	Colombia	●	●			
	Dominican Republic	● ●				
	Ecuador	●				●
	El Salvador	●				●
	French Guiana	● ●				
	Guatemala			● ●		
	Guyana	● ●				
	Haiti	● ●				
	Honduras	● ●				
	Mexico	● ●				
	Nicaragua				● ●	
	Panama	●			●	
	Peru				● ●	
	Suriname	● ●				
	Venezuela (Bolivarian Republic of)				● ●	
Eastern Mediterranean	Afghanistan			● ●		
	Djibouti				● ●	
	Iran (Islamic Republic of)	● ●				
	Pakistan	●	●			
	Saudi Arabia				●	●
	Somalia				● ●	
	Sudan			● ●		
	Yemen	● ●				
European	Tajikistan	●				●
South-East Asia	Bangladesh	● ●				
	Bhutan	● ●				
	Democratic People's Republic of Korea	●				●
	India	●	●			
	Indonesia	● ●				
	Myanmar	● ●				
	Nepal	●	●			
	Thailand	● ●				
	Timor-Leste	● ●				
Western Pacific	Cambodia	●	●			
	China	●				●
	Lao People's Democratic Republic	●		●		
	Malaysia	● ●				
	Papua New Guinea	●	●			
	Philippines	● ●				
	Republic of Korea			●		●
	Solomon Islands	● ●				
	Vanuatu	● ●				
	Viet Nam	● ●				

Annex 4 – A. Policy adoption, 2015

WHO region Country/area	Insecticide-treated mosquito nets			Indoor residual spraying		Chemoprevention	
	ITNs/ LLINs are distributed free of charge	ITNs/ LLINs are distributed to all age groups	ITNs/ LLINs distributed through mass campaigns to all age groups	IRS is recommended by malaria control programme	DDT is used for IRS	IPTp used to prevent malaria during pregnancy	Seasonal malaria chemo-prevention (SMC or IPTc) is used
AFRICAN							
Algeria	○	○	–	●	○	–	○
Angola	●	○	●	●	○	●	○
Benin	●	○	●	●	○	●	○
Botswana	●	●	●	●	●	–	○
Burkina Faso	●	●	●	●	○	●	●
Burundi	●	○	●	●	○	○	○
Cabo Verde	○	○	○	●	○	○	–
Cameroon	●	●	●	●	○	●	○
Central African Republic	●	●	●	●	○	●	○
Chad	●	●	●	●	○	●	●
Comoros	●	●	●	●	○	●	○
Congo	●	●	○	●	○	●	○
Côte d'Ivoire	●	○	●	○	○	●	○
Democratic Republic of the Congo	●	●	●	●	●	●	○
Equatorial Guinea	●	○	●	●	○	–	○
Eritrea	●	●	●	●	○	○	○
Ethiopia	●	●	●	●	○	○	○
Gabon	○	○	●	●	○	●	○
Gambia	●	●	●	●	●	●	●
Ghana	●	●	●	●	○	●	○
Guinea	●	●	●	●	○	●	●
Guinea-Bissau	●	○	●	○	○	●	○
Kenya	●	●	●	●	○	●	○
Liberia	●	●	●	●	○	●	○
Madagascar	●	●	●	●	○	●	○
Malawi	●	●	●	●	○	●	○
Mali	●	●	●	●	○	●	●
Mauritania	●	○	–	○	○	●	○
Mayotte	●	●	–	–	○	–	–
Mozambique	●	●	●	●	●	●	○
Namibia	●	●	●	●	●	●	○
Niger	●	●	○	●	○	●	●
Nigeria	●	●	●	●	○	●	●
Rwanda	●	●	●	●	○	○	○
Sao Tome and Principe	●	●	●	●	○	●	○
Senegal	●	●	●	●	○	●	●
Sierra Leone	●	●	●	●	○	●	○
South Africa	○	○	○	●	●	○	○
South Sudan[2]	●	●	●	●	○	●	○
Swaziland	●	–	●	●	●	○	○
Togo	●	●	●	○	○	●	●
Uganda	●	●	●	●	○	●	○
United Republic of Tanzania	●	●	●	●	○	●	○
Mainland	●	●	○	●	○	●	○
Zanzibar	●	●	●	●	○	●	○
Zambia	●	●	●	●	●	●	○
Zimbabwe	●	●	●	●	●	●	○
AMERICAS							
Belize	●	●	●	●	○	NA	NA
Bolivia (Plurinational State of)	●	●	●	●	○	NA	NA
Brazil	●	●	●	●	○	NA	NA
Colombia	●	●	●	●	○	NA	NA
Dominican Republic	●	●	○	●	○	NA	NA

Testing				Treatment				
Patients of all ages should get diagnostic test	Malaria diagnosis is free of charge in the public sector	RDTs used at community level	G6PD test is recommended before treatment with primaquine	ACT for treatment of *P. f.*	Pre-referral treatment with quinine or artemether IM or artesunate suppositories	Single dose of primaquine is used as gametocidal medicine for *P. falciparum*[1]	Primaquine is used for radical treatment of *P. vivax* cases	Directly observed treatment with primaquine is undertaken
–	●	–	○	NA	–	●	●	●
●	●	○	●	●	●	○	●	○
○	●	●	–	●	●	○	○	○
●	●	○	○	●	●	●	●	●
●	●	○	○	●	●	○	○	○
●	○	●	○	●	●	○	–	○
●	●	●	●	●	○	●	●	●
●	○	●	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	○	○	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	○	○	●	○	○	○	○
●	●	●	○	●	●	●	●	○
●	●	●	○	●	●	○	○	○
●	○	●	○	●	●	○	○	○
●	●	○	–	●	●	○	○	–
●	○	●	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	●	○	●	●	●	○	●
●	○	○	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	●	●	●	●	○	●	○
–	●	–	●	–	–	○	●	●
●	●	●	○	●	●	○	○	○
●	●	○	○	●	●	○	–	○
●	●	○	–	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	○	●	○	●	●	○	○	○
●	●	○	○	●	●	●	●	●
●	●	●	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	●	●	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	●	●	○	●	●	●	○	○
●	●	○	–	●	●	○	○	–
●	●	●	○	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	●	○	○	●	●	○	○	○
●	●	●	○	●	●	○	○	○
●	●	●	○	●	●	●	○	●
●	●	○	○	NA	○	●	●	●
●	●	●	○	●	○	●	●	○
●	●	●	○	●	●	●	●	○
●	●	●	○	●	●	●	●	○
●	●	○	○	NA	○	●	●	●

Annex 4 – A. Policy adoption, 2015

WHO region Country/area	Insecticide-treated mosquito nets			Indoor residual spraying		Chemoprevention	
	ITNs/ LLINs are distributed free of charge	ITNs/ LLINs are distributed to all age groups	ITNs/ LLINs distributed through mass campaigns to all age groups	IRS is recommended by malaria control programme	DDT is used for IRS	IPTp used to prevent malaria during pregnancy	Seasonal malaria chemo-prevention (SMC or IPTc) is used
AMERICAS							
Ecuador	●	●	●	●	○	NA	NA
El Salvador	●	●	○	●	○	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	●	○	●	●	○	○	○
Iran (Islamic Republic of)	●	●	●	●	○	NA	NA
Pakistan	●	○	○	●	○	NA	NA
Saudi Arabia	●	●	-	●	○	NA	NA
Somalia	●	●	●	●	○	○	○
Sudan	●	●	●	●	○	○	○
Yemen	●	●	●	●	○	NA	NA
EUROPEAN							
Tajikistan	●	●	-	●	○	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
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	NA
Philippines	●	●	○	●	○	NA	NA
Republic of Korea	●	○	-	-	○	NA	NA
Solomon Islands	●	●	●	●	○	NA	NA
Vanuatu	●	●	●	●	○	NA	NA
Viet Nam	●	●	●	●	○	NA	NA

ACT, artemisinin-based combination therapy; DDT, dichloro-diphenyl-trichloroethane; 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; NA, not applicable; NMCP, national malaria control programme; RDT, rapid diagnostic test; SMC, seasonal malaria chemoprevention

Testing				Treatment				
Patients of all ages should get diagnostic test	Malaria diagnosis is free of charge in the public sector	RDTs used at community level	G6PD test is recommended before treatment with primaquine	ACT for treatment of *P. f.*	Pre-referral treatment with quinine or artemether IM or artesunate suppositories	Single dose of primaquine is used as gametocidal medicine for *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	○	●	●	○
●	●	○	○	NA	○	●	●	●
●	●	●	○	NA	○	●	●	●
●	●	○	○	NA	○	●	●	●
●	●	●	○	●	●	●	○	●
●	●	●	○	●	●	●	●	○
●	●	○	○	●	○	○	●	○
●	●	–	●	●	●	●	●	●
●	●	○	○	●	○	○	●	○
●	●	–	○	●	–	●	●	●
●	●	○	●	●	●	●	●	○
●	●	–	●	●	–	●	●	○
●	●	○	○	●	●	○	○	○
●	○	●	○	●	●	○	●	○
●	●	●	●	●	●	○	●	○
●	●	–	●	●	–	●	●	●
●	●	●	○	●	●	●	●	○
●	●	○	○	●	○	●	●	○
●	●	–	○	NA	–	○	●	●
●	●	●	○	●	●	●	●	●
●	●	●	○	●	●	●	●	○
●	●	●	○	●	●	●	●	●
●	●	●	●	●	–	●	●	○
●	●	●	●	●	○	●	●	●
●	●	●	○	●	●	●	●	○
●	●	●	●	●	○	●	●	○
●	○	○	○	●	○	●	●	●
●	●	●	●	●	○	○	○	○
●	●	–	●	●	–	●	●	●
●	●	○	○	●	●	○	●	○
●	●	●	●	●	●	●	○	●
●	●	–	○	NA	–	○	●	○
●	●	○	●	●	●	○	●	○
●	○	●	●	●	●	●	●	●
●	●	●	○	●	●	●	●	●

(●) = Actually implemented.

(○) = Not implemented.

(–) = Question not answered or not applicable.

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, http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf)

Annex 4 – B. Antimalarial drug policy, 2015

WHO region Country/area	*P. falciparum*				*P. vivax*
	Uncomplicated unconfirmed	Uncomplicated confirmed	Severe	Prevention during pregnancy	Treatment
AFRICAN					
Algeria	–	–	–	–	CQ
Angola	AL	AL	QN	AS; QN	–
Benin	AL	AL	QN	AS; QN	–
Botswana	AL	AL	QN	QN	–
Burkina Faso	AL; AS+AQ	AL; AS+AQ	QN	AS; QN	–
Burundi	AS+AQ	AS+AQ	QN	AS; QN	–
Cabo Verde	AL	AL	QN	QN	–
Cameroon	AS+AQ	AS+AQ	QN	AS, AM;QN	–
Central African Republic	AL	AL	QN	AS, AM; QN	–
Chad	AL; AS+AQ	AL; AS+AQ	QN	AS,QN	–
Comoros	AL	AL	QN	QN	–
Congo	AS+AQ	AS+AQ	AL	QN	–
Côte d'Ivoire	AS+AQ	AS+AQ	AL	QN	–
Democratic Republic of the Congo	AS+AQ	AS+AQ	QN	AS, QN	–
Equatorial Guinea	AS+AQ	AS+AQ	QN	AS	–
Eritrea	AS+AQ	AS+AQ	QN	QN	AS+AQ+PQ
Ethiopia	AL	AL	QN	AS; AM; QN	CQ
Gabon	AS+AQ	AS+AQ	AL	AS; AM; QN	–
Gambia	AL	AL	QN	QN	–
Ghana	AS+AQ	AL; AS+AQ	QN	AS; AM; QN	–
Guinea	AS+AQ	AS+AQ	QN	AS	–
Guinea-Bissau	AL	AL	QN	AS;QN	–
Kenya	AL	AL	QN	AS; AM; QN	–
Liberia	AS+AQ	AS+AQ	QN	AS; AM; QN	–
Madagascar	AS+AQ	AS+AQ	QN	QN	–
Malawi	AL	AL	AS+AQ	AS; QN	–
Mali	AS+AQ	AL; AS+AQ	AL	QN	–
Mauritania	AS+AQ	AL; AS+AQ	–	QN	–
Mayotte	–	AL	QN	QN; AS; QN+AS; AS+D; QN+D	CQ+PQ
Mozambique	AL	AL	–	AS, QN	–
Namibia	AL	AL	QN	QN	AL
Niger	AL	AL	QN	AS; QN	–
Nigeria	AL; AS+AQ	AL; AS+AQ	QN	AS; AM; QN	–
Rwanda	AL	AL	QN	AS; QN	–
Sao Tome and Principe	AS+AQ	AS+AQ	AL	QN	–
Senegal	AS+AQ	AL; AS+AQ	–	AS; QN	–
Sierra Leone	AS+AQ	AL; AS+AQ	QN	AS; AM; QN	–
South Africa	–	AL; QN+CL; QN+D	AS; QN	QN	AL+PQ; CQ+PQ
South Sudan[1]	AS+AQ	AS+AQ	AL	AM; AS; QN	AS+AQ+PQ
Swaziland	–	AL	QN	AS	–
Togo	AL; AS+AQ	AL; AS+AQ	–	AS; AM; QN	–
Uganda	AL	AL	QN	AS, QN	–
United Republic of Tanzania	AL; AS+AQ	AL; AS+AQ	QN	AS, AM; QN	–
Mainland	AL	AL	QN	AS, AM; QN	–
Zanzibar	AS+AQ	AS+AQ	QN	AS; QN	–
Zambia	AL	AL	QN	AS; AM; QN	–
Zimbabwe	AL	AL	QN	QN	–
AMERICAS					
Belize	–	CQ+PQ(1d)	QN	AL; QN	CQ+PQ(14d)
Bolivia (Plurinational State of)	–	AL+PQ	–	–	CQ+PQ(7d)
Brazil	–	AL+PQ(1d); AS+MQ+PQ(1d)	QN+D+PQ	AM+CL; AS+CL; QN+CL	CQ+PQ(7d)
Colombia	–	AL	QN+CL	AS+AL	CQ+PQ(14d)
Dominican Republic	–	CQ+PQ(1d)	AS+D	QN+CL	CQ+PQ(14d)
Ecuador	–	AL+PQ	QN+CL	QN	CQ (3d)+PQ(7d)

WHO region Country/area	*P. falciparum*				*P. vivax*
	Uncomplicated unconfirmed	Uncomplicated confirmed	Severe	Prevention during pregnancy	Treatment
AMERICAS					
El Salvador	–	CQ+PQ(1d)	AL	QN	CQ+PQ(14d)
French Guiana	–	AL	AQ+PG	AS; AL	CQ+PQ
Guatemala	–	–	CQ+PQ	QN	CQ+PQ(14d)
Guyana	–	AL+PQ(1d)	QN+T	AM	CQ+PQ(14d)
Haiti	–	CQ+PQ(1d)	MQ; SP	QN	CQ+PQ(14d)
Honduras	–	CQ+PQ(1d)	SP	QN	CQ+PQ(14d)
Mexico	–	CQ+PQ	AL+QN	AL	CQ+PQ
Nicaragua	–	CQ+PQ(1d)	AS+MQ; AS+SP	QN	CQ+PQ(7d)
Panama	–	AL+PQ(1d)	AS+M	QN	CQ+PQ(7d); CQ+PQ(14d)
Peru	–	AS+MQ	–	AS+MQ	CQ+PQ
Suriname	–	AL+PQ(1d)	AS+MQ	AS	CQ+PQ(14d)
Venezuela (Bolivarian Republic of)	–	AS+MQ+PQ	–	AM; QN	CQ+PQ(14d)
EASTERN MEDITERRANEAN					
Afghanistan	CQ	AS+SP+PQ	AS; AM; QN	QN	CQ+PQ(8w)
Djibouti	AL	AL+PQ	QN	AS	CQ+PQ(14d)
Iran (Islamic Republic of)	–	AS+SP; AS+SP+PQ	AS;QN	AS	CQ+PQ(14d & 8w)
Pakistan	CQ	AS+SP+PQ	AS;QN	AS	CQ+PQ(14d)
Saudi Arabia	–	AS+SP+PQ	AS; AM; QN	AS; AM; QN	CQ+PQ(14d)
Somalia	AL	AS+PQ	AS; AM; QN	AS; AM; QN	AL+PQ(14d)
Sudan	AS+SP; AL	AS+SP; AL	QN; AM	AS	AL+PQ(14d)
Yemen	AS+SP	AS+SP	QN; AM	AM; QN	CQ+PQ(14d)
SOUTH-EAST ASIA					
Bangladesh	–	AL	QN+D; QN+T	AM; QN	CQ+PQ(14d)
Bhutan	–	AL	QN	AM; QN	CQ+PQ(14d)
Democratic People's Republic of Korea	–	–	–	–	CQ+PQ(14d)
India	CQ	AS+SP+PQ	QN+D; QN+T	AM; AS; QN	CQ+PQ(14d)
Indonesia	–	DHA-PP+PQ	QN+D+PQ	AM; AS; QN	DHA-PP+PQ(14d)
Myanmar	–	AL; AM; AS+MQ; DHA-PPQ; PQ	AS+D; AS+T	AM; AS; QN	CQ+PQ(14d)
Nepal	CQ	AL+PQ	AS; QN	AS; QN	CQ+PQ(14d)
Thailand	–	DHA-PPQ	QN+D	QN+D	CQ+PQ(14d)
Timor-Leste	–	AL	QN+D	AM; AS; QN	CQ+PQ(14d)
WESTERN PACIFIC					
Cambodia	–	AS+MQ; DHA-PPQ+PQ	QN+T	AM; AS; QN	DHA-PPQ
China	–	ART+NQ; ART-PPQ; AS+AQ; DHA-PPQ	–	AM; AS; PYR	CQ+PQ(8d)
Lao People's Democratic Republic	–	AL	QN+D	AS+AL	CQ+PQ(14d)
WESTERN PACIFIC					
Malaysia	–	AS+MQ	QN+T	QN+T	CQ+PQ(14d)
Papua New Guinea	–	AL	DHA-PPQ	AM; AS	AL+PQ
Philippines	AL	AL+PQ	QN+CL; QN+D; QN+T	QN+T; QN+D; QN+CL	CQ+PQ(14d)
Republic of Korea	CQ	–	–	–	CQ+PQ(14d)
WESTERN PACIFIC					
Solomon Islands	AL	AL	QN	AL; AS	AL+PQ(14d)
Vanuatu	–	AL	QN	AS	AL+PQ(14d)
Viet Nam	DHA-PPQ	DHA-PPQ	QN+CL; QN+D	AS; QN	CQ+PQ(14d)

AL=Artemether-lumefantrine
AM=Artemether
AQ=Amodiaquine
ART=Artemisinin
AS=Artesunate
AT= Atovaquone
CL=Clindamycline
CQ=Chloroquine
D=Doxycycline
DHA=Dihydroartemisinin
MQ=Mefloquine
NQ=Naphroquine
PG=Proguanil
PPQ=Piperaquine
PQ=Primaquine
PYR=Pyronaridine
QN=Quinine
SP=Sulphadoxine-pyrimethamine
T=Tetracycline

1 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf)

Annex 4 – C. Funding for malaria control, 2013–2015

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/ USAID[2]	The World Bank[3]	UK[4]
AFRICAN					
Algeria	2013				
	2014				
	2015				
Angola	2013	25 215 799	28 548 000		
	2014	-249 158	29 000 000		
	2015				
Benin	2013	27 645 452	16 653 000		
	2014	13 105 187	16 500 000		
	2015				
Botswana	2013			0	
	2014				
	2015				
Burkina Faso	2013	9 399 940	9 421 000	4 254 781	281 893
	2014	5 963 608	9 500 000		
	2015				
Burundi	2013	22 752 851	9 229 000		
	2014	4 774 243	9 500 000		
	2015				
Cabo Verde	2013	892 644			
	2014				
	2015				
Cameroon	2013	10 878 702			
	2014	8 613 320			
	2015				
Central African Republic	2013	12 276 042			
	2014	1 991 913			
	2015				
Chad	2013	34 674 177			
	2014	12 587 947			
	2015				
Comoros	2013	3 541 013			
	2014	1 107 319			
	2015				
Congo	2013	735 866			
	2014				
	2015				
Côte d'Ivoire	2013	45 346 542			
	2014	27 496 568			
	2015				
Democratic Republic of the Congo	2013	58 206 877	41 869 000	11 238 171	13 731 500
	2014	78 117 103	50 000 000		
	2015				
Equatorial Guinea	2013				
	2014	-138 121			
	2015				
Eritrea	2013	14 460 101			
	2014	6 797 703			
	2015				
Ethiopia	2013	113 143 096	43 773 000		
	2014	9 890 472	45 000 000		
	2015				
Gabon	2013	-118			
	2014	-154 828			
	2015				

Contributions reported by countries							
Government	Global Fund	The World Bank	PMI/ USAID	Other bilaterals	WHO	UNICEF	Other contributions[6]
0 [5]							0
1 705 134	0				12 000		0
1 335 355							
64 047 348 [5]	19 286 339		27 200 000			3 555 239	
27 851 717	5 378 690		27 000 000				
47 356 258 [5]	2 675 645		28 000 000				
980 000							
1 082 000	40 580 540						
–							
1 947 775	0	0	0	0		0	0
2 142 552	0	0	0	0		0	0
1 605 618	280 899	0	0	0		0	0
58 920 267	40 645 351	0	8 552 723	0	37 800	521 760	942 955
3 126 963	2 433 376	697 173	8 571 017	70 804	19 048	136 540	379 610
576 253	42 735 771	284 328	8 579 441	9 454	11 800	305 704	2 533 200
1 134 923	19 481 377		9 260 000	2 602 730	65 000	453 631	1 277 376
2 001 113	6 027 330		9 229 345	0	79 050	475 936	1 324 385
464 515	4 523 416		9 500 000		32 595	47 445 292	
397 920	555 169				130 448		
253 251	64 285				19 638		
1 520 070 [5]	325 273				19 142		
5 246 883 [5]	15 293 706			5 415 537	904 218	118 341	5 415 537
43 709 021 [5]	147 856 497		1 123 490		460 000	14 718	669 000
12 122 087 [5]	54 918 697				221 000		
160 000	5 342 710	0	0			2 000 000	
530 000 [5]	2 852 385				20 500	5 596 000	
530 000 [5]					100 000		
7 493 400 [5]							
9 122 400 [5]	30 125 205			239 735	54 574	2 667 358	673 440
1 184 508	6 141 762				20 000	216 491	
137 147	499 000	0	0	0	40 000	5 576	0
94 797	1 074 877	0	0	0	104 000	51 630	58 500
114 685	224 643	0	0	0	30 000	6 221	0
1 651 000	0	0	0	0	45 000	10 000	0
1 675 000					45 000		3 827
446 000	0	0	0	0	68 000	18 000	0
54 723 090	74 853 096	13 119 140	9 839 355	244 000	36 338	24 975 817	244 000
53 942 249	33 611 939		9 839 355		6 245 966	29 250 235	
913 958 253	14 414 815 784	0	0	0	0	15 070 138	22 954 890
7 812 690	86 281 277	2 952 042	37 001 000	0	0	1 790 452	35 020 370
8 104 841	102 540 781	0	34 000 000	24 838 023	2 100 000	7 196 262	0
7 014 345	107 594 221	0	34 000 000	23 018 218	2 933 630	808 130	0
2 582 747 [5]	0						4 490 030
–							
–							
–	15 871 769						
0	4 906 745	0	0		58 832	0	0
0	6 216 618	0	0	0	46 081	0	0
19 705 028	85 723 876		29 370 000		111 677		15 000 000
–	93 201 479						
–	18 448 416		3 800 000				13 114 670
226 596	0	0	0	0	11 276	0	
123 200	0	0	0	0	34 855	0	
27 677 576 [5]	0	0	0	0	47 147	0	272 289

Annex 4 – C. Funding for malaria control, 2013–2015

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/ USAID[2]	The World Bank[3]	UK[4]
AFRICAN					
Gambia	2013	9 288 845			2 982 020
	2014	4 134 951			
	2015				
Ghana	2013	67 802 357	28 547 000	1 903 200	145 948
	2014	14 840 935	28 000 000		
	2015				
Guinea	2013	4 603 535	12 371 000		
	2014	9 144 353	12 500 000		
	2015				
Guinea-Bissau	2013	7 320 497			
	2014	2 340 811			
	2015				
Kenya	2013	33 311 280	34 256 000		22 345 400
	2014	49 541 177	35 000 000		
	2015				
Liberia	2013	5 882 949	12 370 000		
	2014	10 405 293	12 000 000		
	2015				
Madagascar	2013	22 647 300	26 026 000		
	2014	499 317	26 000 000		
	2015				
Malawi	2013	9 084 196	24 075 000		
	2014	7 129 260	22 000 000		
	2015				
Mali	2013	13 845 815	25 007 000		
	2014	10 803 020	25 000 000		
	2015				
Mauritania	2013				264 584
	2014				
	2015				
Mayotte	2013				
	2014				
	2015				
Mozambique	2013	12 626 612	29 023 000	2 031 197	7 739 210
	2014	34 642 279	29 000 000		
	2015				
Namibia	2013	3 608 532			
	2014	556 809			
	2015				
Niger	2013	9 305 823			
	2014	24 009 643			
	2015				
Nigeria	2013	45 365 287	73 272 000	27 963 280	30 852 400
	2014	144 939 061	75 000 000		
	2015				
Rwanda	2013	22 881 569	18 003 000		
	2014	15 427 182	17 500 000		
	2015				
Sao Tome and Principe	2013	3 699 517	0	9 455	
	2014	3 306 066	0		
	2015				
Senegal	2013	3 662 132	24 124 000		
	2014	21 674 466	24 000 000		
	2015				

Contributions reported by countries							
Government	Global Fund	The World Bank	PMI/ USAID	Other bilaterals	WHO	UNICEF	Other contributions[6]
726 578	4 919 685	0	0	0	16 000	26 229	100 000
799 091	5 934 320				132 833	150 000	120 814
793 818	2 887 213	0	0	0		3 062	2 406 568
8 736 726	67 804 357	0	27 000 000	38 817	47 050	0	
8 855 177	64 952 156		4 730 000	825 000	32 514	7 519	6 429
9 832 327	39 759 327	0	28 000 000	520 000	60 000	0	0
3 015 335			10 000 000				
956 833	15 603 972		12 052 476		105 114	36 639	16 581
48 178 445	28 859 411		12 500 000	3 979 774	21 886	10 419	
0	701 363	0	0		73 734	218 811	
100 000 [5]	2 952 761	0	0	0	16 869	7 231	0
–							
1 372 093	29 089 771	1 127 907	32 400 000	23 457 627		0	23 457 627
1 178 804	48 916 476		32 400 000	25 635 413	832 402		
1 520 205	64 945 727		32 400 000		604 058	100 000	
284 306 [5]	14 026 642	0	12 000 000		44 890	340 647	
11 341 797	10 399 555	0	12 000 000	0		0	0
–							
15 286	29 994 536	0	27 000 000	369 500	299 000	737 588	0
23 658	2 524 013	600 000	25 920 000	0	3 369 341	254 170	0
25 400	23 199 442	0	26 000 000	213 615	298 946	70 000	56 422
–	880 267		23 000 000		150 000		
–	8 023 075		19 118 000		150 000		
4 266 640 [5]	22 777 197		12 234 171				1 082 008
1 871 915	18 180 392	0	25 500 000	0	92 000	3 092 000	0
1 756 941	26 392 018	0	25 500 000		95 000	1 437 552	
5 670 552	21 201 959	0	25 500 000		120 000	574 693	5 326 854
1 130 593					11 767	42 583	
2 328 000					46 000	42 000	
173 720					67 000	67 000	
–							
–							
–							
65 800 000	2 497 243	11 000 000	29 000 000		100 000	2 668 555	
4 186 129	37 646 902	3 500 000	29 023 096			268 993	
5 146 910	4 357 070	0	29 000 000	0	200 000	1 688 356	139 501
14 811 934	882 630	0		0	100 000		0
2 996 923	2 910 095	0	0	0	100 000	0	0
4 051 428	2 796 269				100 000		136 929
2 668 014	19 000 000	0	0		27 000	4 000 000	
2 859 000	2 494 013	0	0	0	70 248	1 249 000	44 000
8 999 547	9 324 003	0	72 000	0	86 567	18 500	0
5 541 401	100 362 906	7 040 569	60 462 012	36 736 654	934 980	3 000 000	
–	137 920 815	52 220 588	73 771 000	20 157 565	861 615	1 000 000	
–	126 250 194		75 000 000	12 322 449	964 784		4 809 717
–							
0	0	0	0	0	0	0	0
531 541	10 893 838		18 000 000				
10 724	1 002 778	0	0	1 050 830	32 512	0	2 000
11 084	1 715 622	0	0	1 020 102	125 209	0	1 600
47 033	1 668 679	0	0	1 000 000	60 006	1 293	1 600
13 986	4 675 836		24 500 000		12 490	200 000	
24 800	15 023 299		25 302 960		12 491	9 780	
2 069 404	2 427 578	1 000 000	23 666 000				25 705

Annex 4 – C. Funding for malaria control, 2013–2015

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/ USAID[2]	The World Bank[3]	UK[4]
AFRICAN					
Sierra Leone	2013	6 214 513			6 097 560
	2014	13 788 079			
	2015				
South Africa	2013			0	
	2014				
	2015				
South Sudan[7]	2013	8 716 372	6 947 000		8 955 920
	2014	14 253 512	6 000 000		
	2015				
Swaziland	2013	1 336 085			
	2014	1 654 211			
	2015				
Togo	2013	20 510 821			
	2014	7 413 283			
	2015				
Uganda	2013	19 511 505	33 782 000		680 702
	2014	14 223 217	34 000 000		
	2015				
United Republic of Tanzania[8]	2013	56 328 793	46 056 000		7 354 400
	2014	28 943 792	46 000 000		
	2015				
Mainland	2013	52 221 547			
	2014	28 943 792			
	2015				
Zanzibar	2013	4 107 246			
	2014				
	2015				
Zambia	2013	29 335 147	24 028 000	4 903 770	19 235 700
	2014		24 000 000		
	2015				
Zimbabwe	2013	9 985 457	15 035 000		
	2014	10 695 816	15 000 000		
	2015				
AMERICAS					
Argentina	2013			0	
	2014				
	2015				
Belize	2013			0	
	2014				
	2015				
Bolivia (Plurinational State of)	2013	2 112 710			
	2014	1 318 174			
	2015				
Brazil	2013	-228 780			
	2014				
	2015				
Colombia	2013	6 737 839			
	2014	2 894 197			
	2015				
Dominican Republic	2013	1 149 536			
	2014	514 691			
	2015				

Contributions reported by countries							
Government	Global Fund	The World Bank	PMI/ USAID	Other bilaterals	WHO	UNICEF	Other contributions[6]
26 898	13 216 219	1 952 807			64 000	7 874 921	112 855
3 074	13 525 631	0	0	6 156 320	50 000	17 912	2 200 067
190 741	5 353 621	0	0	0	101 207	100 847	
13 511 860				152 277			
17 096 911				68 180			
0	0	0	0	41 140	40 000	0	0
0 [5]	46 437 577		6 900 000	0	2 934 000	1 000 000	4 108 159
–							
–							
556 245	1 715 525	0	0	132 445	20 250	0	0
678 718	1 203 444				0		0
11 847 354	1 714 840						
–							
5 139 088	4 897 544	17 304	0	0	1 779	222 460	0
–							
–	20 146 401		33 781 000				
8 035 963 [5]	24 195 015	3 418 520	33 000 000	39 623 353		1 359 595	4 896 045
8 035 963 [5]	74 643 525	0	33 000 000	32 222 500		5 676 820	4 899 062
–	142 485 233	0	40 602 700	0	850	41 153	2 528 703
–	147 632 422	0	1 975 000	50 000	850	0	0
–	28 982 597	0	1 060 714	77 966 100	0	0	480 412
937 500	140 356 602	0	37 117 700	0	500	0	2 487 550
6 022 000	145 506 422	0	450 000	0	500	0	0
30 523 723	28 982 597	0	1 060 714	77 966 100	0	0	480 412
15 152	2 128 631	0	3 485 000		350	41 153	41 153
407 082	2 126 000	0	1 525 000	50 000	350	0	
–							
185 325	19 361 732	0	24 000 000	3 500 000	204 466	27 318	0
15 462 950	24 362 218		24 000 000			20 000	6 000 000
22 640 090	10 614 665		24 000 000		170 500	1 006 000	6 500 000
706 200	7 460 006		13 000 000		90 060		
520 000	7 626 664		12 000 000			42 500	
780 000	33 425 777		12 000 000		39 649		
1 082 700 [5]	0	0	0	0	0	0	0
1 082 700 [5]	0	0	0	0	0	0	0
1 082 700 [5]	0	0	0	0	0	0	0
261 500 [5]	0	0	14 223	0	0	0	
270 000 [5]	10 121	0	6 761	0	0	0	
297 500 [5]	189 879	0	12 747	0	0	0	0
787 966 [5]	365 193	0	0	0	0	0	0
718 391 [5]	1 631 520	0	0	0	0	0	0
531 609 [5]	1 170 000	0	0	0	38 991	0	0
73 291 509 [5]	0	0	18 700	0	0	0	0
72 248 286 [5]	0	0	47 495	0	0	0	0
60 803 769 [5]	0	0	129 288	0	0	0	0
23 100 498 [5]	4 832 745	0	142 406	0	0	0	0
11 493 708 [5]	3 257 687	0	96 194	0	0	0	0
13 059 553 [5]	0	0	73 391	0	0	0	0
1 966 812 [5]	1 158 508	0	0	0	21 930	0	23 382
1 883 503 [5]	852 947	0	0	0	0	0	106 598
2 663 837 [5]	72 511	0	0	0	0	0	213 094

Annex 4 – C. Funding for malaria control, 2013–2015

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/ USAID[2]	The World Bank[3]	UK[4]
AMERICAS					
Ecuador	2013	1 110 598			
	2014	1 002 244			
	2015				
El Salvador	2013			0	
	2014				
	2015				
French Guiana	2013				
	2014				
	2015				
Guatemala	2013	–2 089 393			
	2014	4 388 420			
	2015				
Guyana	2013	379 266			
	2014				
	2015				
Haiti	2013	3 902 655			
	2014	4 531 760			
	2015				
Honduras	2013	954 631			
	2014	967 393			
	2015				
Mexico	2013			0	
	2014				
	2015				
Nicaragua	2013	2 431 682			
	2014	1 010 094			
	2015				
Panama	2013			0	
	2014				
	2015				
Peru	2013			0	
	2014				
	2015				
Suriname	2013	549 463			
	2014	158 751			
	2015				
Venezuela (Bolivarian Republic of)	2013			0	
	2014				
	2015				
EASTERN MEDITERRANEAN					
Afghanistan	2013	17 626 010		3 154 876	
	2014	8 403 364			
	2015				
Djibouti	2013			52 000	
	2014				
	2015				
Iran (Islamic Republic of)	2013	3 180 088			
	2014	2 665 232			
	2015				
Pakistan	2013	5 849 945			
	2014	9 003 535			
	2015				

Contributions reported by countries							
Government	Global Fund	The World Bank	PMI/ USAID	Other bilaterals	WHO	UNICEF	Other contributions[6]
1 852 740 [5]	735 047	0	19 719	0	0	0	
–	983 835	0	98 057	0		0	
2 444 718 [5]	0	0		0	141 000	0	
2 854 844 [5]	0	0	0	0	56 948	0	0
0 [5]	0	0	0	0	54 340	0	0
0 [5]	0	0	13 376	0	11 563	0	0
–	0	0	0	0	0	0	0
–	0	0	0	0	0	0	0
–							
1 385 919 [5]	3 498 024	0	105 373	0	0	0	0
542 663 [5]	3 278 171	0	92 461	0	0	0	0
2 610 850 [5]	8 232 108	0	56 824	0	0	0	0
883 314 [5]	809 474	0	297 569	0	71 370	0	0
800 439 [5]	451 597	0	115 708	0	140 486	0	0
1 023 795 [5]	337 939	0	288 169	0	47 500	0	0
2 433 241 [5]	1 248 119	0		0	169 000	0	820 000
–	1 161 379	0	102 864	0	24 413	0	
–	1 415 674		62 156	470 000			250 064
971 742 [5]	1 106 404	0	99 330	6 000	0	0	0
543 312 [5]	792 634	0	113 187	0	0	0	6 046
–		0	118 071		18 457	0	
25 256 768 [5]	0	0	0	0	0	0	0
23 827 054 [5]	0	0	0	0	0	0	0
46 662 926 [5]	0	0	0	0	0	0	0
980 326	2 075 252	0	37 630	0	4 814	0	0
2 596 547	1 214 811	0	51 323	0	21 868	0	0
2 886 581	1 013 568	0	59 175		28 098		
7 220 410 [5]	0	0	32 136	0	0	0	0
7 469 311 [5]	100 000	0	77 562	0	0	0	0
7 964 427 [5]	10 000	0	49 079	0	11 000	0	
429 285 [5]	0	0	56 703	0	0	0	0
–	0	0	91 037	0	0	0	0
–	0	0	98 598	0		0	0
152 805 [5]	550 000	0	157 887	400 000	100 000	0	400 000
1 650 498 [5]	479 600	0	30 198	400 541	77 264	0	0
1 049 230 [5]	975 757	0	47 762	400 541	41 437	0	0
800 000 [5]	0	0	0				
1 000 000 [5]	0	0	0				
19 600 139 [5]	0	0	0				
–	16 651 753				109 068		
–	9 083 870				113 341		
–	4 571 460				89 167		
–					121 616	200 563	9 200
–							
–							
5 000 000	0				60 500		
6 300 000	2 979 260				34 000		
2 500 000	2 418 943				5 000		
–	8 057 177						
–	10 718 906				154 000		
–	5 910 215				89 000		

Annex 4 – C. Funding for malaria control, 2013–2015

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/ USAID[2]	The World Bank[3]	UK[4]
EASTERN MEDITERRANEAN					
Saudi Arabia	2013			0	
	2014				
	2015				
Somalia	2013	2 266 628			
	2014	9 672 384			
	2015				
Sudan	2013	35 680 104	0		
	2014	16 053 353	0		
	2015				
Yemen	2013	5 973 123			
	2014	2 017 535			
	2015				
EUROPEAN					
Tajikistan	2013	1 308 106			
	2014	1 032 277			
	2015				
SOUTH-EAST ASIA					
Bangladesh	2013	16 404 817			
	2014	4 395 406			
	2015				
Bhutan	2013	405 271			
	2014	239 889			
	2015				
Democratic People's Republic of Korea	2013	2 706 329			
	2014	6 704 605			
	2015				
India	2013	7 174 057		5 377 070	
	2014	4 481 942			
	2015				
Indonesia	2013	31 045 276			297 389
	2014	11 488 128			
	2015				
Myanmar	2013	15 032 712	6 566 000		11 283 400
	2014	18 254 744	8 000 000		
	2015				
Nepal	2013	4 922 108			
	2014	1 813 110			
	2015				
Thailand	2013	11 325 529			
	2014	16 524 453			
	2015				
Timor-Leste	2013	2 604 409	0		
	2014	1 527 841	0		
	2015				
WESTERN PACIFIC					
Cambodia	2013	12 111 758	3 997 000		
	2014	17 983 122	4 500 000		
	2015				

Contributions reported by countries							
Government	Global Fund	The World Bank	PMI/ USAID	Other bilaterals	WHO	UNICEF	Other contributions[6]
29 440 000							
30 000 000	0				0		0
30 000 000	0	0	0	0	0	0	0
64 515	15 062 018	0	0		138 400		
67 740	9 604 810	0	0	0	85 000	0	0
79 488	7 365 620	0	0	0	121 800		0
26 724 830	34 938 594				475 893	140 000	
27 316 109	35 883 294				446 160		
21 536 529	16 251 350	0	0	0	471 552	0	0
2 293 553 [5]	6 256 730				200 000		1 986 444
8 480	2 110 776			258 495	465 713		1 674 350
0	14 326 025				390 259		
633 740	1 714 393				35 000		
773 000	1 057 879				75 000		0
–							
4 134 615	8 033 087				399 189		
5 586 290	8 912 484						
935 897	9 507 849	0	0	0	65 000	0	0
–							
180 328	390 420				10 000		166 639
179 104	487 909	0	0	0	5 552	0	0
1 895 000	2 706 329	0	0	0	25 000	0	0
1 957 000	1 571 206	0	0	0	98 000	0	0
2 042 000	6 817 631	0	0	0	30 200	0	
51 336 600	4 811 540	4 299 233					
43 802 468	16 129 032	0					
48 419 018	5 244 575	0	0	0		0	
15 288 402 [5]	34 580 791	0	0	0	400 000	3 525 000	0
16 108 194 [5]	15 913 410	0	0	0	277 282	3 490 400	0
10 940 000 [5]	10 966 688	0	0	0	277 282	1 691 397	0
1 028 807	14 863 117		5 400 000		142 500	1 000 000	
–	42 620 577		6 565 881	451 400	25 000		5 561 917
5 272 824 [5]	31 629 898	0	6 500 000	2 800 000	25 000	0	0
1 910 485	3 110 685				46 500		
–					46 500		
2 315 400 [5]	5 199 862				45 000		
5 893 255	9 937 671		278 311		139 166		70 833
7 546 409	20 175 612	0	345 667	0	0	0	0
7 934 078	13 830 845	0	685 341	0	0	0	0
2 981 432	4 372 545				65 012		120 000
–	3 482 955						
791 375	2 610 355	0	0	0	27 280	0	0
3 484 029	13 240 888	0	3 996 624	0	431 792	0	
714 343	2 917 174	0	4 500 000	0	334 029	0	
692 698	4 042 964	0	4 500 000	0	406 393	0	

Annex 4 – C. Funding for malaria control, 2013–2015

WHO region Country/area	Year	Contributions reported by donors			
		Global Fund[1]	PMI/ USAID[2]	The World Bank[3]	UK[4]
WESTERN PACIFIC					
China	2013	1 856 499			
	2014	-1 738 247			
	2015				
Lao People's Democratic Republic	2013	3 256 001		695 423	
	2014	2 322 590			
	2015				
Malaysia	2013			0	
	2014				
	2015				
Papua New Guinea	2013	22 970 152			
	2014	10 970 461			
	2015				
Philippines	2013	4 806 916			
	2014	6 932 455			
	2015				
Republic of Korea	2013			0	
	2014				
	2015				
Solomon Islands	2013				
	2014				
	2015				
Vanuatu	2013			0	
	2014				
	2015				
Viet Nam	2013	4 249 171		-2 733	
	2014	3 777 902			
	2015				

PMI, United States President's Malaria Initiative; UK, Funding from the United Kingdom of Great Britain and Northern Ireland government; UNICEF, United Nations Children's Fund; USAID, United States Agency for International Development

1 Source: The Global Fund
2 Source: www.foreignassistance.gov
3 Source: OECD Database
4 Source: OECD Database
5 Budget not expenditure
6 Other contributions as reported by countries: NGOs, foundations, etc.
7 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 high-transmission areas of Sudan (10 southern states which correspond to contemporary South Sudan) and low-transmission areas (15 northern states which correspond to contemporary Sudan) are reported separately.
8 Where national totals for the United Republic of Tanzania are unavailable, refer to the sum of Mainland and Zanzibar.
* Negative disbursements reflect recovery of funds on behalf of the financing organization.

Contributions reported by countries							
Government	Global Fund	The World Bank	PMI/ USAID	Other bilaterals	WHO	UNICEF	Other contributions[6]
16 812 725	0	0	0	0	0	0	0
20 843 118	0				0		0
17 620 404							
1 122 915	4 038 937	0	120 132	0	20 000	0	0
247 375	2 475 938	0	0	0	113 000	0	43 620
211 874	6 458 501	0	216 986	600 000	198 357	0	0
39 845 997					0		0
57 535 038	0				0		0
64 881 663							
388 000	25 311 547	0	0			0	
377 000	695 052	0	0	0	0	0	0
1 637 421	19 431 536						
5 235 686	8 612 874	0	0	0	315 326	0	22 220
5 861 758	7 395 343	0	0	0	0	0	0
6 165 334	6 087 433	0	0	0	0	0	0
519 102	0				0		0
556 200	0				0		0
538 495	0	0	0	0	0	0	0
270 180	1 305 840	0	0	1 987 523	852 472	0	674 896
260 505	1 362 022	0	0	1 820 735	654 985	0	0
281 324	2 232 220	0	0	1 017 390	464 914	0	0
812 377 [5]	1 162 890	0	0	1 692 091	287 615	0	0
812 377 [5]	1 310 500	0	0	1 064 592	287 615	0	0
166 359	687 267	0	0	424 136	175 894	0	0
4 523 810	5 254 143	0	0	0	410 000	0	0
2 666 667	15 263 816	0	0	0	640 700	0	0
2 666 666	5 528 000	0	0	0	560 000	0	200 000

Annex 4 – D. Commodities distribution, 2013–2015

WHO region Country/area	Year	No. of ITN + LLIN sold or delivered	No. of people protected by IRS	No. of RDTs distributed	First-line treatment courses delivered (including ACT)	ACT treatment courses delivered
AFRICAN						
Algeria	2013	0	17 407	–	603	0
	2014	0	–	–	266	92
	2015	–	–	0	747	–
Angola	2013	1 182 519	419 353	900 000	2 814 900	2 814 900
	2014	2 978 937	58 370	–	–	–
	2015	2 138 331	–	2 500 000	3 185 160	3 185 160
Benin	2013	584 285	694 729	–	–	–
	2014	6 203 924	789 883	1 332 948	1 101 154	1 101 154
	2015	–	802 597	1 486 667	1 177 261	1 177 261
Botswana	2013	0	176 887	1 600	3 953	3 953
	2014	–	205 831	–	–	–
	2015	50 000	143 268	1 135	1 386	1 386
Burkina Faso	2013	9 959 820	0	5 728 612	5 797 938	5 797 938
	2014	239 559	0	6 224 055	7 494 498	7 494 498
	2015	481 107	0	8 290 188	7 824 634	7 824 634
Burundi	2013	731 981	0	2 857 991	3 836 437	3 836 437
	2014	5 752 583	0	3 089 202	4 772 805	4 263 178
	2015	726 767	–	5 075 437	4 798 379	4 798 376
Cabo Verde	2013	0	298 475	–	4 824	3 144
	2014	0	25 780	–	46	41
	2015	0	308 586	–	26	26
Cameroon	2013	–	0	920 382	1 048 811	497 022
	2014	–	0	–	1 270 172	1 270 172
	2015	2 751 112	–	1 573 992	826 434	826 434
Central African Republic	2013	150 000	0	25 000	420 000	420 000
	2014	555 334	–	303 582	522 270	522 270
	2015	1 170 566	–	759 245	1 043 674	1 043 674
Chad	2013	230 043	–	994 779	814 449	814 449
	2014	6 321 676	–	1 144 686	1 038 000	1 038 000
	2015	1 218 640	–	1 057 033	1 326 091	1 326 091
Comoros	2013	377 252	31 150	23 565	60 868	60 868
	2014	13 576	22 475	5 375	4 750	4 750
	2015	16 969	20 275	14 813	577	550
Congo	2013	14 005	0	39 375	0	0
	2014	180 595	0	19 746	0	0
	2015	447	–	0	1 304 959	1 304 959
Côte d'Ivoire	2013	1 821 267	–	3 891 695	2 358 567	2 358 567
	2014	12 627 282	–	–	–	–
	2015	3 663 080	–	5 600 100	3 296 991	3 296 991
Democratic Republic of the Congo	2013	7 947 747	185 252	9 746 694	14 941 450	7 112 841
	2014	13 918 109	194 566	13 962 862	19 008 927	19 008 927
	2015	15 419 488	77 643	13 574 891	9 871 484	9 871 484
Equatorial Guinea	2013	8 397	129 000	17 630	40 911	40 911
	2014	10 010	165 944	9 801	14 577	–
	2015	–	–	–	–	–
Eritrea	2013	86 597	275 857	393 780	182 911	182 911
	2014	0	320 881	54 516	216 195	216 195
	2015	2 054 194	328 915	645	255 602	255 602
Ethiopia	2013	11 709 780	23 150 388	18 300 000	12 800 000	9 164 641
	2014	13 388 552	16 709 249	7 416 167	7 321 471	5 321 471
	2015	17 233 074	–	13 148 960	7 036 620	6 049 320
Gabon	2013	21 666	0	–	–	–
	2014	10 000	–	–	984 423	984 423
	2015	10 730	–	–	–	–
Gambia	2013	138 149	800 290	907 880	468 767	468 767
	2014	1 046 510	350 442	603 900	319 182	319 182
	2015	93 375	438 234	875 850	351 677	351 677
Ghana	2013	1 926 300	2 936 037	3 840 000	8 330 784	8 330 784
	2014	5 190 887	2 154 924	9 309 200	14 267 045	14 267 045
	2015	8 423 676	–	3 778 325	2 715 640	2 715 640
Guinea	2013	5 268 245	–	2 436 825	370 771	1 402 400
	2014	73 145	–	2 870 250	1 312 802	644 829
	2015	357 706	–	2 412 597	1 645 493	–

WHO region Country/area	Year	No. of ITN + LLIN sold or delivered	No. of people protected by IRS	No. of RDTs distributed	First-line treatment courses delivered (including ACT)	ACT treatment courses delivered
AFRICAN						
Guinea-Bissau	2013	116 268	–	–	–	–
	2014	1 109 568	–	917 200	171 540	171 540
	2015	–	–	–	–	–
Kenya	2013	1 641 982	0	5 000 000	8 300 000	7 000 000
	2014	5 450 064	0	5 500 000	10 839 611	10 614 717
	2015	11 637 493	0	4 319 000	11 052 564	10 321 221
Liberia	2013	95 775	–	610 225	1 332 055	443 900
	2014	236 996	0	58 248	100 535	96 787
	2015	–	0	–	–	–
Madagascar	2013	6 458 693	1 579 521	1 640 095	2 172 536	2 172 536
	2014	105 442	1 307 384	2 839 325	1 648 093	1 648 093
	2015	11 249 042	1 327 326	4 962 600	2 040 289	2 040 289
Malawi	2013	636 318	–	–	7 601 460	7 601 460
	2014	1 423 507	–	8 197 250	8 735 160	8 735 160
	2015	1 100 000	–	8 462 325	6 240 060	6 240 060
Mali	2013	636 465	826 386	4 101 525	3 080 130	3 080 130
	2014	3 790 403	836 568	2 563 993	2 211 118	2 211 118
	2015	6 080 030	494 163	4 381 050	3 761 319	3 761 319
Mauritania	2013	105 000	–	225 680	56 015	56 015
	2014	178 922	–	269 941	176 192	176 192
	2015	240 000	–	360 000	–	109 000
Mayotte	2013	39 400	381	–	–	–
	2014	5 252	450	–	–	–
	2015	–	–	–	–	–
Mozambique	2013	3 315 727	9 647 202	10 547 052	13 477 650	13 477 650
	2014	6 112 245	5 597 770	17 374 342	15 976 059	15 976 059
	2015	5 126 340	3 659 845	17 219 225	13 653 685	13 653 685
Namibia	2013	104 249	598 901	185 025	90 377	87 520
	2014	163 526	467 930	–	–	–
	2015	–	386 759	30 120	79 215	–
Niger	2013	409 400	0	2 561 900	6 556 070	6 556 070
	2014	2 048 430	0	4 197 381	5 731 036	5 731 036
	2015	6 253 448	0	3 039 594	3 698 674	3 698 674
Nigeria	2013	8 559 372	132 211	13 200 766	32 568 349	32 568 349
	2014	23 328 225	316 255	10 679 235	22 145 889	22 145 889
	2015	27 628 073	–	–	–	–
Rwanda	2013	5 249 761	1 562 411	604 565	1 204 913	1 204 913
	2014	1 373 582	1 243 704	444 729	1 917 021	1 917 021
	2015	2 066 915	–	2 015 100	4 392 006	4 392 006
Sao Tome and Principe	2013	14 596	153 514	30 909	8 752	8 752
	2014	11 385	124 692	58 005	1 456	1 456
	2015	113 221	143 571	72 407	1 704	1 704
Senegal	2013	3 902 145	690 090	1 453 000	976 840	976 840
	2014	3 785 595	708 999	1 193 075	703 712	703 712
	2015	556 135	514 833	2 570 500	958 492	958 492
Sierra Leone	2013	441 859	0	2 522 058	2 201 370	2 201 370
	2014	3 846 204	0	2 057 306	1 391 273	1 391 273
	2015	395 061	–	2 494 935	1 687 031	1 687 031
South Africa	2013	0	2 318 129	242 123	8 272	5 444
	2014	0	5 650 177	499 086	14 036	14 036
	2015	0	1 178 719	16 007	0	0
South Sudan[1]	2013	3 144 818	332 968	764 670	3 125 448	3 125 448
	2014	–	–	–	–	–
	2015	–	–	–	–	–
Swaziland	2013	0	0	21 575	356	307
	2014	5 399	3 971	–	588	558
	2015	3 808	–	58 700	491	396
Togo	2013	468 575	0	989 436	964 927	802 904
	2014	4 042 425	0	1 633 891	1 134 604	1 208 529
	2015	8 600	–	1 633 891	1 508 016	1 208 529
Uganda	2013	13 219 306	2 581 839	19 048 750	24 375 450	24 375 450
	2014	10 615 631	3 219 122	17 157 725	21 698 700	21 698 700
	2015	1 442 500	3 895 232	27 110 800	30 166 620	30 166 620

Annex 4 – D. Commodities distribution, 2013–2015

WHO region Country/area	Year	No. of ITN + LLIN sold or delivered	No. of people protected by IRS	No. of RDTs distributed	First-line treatment courses delivered (including ACT)	ACT treatment courses delivered
AFRICAN						
United Republic of Tanzania	2013	2 547 391	3 793 027	21 785 950	20 382 485	20 382 485
	2014	619 189	2 224 900	24 126 300	19 937 820	19 937 820
	2015	21 141 998	14 684 925	17 031 950	10 164 660	10 164 660
Mainland	2013	2 489 536	3 537 097	21 491 950	20 377 410	20 377 410
	2014	510 000	2 000 000	24 126 300	19 937 820	19 937 820
	2015	20 794 000	14 386 280	16 416 675	10 160 910	10 160 910
Zanzibar	2013	57 855	255 930	294 000	5 075	5 075
	2014	109 189	224 900	–	–	–
	2015	347 998	298 645	615 275	3 750	3 750
Zambia	2013	3 362 588	1 063 460	9 221 210	15 926 301	15 926 301
	2014	6 368 026	5 538 574	7 500 000	13 000 845	13 000 845
	2015	–	5 930 141	11 310 350	14 365 969	14 365 969
Zimbabwe	2013	2 010 000	3 106 659	1 671 832	815 260	815 260
	2014	1 743 542	3 460 871	2 446 996	960 455	960 455
	2015	84 087	3 548 246	1 981 613	847 333	847 333
AMERICAS						
Belize	2013	2 324	21 413	0	26	0
	2014	2 452	21 413	0	19	0
	2015	4 152	36 796	0	13	0
Bolivia (Plurinational State of)	2013	20 965	30 280	15 000	7 342	959
	2014	23 580	16 573	–	7 401	325
	2015	17 514	11 138	–	6 907	6 907
Brazil	2013	147 736	324 477	100 050	452 990	122 290
	2014	229 947	287 150	46 950	334 740	59 690
	2015	–	276 278	101 700	290 580	94 380
Colombia	2013	146 196	154 000	43 600	68 879	48 285
	2014	169 500	519 333	2 960	86 228	32 489
	2015	25 100	252 500	0	108 469	55 469
Dominican Republic	2013	54 139	49 510	71 000	579	4
	2014	6 733	6 066	54 425	496	7
	2015	105 906	100 090	50 220	661	3
Ecuador	2013	20 337	94 321	–	378	161
	2014	–	–	–	–	–
	2015	120 532	–	–	686	227
El Salvador	2013	10 000	15 076	0	10 865	0
	2014	0	6 424	0	8	0
	2015	0	37 500	0	9	0
French Guiana	2013	2 920	16 932	–	–	–
	2014	2 990	–	–	–	–
	2015	–	–	–	–	–
Guatemala	2013	282 788	37 450	139 525	–	–
	2014	49 905	1 700	50 459	–	–
	2015	600 049	–	108 900	0	0
Guyana	2013	27 921	41 000	0	31 479	13 655
	2014	152 996	25 592	0	12 354	12 354
	2015	24 201	146	0	9 984	3 219
Haiti	2013	0	0	0	109 625	0
	2014	0	0	–	2 030 300	–
	2015	–	–	–	–	–
Honduras	2013	66 920	121 121	8 000	37 248	2
	2014	25 118	116 490	4 275	54 466	8
	2015	36 149	125 975	9 750	–	8
Mexico	2013	4 500	49 401	–	2 974	4
	2014	7 500	47 775	–	4 592	6
	2015	15 000	214 032	0	3 133	6
Nicaragua	2013	17 100	127 601	19 029	1 162	0
	2014	83 279	56 675	15 620	1 142	0
	2015	0	59 282	12 527	2 307	–
Panama	2013	0	17 055	0	705	0
	2014	0	11 422	0	874	0
	2015	0	11 581	0	562	0
Peru	2013	4 600	43 617	–	42 670	6 504
	2014	45 000	69 155	–	65 252	10 416
	2015	64 687	142 253	–	66 609	13 618

WHO region Country/area	Year	No. of ITN + LLIN sold or delivered	No. of people protected by IRS	No. of RDTs distributed	First-line treatment courses delivered (including ACT)	ACT treatment courses delivered
AMERICAS						
Suriname	2013	4 892	0	–	800	300
	2014	3 000	0	24 425	401	144
	2015	0	–	17 625	–	–
Venezuela (Bolivarian Republic of)	2013	467	4 369 755	–	–	27 659
	2014	2 666	4 189 850	0	120 979	32 005
	2015	1 041	2 739 290	–	136 389	35 509
EASTERN MEDITERRANEAN						
Afghanistan	2013	359 622	0	188 370	11 135	11 135
	2014	4 325 552	0	355 160	21 625	21 625
	2015	58 830	–	98 065	–	200
Djibouti	2013	25 700	0	20 800	8 920	8 920
	2014	25 000	36 630	–	–	–
	2015	0	–	40 761	–	–
Iran (Islamic Republic of)	2013	169 084	281 203	–	6 230	3 400
	2014	70 360	289 249	–	8 830	8 830
	2015	91 845	217 773	114 450	37 971	2 042
Pakistan	2013	2 238 300	1 161 825	1 170 000	2 150 000	590 840
	2014	1 519 947	1 103 480	857 690	907 200	162 880
	2015	1 822 015	1 685 264	770 074	890 500	80 000
Saudi Arabia	2013	750 000	1 736 400	–	974	974
	2014	1 450 000	752 851	–	1 155	1 155
	2015	125 000	131 661	–	1 444	1 444
Somalia	2013	525 000	90 060	809 520	292 000	292 000
	2014	413 000	61 362	617 640	155 450	155 450
	2015	291 085	15 645	424 140	386 200	386 200
Sudan	2013	5 803 319	3 902 712	1 800 000	2 630 400	2 077 204
	2014	4 432 714	3 942 110	2 200 000	3 823 175	3 823 175
	2015	2 729 334	2 460 816	4 344 150	2 551 310	2 551 310
Yemen	2013	1 405 837	2 204 429	233 311	303 847	303 847
	2014	375 899	2 188 436	412 350	215 486	215 486
	2015	847 946	798 707	334 525	153 682	153 682
EUROPEAN						
Tajikistan	2013	100 000	437 436	–	1	1
	2014	50 000	387 010	–	0	0
	2015	–	–	–	–	–
SOUTH-EAST ASIA						
Bangladesh	2013	612 000	0	186 700	42 390	42 390
	2014	728 773	0	–	75 479	58 770
	2015	2 380 759	–	259 171	40 742	35 708
Bhutan	2013	93 726	32 824	–	518	518
	2014	10 609	144 669	–	118	118
	2015	26 000	70 926	16 875	416	416
Democratic People's Republic of Korea	2013	0	2 651 612	0	15 673	0
	2014	0	2 617 120	0	11 212	0
	2015	864 750	1 146 750	253 320	29 272	0
India	2013	0	45 854 424	16 200 000	147 000	147 000
	2014	0	45 150 612	15 562 000	211 500	211 500
	2015	7 241 418	41 849 017	21 182 000	2 123 760	2 123 760
Indonesia	2013	913 135	253 815	1 047 504	300 008	300 008
	2014	6 416 947	103 285	879 650	212 346	212 165
	2015	56 337	53 497	300 000	406 614	406 614
Myanmar	2013	1 508 557	–	1 497 545	371 663	371 663
	2014	904 613	48 626	3 048 440	281 103	281 103
	2015	3 398 941	129 545	1 309 300	243 515	243 515
Nepal	2013	1 395 865	345 000	65 500	38 113	325
	2014	1 064 518	372 000	60 000	24 500	195
	2015	304 437	235 000	56 000	3 350	300
Thailand	2013	670 000	106 374	160 000	15 069	15 069
	2014	528 850	362 469	258 823	19 314	19 314
	2015	251 500	348 713	15 400	8 125	8 125
Timor-Leste	2013	253 037	51 627	121 991	1 042	513
	2014	99 572	110 707	86 592	347	105
	2015	24 607	93 019	90 818	80	56

Annex 4 – D. Commodities distribution, 2013–2015

WHO region Country/area	Year	No. of ITN + LLIN sold or delivered	No. of people protected by IRS	No. of RDTs distributed	First-line treatment courses delivered (including ACT)	ACT treatment courses delivered
WESTERN PACIFIC						
Cambodia	2013	5 418	0	1 085 325	117 547	117 547
	2014	70 411	0	538 500	118 483	114 159
	2015	1 517 074	–	483 600	128 004	122 013
China	2013	0	447 639	821 000	4 127	3 919
	2014	19 899	504 936	–	43 150	9 350
	2015	29 611	1 697 188	–	67 555	20 710
Lao People's Democratic Republic	2013	439 677	13 113	160 000	58 470	58 470
	2014	276 655	4 691	312 075	50 092	50 092
	2015	152 791	–	324 225	86 456	86 456
Malaysia	2013	317 943	682 288	–	3 850	2 873
	2014	622 673	615 384	–	3 923	3 182
	2015	285 946	489 030	–	2 311	1 616
Papua New Guinea	2013	1 625 831	0	1 032 600	915 330	915 330
	2014	1 613 140	–	963 900	802 080	802 080
	2015	991 440	–	1 000 000	728 310	728 310
Philippines	2013	715 125	1 108 220	70 550	24 771	24 771
	2014	996 180	1 175 136	201 775	30 095	30 095
	2015	932 736	847 845	79 300	16 989	16 989
Republic of Korea	2013	0	–	–	443	–
	2014	5 250	–	–	638	–
	2015	5 250	–	4 900	699	–
Solomon Islands	2013	371 124	98 971	1 677	146 439	146 439
	2014	47 258	128 673	47 450	147 430	147 430
	2015	10 721	175 683	107 425	242 456	242 456
Vanuatu	2013	94 232	3 033	35 000	24 000	24 000
	2014	42 916	0	50 000	24 000	24 000
	2015	38 211	–	53 400	20 256	20 256
Viet Nam	2013	0	1 310 820	412 530	218 389	141 570
	2014	526 366	616 670	434 160	194 397	106 100
	2015	658 450	620 093	459 332	97 570	45 000

ACT, artemisinin-based combination therapy; IRS, indoor residual spraying; ITN, insecticide-treated mosquito net; LLIN, long-lasting insecticidal net; RDT, rapid diagnostic test

1 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf)

WHO region Country/area	Source	% of HH that have at least one ITN	% of HH with enough ITNs for individuals who slept in the house the previous night	% of population with access to an ITN in their household	% of existing ITNs in HH used the previous night	% of the population who slept under an ITN the previous night	% of children <5 years who slept under an ITN the previous night	% of pregnant women who slept under an ITN the previous night	% of HH sprayed by IRS within last 12 months	% of HH with = 1 ITN for 2 pers. and/or sprayed by IRS within last 12 months	% of women who received at least 3 doses of IPT during ANC visits during their last pregnancy	% of children aged 6-59 months with		% children <5 years with fever in last 2 weeks		
												a hemoglobin measurement <8g/dL	a positive microscopy blood smear	for whom advice or treatment was sought	who received an ACT among those who received any antimalarial	who had a finger or heel stick
AFRICAN																
Burkina Faso	MIS 2014	–	47	71	85	66	–	76	1	47	–	–	46	64	28	31
Burundi	DHS 2013	–	23	46	83	47	–	55	6	–	–	–	–	–	69	48
Chad	DHIS 2015	–	27	40	47	21	–	22	1	41	8	–	–	43	10	13
Democratic Republic of the Congo	DHS 2013	–	24	47	85	49	–	59	–	–	–	8	–	–	19	19
	DHS 2014	–	24	47	85	49	–	59	–	–	6	8	23	59	18	19
Gambia	DHS 2013	–	19	45	77	36	–	46	32	43	6	12	1	66	31	37
Ghana	DHS 2014	–	44	59	50	35	–	43	12	51	40	9	–	80	78	34
Kenya	DHS 2014	–	32	48	79	41	–	50	2	34	10	–	–	73	85	35
	DHIS 2015	–	39	53	78	47	–	58	–	–	23	–	8	73	92	39
Liberia	DHS 2013	–	20	37	71	31	–	36	13	30	18	–	–	80	43	42
Madagascar	DHS 2013	–	28	48	85	54	–	61	30	–	–	4	–	–	41	13
Malawi	MIS 2014	–	30	52	86	52	–	61	9	37	–	7	33	67	93	49
Mali	DHS 2013	–	38	65	90	58	–	73	6	42	13	21	53	49	17	12
	DHIS 2015	–	37	70	91	63	–	78	5	40	–	–	36	58	29	14
Namibia	DHS 2013	–	12	18	23	4	–	4	17	26	3	3	–	66	46	22
Nigeria	DHS 2013	–	22	36	35	13	–	16	2	23	7	–	–	78	18	11
	DHIS 2015	–	34	55	60	37	–	49	1	35	22	10	27	68	38	13
Rwanda	DHS 2013	–	41	66	75	60	–	74	12	–	–	–	–	–	93	30
	DHIS 2015	–	41	64	80	60	–	73	–	–	–	2	1	59	99	36
Senegal	DHS 2013	–	27	57	66	39	–	43	13	–	–	10	–	–	18	–
	DHS 2014	–	34	58	63	39	–	38	10	41	3	5	1	59	10	11
	DHIS 2015	–	39	66	71	50	–	51	5	42	8	8	0	51	14	18
Sierra Leone	DHS 2013	–	14	38	93	41	–	52	5	–	–	17	–	–	77	40
Togo	DHS 2014	–	32	49	61	33	–	40	–	–	24	9	38	61	48	24
Uganda	MIS 2015	–	60	79	77	67	–	75	5	63	28	5	19	83	87	36
Zambia	DHS 2014	–	24	47	65	34	–	41	31	48	50	–	–	77	90	49
WESTERN PACIFIC																
Cambodia	DHS 2014	–	–	–	–	–	–	–	–	–	–	3	–	89	63	14

ACT, artemisinin-based combination therapy; ANC, antenatal care; DHS, demographic and health survey; HH, households; IPT, intermittent preventive treatment; IRS, indoor residual spraying; ITN, insecticide-treated mosquito net; MIS, malaria indicator survey

Annex 4 – F. Estimated malaria cases and deaths, 2000–2015

WHO region Country/area		2000			2005		
		Lower	Point	Upper	Lower	Point	Upper
AFRICAN							
Algeria	cases		<50			<10	
	deaths		<10			<10	
Angola	cases	3 300 000	4 800 000	6 400 000	4 100 000	5 400 000	6 700 000
	deaths	17 000	22 000	28 000	16 000	22 000	28 000
Benin	cases	1 700 000	2 700 000	3 900 000	2 400 000	3 400 000	4 400 000
	deaths	5 600	7 400	9 500	6 600	8 600	11 000
Botswana	cases	12 000	27 000	77 000	1 000	2 300	5 600
	deaths	1	70	240		<10	
Burkina Faso	cases	5 500 000	7 200 000	9 000 000	5 700 000	7 400 000	9 100 000
	deaths	36 000	39 000	55 000	25 000	32 000	49 000
Burundi	cases	1 900 000	2 800 000	4 000 000	1 500 000	2 200 000	3 000 000
	deaths	7 300	10 000	12 000	3 600	6 800	7 600
Cameroon	cases	4 600 000	6 300 000	8 200 000	5 900 000	8 000 000	10 000 000
	deaths	16 000	20 000	26 000	15 000	21 000	27 000
Cabo Verde	cases	210	490	1 400	97	220	590
	deaths		<10			<10	
Central African Republic	cases	1 100 000	1 600 000	2 300 000	1 200 000	1 900 000	2 700 000
	deaths	5 100	6 400	8 200	5 700	7 400	9 400
Chad	cases	810 000	1 700 000	2 800 000	870 000	2 200 000	3 900 000
	deaths	4 400	6 200	9 000	3 800	7 400	11 000
Comoros	cases	65 000	110 000	190 000	66 000	110 000	190 000
	deaths	9	280	620	9	280	650
Congo	cases	750 000	1 100 000	1 500 000	840 000	1 200 000	1 700 000
	deaths	2 100	2 800	3 600	1 100	2 400	3 100
Côte d'Ivoire	cases	6 500 000	8 700 000	11 000 000	6 800 000	9 600 000	13 000 000
	deaths	27 000	33 000	40 000	25 000	32 000	39 000
Democratic Republic of the Congo	cases	17 000 000	24 000 000	31 000 000	20 000 000	29 000 000	38 000 000
	deaths	87 000	100 000	140 000	88 000	110 000	150 000
Equatorial Guinea	cases	120 000	190 000	270 000	180 000	250 000	310 000
	deaths	540	680	870	570	790	1 000
Eritrea	cases	21 000	70 000	170 000	18 000	28 000	41 000
	deaths	3	140	590		<100	
Ethiopia	cases	1 100 000	21 000 000	34 000 000	1 200 000	4 800 000	12 000 000
	deaths	450	47 000	74 000	280	9 300	29 000
Gabon	cases	290 000	440 000	630 000	140 000	230 000	340 000
	deaths	330	460	590	78	310	430
Gambia	cases	310 000	410 000	540 000	310 000	410 000	530 000
	deaths	520	740	990	160	570	820
Ghana	cases	6 800 000	9 200 000	12 000 000	6 500 000	8 300 000	10 000 000
	deaths	15 000	19 000	25 000	8 400	16 000	20 000
Guinea	cases	3 200 000	4 200 000	5 200 000	2 800 000	4 100 000	5 700 000
	deaths	12 000	15 000	20 000	8 800	12 000	16 000
Guinea-Bissau	cases	350 000	570 000	790 000	96 000	190 000	290 000
	deaths	1 200	1 600	2 000	240	730	1 000
Kenya	cases	5 500 000	7 200 000	9 300 000	3 700 000	5 200 000	6 800 000
	deaths	8 700	14 000	16 000	3 500	12 000	13 000
Liberia	cases	950 000	1 400 000	2 100 000	980 000	1 500 000	2 000 000
	deaths	5 400	6 700	8 700	2 800	4 100	5 300
Madagascar	cases	69 000	1 700 000	5 600 000	22 000	1 300 000	3 500 000
	deaths	9	4 400	18 000	5	3 300	12 000
Malawi	cases	3 300 000	4 800 000	6 400 000	3 100 000	4 100 000	5 100 000
	deaths	12 000	16 000	20 000	4 800	9 700	13 000
Mali	cases	3 900 000	5 000 000	6 200 000	4 800 000	6 100 000	7 400 000
	deaths	21 000	27 000	34 000	18 000	23 000	29 000
Mauritania	cases	31 000	250 000	730 000	44 000	310 000	890 000
	deaths	510	920	1 200	280	1 000	1 400
Mozambique	cases	7 400 000	9 400 000	12 000 000	7 600 000	9 300 000	11 000 000
	deaths	31 000	40 000	51 000	17 000	25 000	32 000
Namibia	cases	47 000	84 000	150 000	45 000	70 000	110 000
	deaths	6	210	520	5	180	400
Niger	cases	1 900 000	3 700 000	5 700 000	2 400 000	4 600 000	7 000 000
	deaths	11 000	14 000	20 000	9 100	13 000	19 000

2010			2015			Method used
Lower	Point	Upper	Lower	Point	Upper	
	<10			0		1
	<10			0		1b
1 700 000	2 400 000	3 300 000	1 800 000	3 100 000	4 700 000	2
8 800	14 000	20 000	9 200	14 000	21 000	2
2 300 000	3 200 000	4 200 000	2 300 000	3 200 000	4 100 000	2
5 100	6 800	8 900	4 200	6 000	8 000	2
1 700	3 400	7 500	370	710	1 500	1
<10				<10		1c
7 300 000	9 400 000	11 000 000	4 500 000	7 000 000	10 000 000	2
22 000	29 000	45 000	10 000	15 000	29 000	2
1 100 000	1 900 000	2 800 000	890 000	1 400 000	2 000 000	2
2 000	5 300	5 700	1 500	5 200	5 600	2
4 200 000	5 700 000	7 300 000	3 500 000	5 300 000	7 700 000	2
6 500	11 000	15 000	4 900	9 200	13 000	2
66	140	300		<50		1
	<10			<10		1a
980 000	1 600 000	2 500 000	770 000	1 400 000	2 300 000	2
3 700	5 000	6 400	2 500	3 600	4 600	2
850 000	1 900 000	3 500 000	720 000	1 900 000	3 400 000	2
3 400	7 400	11 000	3 200	7 500	11 000	2
96 000	140 000	210 000	2 000	2 900	4 500	1
12	350	720		<10		1c
530 000	880 000	1 400 000	490 000	800 000	1 200 000	2
390	1 700	2 300	260	1 600	2 400	2
6 900 000	9 000 000	11 000 000	5 900 000	7 900 000	10 000 000	2
17 000	22 000	28 000	9 800	14 000	17 000	2
21 000 000	28 000 000	35 000 000	14 000 000	19 000 000	24 000 000	2
60 000	82 000	110 000	26 000	42 000	65 000	2
80 000	150 000	220 000	75 000	180 000	310 000	2
180	350	460	160	340	450	2
59 000	93 000	140 000	38 000	65 000	100 000	1
11	180	380	7	130	290	1c
480 000	4 400 000	10 000 000	820 000	2 800 000	5 500 000	1
230	8 100	25 000	240	4 900	13 000	1c
100 000	230 000	420 000	140 000	400 000	710 000	2
69	320	460	100	390	530	2
310 000	410 000	550 000	320 000	420 000	520 000	1
120	570	870	110	630	960	2
7 600 000	9 600 000	12 000 000	4 800 000	7 300 000	10 000 000	2
7 300	16 000	20 000	4 600	13 000	17 000	2
3 400 000	4 500 000	5 900 000	3 600 000	4 600 000	5 700 000	2
8 000	11 000	14 000	6 700	9 900	12 000	2
95 000	170 000	250 000	55 000	160 000	330 000	2
170	670	970	150	680	1 000	2
2 500 000	3 300 000	4 200 000	3 800 000	6 500 000	11 000 000	2
2 100	11 000	11 000	2 500	12 000	12 000	2
1 100 000	1 300 000	1 700 000	670 000	1 100 000	1 600 000	2
1 400	2 400	3 100	970	2 000	2 600	2
380 000	650 000	980 000	1 500 000	2 400 000	4 000 000	1
49	1 700	3 500	180	6 000	13 000	1c
5 100 000	6 200 000	7 300 000	2 400 000	3 300 000	4 200 000	2
4 700	10 000	13 000	1 800	7 200	10 000	2
4 200 000	5 300 000	6 300 000	6 100 000	7 500 000	9 100 000	2
12 000	16 000	20 000	16 000	21 000	25 000	2
32 000	240 000	700 000	50 000	260 000	560 000	1
260	1 100	1 500	250	1 200	1 600	2
7 700 000	9 300 000	11 000 000	6 300 000	8 300 000	11 000 000	2
11 000	18 000	24 000	8 100	15 000	20 000	2
2 200	2 900	3 800	17 000	22 000	27 000	1
	<10			<100		2
3 400 000	6 000 000	8 600 000	2 800 000	5 200 000	8 400 000	2
9 700	14 000	20 000	6 600	10 000	16 000	2

Annex 4 – F. Estimated malaria cases and deaths, 2000–2015

WHO region Country/area		2000			2005		
		Lower	Point	Upper	Lower	Point	Upper
AFRICAN							
Nigeria	cases	41 000 000	54 000 000	66 000 000	46 000 000	59 000 000	74 000 000
	deaths	160 000	200 000	260 000	140 000	190 000	240 000
Rwanda	cases	950 000	3 400 000	8 700 000	550 000	1 600 000	3 500 000
	deaths	3 400	5 200	7 200	1 000	3 600	5 200
Sao Tome and Principe	cases	40 000	47 000	55 000	24 000	30 000	39 000
	deaths	110	110	110		<100	
Senegal	cases	1 100 000	2 300 000	3 800 000	640 000	1 300 000	2 200 000
	deaths	4 600	6 500	8 400	1 400	4 600	6 400
Sierra Leone	cases	1 200 000	2 000 000	2 800 000	1 400 000	2 400 000	3 400 000
	deaths	10 000	12 000	17 000	9 000	12 000	16 000
South Africa	cases	23 000	39 000	65 000	13 000	17 000	21 000
	deaths		530			<100	
South Sudan[1]	cases	1 200 000	2 000 000	2 900 000	1 200 000	1 800 000	2 600 000
	deaths	5 600	6 100	9 600	2 500	4 000	7 400
Swaziland	cases	630	1 900	3 900	710	970	1 300
	deaths		<10		<10		
Togo	cases	1 900 000	2 500 000	3 500 000	2 100 000	2 800 000	3 500 000
	deaths	5 500	6 900	8 800	5 200	6 900	8 900
Uganda	cases	9 300 000	12 000 000	16 000 000	10 000 000	13 000 000	17 000 000
	deaths	39 000	49 000	63 000	24 000	35 000	45 000
United Republic of Tanzania	cases	8 400 000	12 000 000	15 000 000	7 400 000	9 700 000	12 000 000
	deaths	22 000	30 000	38 000	7 800	20 000	26 000
Zambia	cases	3 000 000	4 000 000	5 200 000	2 200 000	2 900 000	3 700 000
	deaths	11 000	14 000	18 000	3 400	7 900	10 000
Zimbabwe	cases	78 000	960 000	2 700 000	85 000	990 000	3 000 000
	deaths	23	2 500	9 100	25	2 500	9 200
AMERICAS							
Belize	cases	1 600	1 700	1 900	1 600	1 800	2 000
	deaths		0			0	
Bolivia (Plurinational State of)	cases	33 000	49 000	110 000	21 000	30 000	62 000
	deaths		<50			<50	
Brazil	cases	950 000	1 200 000	1 600 000	710 000	820 000	930 000
	deaths	370	370	370	180	180	180
Colombia	cases	200 000	320 000	470 000	140 000	190 000	240 000
	deaths		<50			<50	
Dominican Republic	cases	1 300	1 600	2 300	4 200	5 300	6 500
	deaths		<10			<50	
Ecuador	cases	110 000	110 000	130 000	17 000	19 000	21 000
	deaths		0			0	
El Salvador	cases	770	820	920	68	73	82
	deaths		0			0	
French Guiana	cases	4 200	7 400	24 000	3 700	6 000	16 000
	deaths		<50			<10	
Guatemala	cases	56 000	98 000	340 000	43 000	68 000	190 000
	deaths		<50			<50	
Guyana	cases	35 000	52 000	83 000	59 000	89 000	140 000
	deaths	7	78	160	12	120	240
Haiti	cases	72 000	130 000	210 000	78 000	140 000	220 000
	deaths	9	330	740	10	370	780
Honduras	cases	56 000	81 000	110 000	26 000	37 000	52 000
	deaths		<50			<50	
Mexico	cases	7 500	8 100	9 100	3 000	3 200	3 600
	deaths		0			0	
Nicaragua	cases	38 000	49 000	62 000	10 000	13 000	17 000
	deaths		<50			<10	
Panama	cases	1 100	1 200	1 300	3 900	4 300	4 600
	deaths		<10			<10	
Peru	cases	99 000	140 000	180 000	130 000	160 000	200 000
	deaths		<50			<10	

2010			2015			Method used
Lower	Point	Upper	Lower	Point	Upper	
47 000 000	59 000 000	71 000 000	42 000 000	61 000 000	82 000 000	2
94 000	130 000	170 000	78 000	110 000	150 000	2
730 000	1 100 000	1 500 000	2 800 000	3 500 000	4 600 000	1
530	3 000	4 600	320	3 000	4 600	1c
3 600	4 900	6 700	2 600	3 400	4 500	1
	<100			<100		1a
1 100 000	1 800 000	2 700 000	950 000	1 400 000	2 100 000	1
800	4 100	6 000	640	4 400	6 500	2
2 000 000	2 800 000	3 700 000	1 200 000	2 000 000	2 800 000	2
8 300	11 000	15 000	4 000	5 800	8 900	2
14 000	17 000	22 000	9 000	12 000	15 000	1
	<100			160		1a
970 000	1 800 000	2 800 000	970 000	1 900 000	3 200 000	2
1 800	3 200	7 100	1 400	2 800	7 400	2
370	530	790	190	260	380	1
	<10			<10		1c
2 200 000	2 900 000	3 800 000	2 000 000	2 500 000	3 000 000	2
4 500	6 300	7 900	2 700	4 200	5 300	2
12 000 000	14 000 000	17 000 000	4 500 000	8 500 000	13 000 000	2
12 000	20 000	25 000	4 300	12 000	17 000	2
5 300 000	6 900 000	8 700 000	3 900 000	5 300 000	6 900 000	2
3 800	16 000	22 000	3 100	17 000	24 000	2
1 700 000	2 200 000	2 600 000	2 200 000	2 800 000	3 600 000	2
1 700	6 300	8 800	1 900	7 100	9 900	2
450 000	970 000	1 800 000	610 000	960 000	1 500 000	1
58	2 500	6 000	69	2 400	5 200	1c
160	180	190		<50		1
	0			0		1a
15 000	20 000	36 000	7 300	9 900	20 000	1
	<50			<10		1c
380 000	440 000	490 000	160 000	180 000	210 000	1
98	98	98		<50		1a
140 000	180 000	240 000	58 000	79 000	100 000	1
	<50			<50		1c
3 800	4 700	5 800	700	870	1 100	1
	<50			<10		1c
1 900	2 100	2 300	630	680	760	1
	0			0		1b
<50	<50	<50	<10	<10	<10	1
	0			0		1b
2 200	3 400	9 200	470	730	1 500	1
	<10			<10		1c
7 800	12 000	32 000	7 500	11 000	25 000	1
	<10			<10		1c
38 000	52 000	76 000	14 000	20 000	28 000	1
6	93	180		<50		1c
87 000	150 000	250 000	42 000	69 000	100 000	1
11	390	850	5	180	370	1c
16 000	21 000	28 000	5 400	7 200	9 600	1
	<50			<10		1c
1 200	1 300	1 500	530	560	630	1
	0			0		1b
1 100	1 400	1 700	3 500	4 600	5 800	1
	<10			<10		1c
440	490	530	590	660	710	1
	<10			0		1a
50 000	63 000	78 000	120 000	150 000	180 000	1
	<10			<10		1a

Annex 4 – F. Estimated malaria cases and deaths, 2000–2015

WHO region Country/area		2000			2005		
		Lower	Point	Upper	Lower	Point	Upper
AMERICAS							
Suriname	cases	12 000	18 000	41 000	9 800	13 000	28 000
	deaths		<50			<10	
Venezuela (Bolivarian Republic of)	cases	40 000	78 000	230 000	49 000	78 000	210 000
	deaths	11	60	180	12	52	140
EASTERN MEDITERRANEAN							
Afghanistan	cases	580 000	1 100 000	1 800 000	380 000	580 000	890 000
	deaths	170	540	1 100	86	280	540
Djibouti	cases	2 000	10 000	28 000	2 200	7 900	14 000
	deaths		<50			<50	
Iran (Islamic Republic of)	cases	12 000	13 000	15 000	15 000	16 000	18 000
	deaths		<10			<10	
Pakistan	cases	1 900 000	3 900 000	14 000 000	1 900 000	3 900 000	13 000 000
	deaths	410	4 000	15 000	400	4 400	16 000
Saudi Arabia	cases	4 800	5 200	5 800	210	220	250
	deaths		0			0	
Somalia	cases	330 000	610 000	1 100 000	740 000	1 100 000	1 400 000
	deaths	50	1 800	3 900	98	2 800	5 300
Sudan	cases	1 600 000	2 400 000	3 500 000	1 600 000	2 200 000	2 900 000
	deaths	210	6 300	12 000	190	5 500	11 000
Yemen	cases	290 000	730 000	1 900 000	260 000	600 000	2 100 000
	deaths	44	1 800	6 400	35	1 500	5 400
EUROPE							
Tajikistan	cases	19 000	21 000	23 000	2 400	2 500	2 800
	deaths		0			0	
SOUTH-EAST ASIA							
Bangladesh	cases	71 000	110 000	150 000	76 000	120 000	170 000
	deaths	13	210	430	11	250	520
Bhutan	cases	6 000	6 500	7 300	1 900	2 000	2 200
	deaths		<50			<10	
Democratic People's Republic of Korea	cases	40 000	150 000	300 000	6 800	7 400	8 200
	deaths		0			0	
India	cases	18 000 000	24 000 000	31 000 000	19 000 000	29 000 000	36 000 000
	deaths	3 100	36 000	64 000	3 500	41 000	63 000
Indonesia	cases	2 200 000	4 000 000	6 600 000	3 600 000	5 100 000	7 300 000
	deaths	600	4 600	9 900	660	7 200	14 000
Myanmar	cases	970 000	1 400 000	2 100 000	1 000 000	1 500 000	2 100 000
	deaths	150	3 100	6 800	160	3 100	6 300
Nepal	cases	71 000	110 000	160 000	50 000	82 000	130 000
	deaths	20	60	100	16	62	110
Thailand	cases	45 000	220 000	1 000 000	33 000	120 000	500 000
	deaths	800	810	820	210	210	210
Timor-Leste	cases	130 000	250 000	500 000	190 000	270 000	370 000
	deaths	22	470	1 300	30	530	1 000
WESTERN PACIFIC							
Cambodia	cases	950 000	1 500 000	2 300 000	270 000	390 000	530 000
	deaths	130	3 600	7 300	47	710	1 400
China	cases	23 000	29 000	36 000	21 000	23 000	25 000
	deaths		<50			<50	
Lao People's Democratic Republic	cases	180 000	260 000	360 000	34 000	50 000	71 000
	deaths	21	630	1 300	4	120	250
Malaysia	cases	12 000	13 000	15 000	5 300	5 600	6 300
	deaths		<50			<50	
Papua New Guinea	cases	1 000 000	1 400 000	1 900 000	1 000 000	1 400 000	1 800 000
	deaths	150	3 100	5 700	160	2 800	5 300
Philippines	cases	79 000	110 000	160 000	96 000	140 000	210 000
	deaths	13	230	460	16	300	590

2010			2015			Method used
Lower	Point	Upper	Lower	Point	Upper	
1 800	2 500	4 500	110	150	270	1
	<10			0		1a
52 000	78 000	210 000	150 000	230 000	490 000	1
11	72	210	27	220	500	1c
250 000	340 000	480 000	300 000	390 000	510 000	1
58	200	340	66	190	330	1c
690	1 600	3 100	1 100	5 600	18 000	1
	<10			<50		1c
1 900	2 000	2 300	170	180	200	1
	<10			<10		1b
1 100 000	1 500 000	2 100 000	730 000	1 000 000	1 500 000	1
250	1 700	3 200	170	740	1 300	1c
	<50		84	91	100	1
	0			0		1b
190 000	280 000	390 000	310 000	700 000	1 300 000	1
26	740	1 400	52	2 100	4 800	1c
880 000	1 200 000	1 600 000	970 000	1 400 000	1 900 000	1
110	3 000	5 700	130	3 500	6 800	1c
320 000	510 000	810 000	200 000	310 000	460 000	1
42	1 300	2 800	24	770	1 600	1c
110	120	140		0		1
	0			0		1b
69 000	84 000	100 000	7 100	8 400	10 000	1
8	200	360		<50		1c
440	480	530		<50		1
	<10			0		1b
15 000	16 000	18 000	7 200	7 700	8 600	1
	0			0		1b
16 000 000	21 000 000	31 000 000	9 900 000	13 000 000	18 000 000	1
2 800	33 000	63 000	1 500	24 000	47 000	1c
4 600 000	5 900 000	7 700 000	990 000	1 300 000	1 600 000	1
830	8 900	17 000	160	1 900	3 600	1c
1 100 000	1 600 000	2 200 000	170 000	240 000	340 000	1
180	3 000	6 100	27	490	980	1c
25 000	38 000	58 000	17 000	24 000	35 000	1
	<50			<50		1c
36 000	120 000	370 000	16 000	52 000	150 000	1
100	100	100		<50		1a
90 000	110 000	150 000	97	120	160	1
14	220	420		<10		1c
140 000	180 000	220 000	95 000	120 000	150 000	1
22	320	560	17	120	200	1c
5 200	5 900	6 300		<50		1
	<10			0		1b
48 000	69 000	97 000	68 000	88 000	110 000	1
6	170	350		<50		1c
5 900	6 400	7 100	1 900	2 000	2 300	1
	<50			<10		1b
890 000	1 200 000	1 600 000	650 000	900 000	1 200 000	1
130	2 600	5 100	140	1 200	2 300	1c
35 000	53 000	75 000	9 200	13 000	17 000	1
5	110	240		<50		1c

Annex 4 – F. Estimated malaria cases and deaths, 2000–2015

WHO region Country/area		2000			2005		
		Lower	Point	Upper	Lower	Point	Upper
WESTERN PACIFIC							
Republic of Korea	cases	4 200	4 500	5 100	1 300	1 400	1 600
	deaths		0			0	
Solomon Islands	cases	160 000	190 000	230 000	180 000	220 000	260 000
	deaths	25	370	650	28	420	730
Vanuatu	cases	17 000	23 000	31 000	19 000	26 000	34 000
	deaths		<50			<50	
Viet Nam	cases	160 000	210 000	250 000	32 000	39 000	47 000
	deaths	24	430	780	5	79	140
REGIONAL SUMMARY							
African	cases	146 716 840	225 899 390	308 872 300	154 924 807	216 738 490	290 668 490
	deaths	588 411	787 840	1 064 830	458 152	667 360	903 200
Americas	cases	1 717 470	2 345 820	3 605 520	1 309 268	1 677 673	2 342 782
	deaths	397	838	1 450	214	722	1 340
Eastern Mediterranean	cases	4 718 800	8 768 200	22 348 800	4 897 410	8 404 120	20 322 250
	deaths	884	14 440	38 400	809	14 480	38 240
European	cases	19 000	21 000	23 000	2 400	2 500	2 800
	deaths		0			0	
South-East Asia	cases	21 533 000	30 246 500	41 817 300	23 957 700	36 201 400	46 580 400
	deaths	4 705	45 250	83 350	4 587	52 352	85 140
Western Pacific	cases	2 585 200	3 739 500	5 287 100	1 658 600	2 295 000	2 984 900
	deaths	363	8 360	16 190	260	4 429	8 410
Total	cases	**177 290 310**	**271 020 410**	**381 954 020**	**186 750 185**	**265 319 183**	**362 901 622**
	deaths	**594 760**	**856 728**	**1 204 220**	**464 022**	**739 343**	**1 036 330**

1 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 high-transmission areas of Sudan (10 southern states, which correspond to contemporary South Sudan) and low-transmission areas (15 northern states which correspond to contemporary Sudan) are reported separately.

Cases: (1) Estimated from reported confirmed cases, (2) Estimated from parasite prevalence surveys

Deaths: (1a) Reported deaths adjusted for completeness of death reporting, (1b) Reported deaths adjusted for case reporting completeness (1c) Estimated by applying case fatality rate to estimated cases, (2) Modelled from verbal autopsy data

2010			2015			Method used
Lower	Point	Upper	Lower	Point	Upper	
1 300	1 400	1 600	1 300	1 400	1 600	1
	<10			0		1b
58 000	70 000	83 000	32 000	39 000	45 000	1
10	130	230	6	51	88	1c
14 000	18 000	25 000	610	820	1 100	1
	<50			<10		1c
21 000	25 000	29 000	11 000	13 000	14 000	1
3	50	88		<50		1c
156 963 936	209 461 870	268 111 090	129 499 160	191 386 270	265 182 880	
313 679	498 340	683 660	216 456	391 330	560 830	
798 400	1 032 070	1 465 720	570 730	764 350	1 173 370	
126	653	1 338	32	400	870	
2 742 590	3 833 600	5 385 400	2 511 354	3 805 871	5 688 300	
486	6 940	13 440	442	7 300	14 830	
110	120	140		0		
	0			0		
21 935 440	28 868 480	41 596 530	11 107 397	14 632 220	20 143 760	
3 932	45 420	86 980	1 687	26 390	51 580	
1 218 400	1 628 700	2 144 000	869 010	1 177 220	1 541 000	
176	3 380	6 568	163	1 371	2 588	
183 658 876	**244 824 840**	**318 702 880**	**144 557 651**	**211 765 931**	**293 729 310**	
318 399	**554 733**	**791 986**	**218 780**	**426 791**	**630 698**	

Annex 4 – G. Population at risk and reported malaria cases by place of care, 2015

WHO region Country/area	Population			
	UN population	At risk (low + high)	At risk (high)	Number of people living in active foci
AFRICAN				
Algeria	39 666 519	–	–	–
Angola	25 021 974	25 021 974	25 021 974	–
Benin	10 879 829	10 879 829	10 879 829	–
Botswana	2 262 485	1 499 989	95 305	–
Burkina Faso	18 105 570	18 105 570	18 105 570	–
Burundi	11 178 921	11 178 921	11 178 921	–
Cabo Verde	520 502	–	–	308 626
Cameroon	23 344 179	23 344 179	16 574 367	–
Central African Republic	4 900 274	4 900 274	4 900 274	–
Chad	14 037 472	13 883 825	9 454 923	–
Comoros	788 474	788 474	375 159	–
Congo	4 620 330	4 620 330	4 620 330	–
Côte d'Ivoire	22 701 556	22 701 556	22 701 556	–
Democratic Republic of the Congo	77 266 814	77 266 814	74 948 810	–
Equatorial Guinea	845 060	845 060	845 060	–
Eritrea	5 227 791	5 227 791	3 711 732	–
Ethiopia	99 390 750	67 585 709	27 034 284	–
Gabon	1 725 292	1 725 292	1 725 292	–
Gambia	1 990 924	1 990 924	1 990 924	–
Ghana	27 409 893	27 409 893	27 409 893	–
Guinea	12 608 590	12 608 590	12 608 590	–
Guinea-Bissau	1 844 325	1 844 325	1 844 325	–
Kenya	46 050 302	46 050 302	32 324 967	–
Liberia	4 503 438	4 503 438	4 503 438	–
Madagascar	24 235 390	24 235 390	21 271 015	–
Malawi	17 215 232	17 215 232	17 215 232	–
Mali	17 599 694	17 599 694	15 839 725	–
Mauritania	4 067 564	4 067 564	2 847 295	–
Mayotte	233 993	–	–	–
Mozambique	27 977 863	27 977 863	27 977 863	–
Namibia	2 458 830	1 951 686	1 135 022	–
Niger	19 899 120	18 705 173	10 546 534	–
Nigeria	182 201 962	182 201 962	139 161 989	–
Rwanda	11 609 666	11 609 666	11 609 666	–
Sao Tome and Principe	190 344	190 344	190 344	–
Senegal	15 129 273	15 129 273	14 524 102	–
Sierra Leone	6 453 184	6 453 184	6 453 184	–
South Africa	54 490 406	5 449 041	2 179 616	–
South Sudan[1]	12 339 812	12 339 812	12 339 812	–
Swaziland	1 286 970	360 352	0	–
Togo	7 304 578	7 304 578	7 304 578	–
Uganda	39 032 383	39 032 383	39 032 383	–
United Republic of Tanzania	53 470 420	53 470 420	52 884 689	–
Mainland	51 957 514	51 957 514	51 957 514	–
Zanzibar	1 512 906	1 512 906	927 175	–
Zambia	16 211 767	16 211 767	16 211 767	–
Zimbabwe	15 602 751	12 286 025	4 464 890	–
AMERICAS				
Belize	359 287	–	–	23 917
Bolivia (Plurinational State of)	10 724 705	4 865 489	267 944	–
Brazil	207 847 528	42 193 048	4 780 493	–
Colombia	48 228 704	10 182 444	4 875 710	–
Dominican Republic	10 528 391	5 072 515	97 337	–
Ecuador	16 144 363	–	–	251 369
El Salvador	6 126 583	–	–	22 000
French Guiana	268 606	268 606	229 658	–
Guatemala	16 342 897	12 539 759	4 069 177	–

Public sector		Private sector		Community level	
P	C	P	C	P	C
0	747	–	–	–	–
6 839 963	3 254 270	–	–	–	–
2 009 959	1 495 375	–	–	94 030	256 392
1 298	340	0	6	–	–
9 783 385	8 286 453	–	–	–	–
8 414 481	5 243 410	–	–	0	269 004
3 117	28	–	–	–	–
3 312 273	2 321 933	–	–	29 162	30 497
1 218 246	953 535	–	–	–	–
1 641 285	1 490 556	–	–	–	–
101 330	1 517	15 848	584	–	–
300 592	264 574	–	–	–	–
5 216 344	3 606 725	0	73 800	0	94 078
16 452 476	11 627 473	–	–	0	911 332
68 058	15 142	–	–	–	–
111 950	24 310	–	–	0	8 664
5 987 580	2 174 707	–	–	–	–
285 489	217 287	–	–	–	–
891 511	249 437	3 966	913	0	5 053
13 368 757	10 186 510	2 145 778	1 337 177	154 619	0
1 251 096	891 175	39 254	23 898	40 118	80 196
–	–	–	–	–	–
15 915 943	7 676 980	208 556	460 109	0	82 141
2 306 116	1 781 092	–	–	43 521	10 625
1 536 344	752 176	16 084	2 416	418 475	193 138
8 518 905	4 933 416	–	–	1 165 029	197 354
4 410 839	3 317 001	–	–	67 678	158 897
219 184	181 562	–	–	–	–
–	–	–	–	–	–
14 241 392	7 718 782	–	–	84 172	504 032
207 612	12 050	–	–	–	–
4 497 920	3 817 634	–	–	0	120 108
17 388 046	14 732 621	494 445	968 551	–	–
6 093 114	2 505 794	–	–	259	188 772
84 348	2 058	–	–	–	–
1 421 221	502 084	–	–	93 231	74 580
2 337 297	1 569 606	3 338	10 541	467 748	0
35 982	8 976	–	–	110	602
–	–	–	–	–	–
651	651	0	300	–	–
1 756 701	1 113 928	–	–	0	394 088
22 095 860	13 421 804	161 371	275 085	–	–
20 797 048	7 746 258	83 613	659 921	–	–
20 451 119	7 741 816	83 613	658 721	–	–
345 929	4 442	–	1 200	–	–
8 116 962	5 094 123	–	–	–	–
1 384 893	391 651	–	–	0	90 728
26 367	13	5	0	–	–
159 167	6 907	–	–	–	–
1 502 840	143 162	–	–	–	–
332 706	55 866	–	–	–	–
367 167	661	0	129	277	0
261 824	686	–	–	–	–
89 267	9	–	–	–	–
11 558	434	–	–	–	–
301 746	6 836	–	–	–	–

Annex 4 – G. Population at risk and reported malaria cases by place of care, 2015

WHO region Country/area	Population			
	UN population	At risk (low + high)	At risk (high)	Number of people living in active foci
AMERICAS				
Guyana	767 085	713 389	268 480	–
Haiti	10 711 067	10 711 067	5 676 866	–
Honduras	8 075 060	5 117 453	376 477	–
Mexico	127 017 224	–	–	4 466 571
Nicaragua	6 082 032	3 428 487	270 047	–
Panama	3 929 141	184 172	172 882	–
Peru	31 376 670	4 437 249	3 414 952	–
Suriname	542 975	85 247	85 247	–
Venezuela (Bolivarian Republic of)	31 108 083	6 193 641	4 977 960	–
EASTERN MEDITERRANEAN				
Afghanistan	32 526 562	24 582 076	8 753 666	–
Djibouti	887 861	443 931	0	–
Iran (Islamic Republic of)	79 109 272	–	–	692 020
Pakistan	188 924 874	185 733 706	54 631 264	–
Saudi Arabia	31 540 372	–	–	42 995
Somalia	10 787 104	10 787 104	5 490 347	–
Sudan	40 234 882	40 234 882	34 964 112	–
Yemen	26 832 215	20 899 635	6 724 424	–
EUROPEAN				
Tajikistan	8 481 855	–	–	–
SOUTH-EAST ASIA				
Bangladesh	160 995 642	16 679 149	4 282 484	–
Bhutan	774 830	–	–	36 042
Democratic People's Republic of Korea	25 155 317	–	–	–
India	1 311 050 527	1 193 055 980	183 547 074	–
Indonesia	257 563 815	67 296 487	30 311 412	–
Myanmar	53 897 154	32 078 320	8 521 440	–
Nepal	28 513 700	13 672 319	1 035 047	–
Thailand	67 959 359	33 979 680	5 436 749	–
Timor-Leste	1 184 765	1 062 868	398 960	–
WESTERN PACIFIC				
Cambodia	15 577 899	11 016 604	7 497 002	–
China	1 383 924 532	–	–	33 340
Lao People's Democratic Republic	6 802 023	6 299 338	2 125 078	–
Malaysia	30 331 007	–	–	–
Papua New Guinea	7 619 321	7 619 321	7 162 162	–
Philippines	100 699 395	61 409 115	6 637 429	–
Republic of Korea	50 293 439	–	–	–
WESTERN PACIFIC				
Solomon Islands	583 591	577 755	577 755	–
Vanuatu	264 652	264 652	230 048	–
Viet Nam	93 447 601	68 869 834	6 352 108	–
REGIONAL SUMMARY				
African	985 902 466	857 774 467	716 045 227	308 626
Americas	536 180 401	105 992 566	29 563 231	4 763 857
Eastern Mediterranean	468 571 774	274 334 476	106 092 630	79 037
European	8 481 855	0	0	0
South-East Asia	1 907 095 109	1 357 824 801	233 533 166	36 042
Western Pacific	1 689 543 460	156 056 619	30 581 582	33 340
Total	**5 595 775 065**	**2 751 982 929**	**1 115 815 836**	**5 220 902**

C = Confirmed
P = Presumed
1 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf)

Public sector		Private sector		Community level	
P	C	P	C	P	C
132 941	9 984	–	–	–	–
302 740	17 583	–	–	0	343
153 906	3 564	0	58	–	–
867 853	551	0	7	–	–
604 418	2 307	–	–	–	–
64 511	562	0	3	–	–
865 980	66 609	0	463	–	–
15 236	376	–	–	–	–
625 174	136 402	–	–	–	–
801 938	350 044	–	–	0	16 482
–	–	–	–	–	–
630 886	1 378	–	610 337	–	–
8 885 456	3 776 244	–	–	–	–
1 306 700	2 620	–	–	–	–
119 008	39 169	–	–	–	–
1 102 186	1 102 186	–	–	–	–
668 024	95 287	–	–	–	–
–	5	–	–	–	–
122 806	6 608	0	119	0	32 992
74 087	104	0	21	–	–
91 007	7 409	–	–	–	–
140 841 230	1 169 261	–	–	–	–
1 599 427	217 025	–	–	–	–
714 075	77 842	–	–	0	104 925
225 353	113 595	–	–	–	725
1 370 461	14 755	–	–	0	9 405
121 110	80	–	–	0	21
163 680	33 930	0	17 809	0	16 370
4 052 616	3 116	–	–	–	–
284 003	36 056	0	5 561	0	9 107
1 066 470	2 311	0	48	–	–
909 940	553 103	–	–	19 038	48 644
260 645	5 135	22	716	0	2 428
699	699	0	662	–	–
192 044	50 916	–	–	–	–
14 938	697	–	–	0	148
2 673 662	19 252	–	–	–	–
210 625 568	129 585 751	3 172 253	3 813 301	2 658 152	3 670 281
6 685 401	452 512	5	660	277	343
12 278 267	5 022 223	0	140	0	32 992
0	5	0	0	0	0
145 159 556	1 606 679	0	140	0	148 068
9 618 697	705 215	22	24 796	19 038	76 697
384 367 489	**137 372 385**	**3 172 280**	**3 839 037**	**2 677 467**	**3 928 381**

Annex 4 – H. Reported malaria cases by method of confirmation, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Algeria	Presumed and confirmed	541	299	408	191	887	603	266	747
	Microscopy examined	27 733	18 392	12 224	11 974	15 790	12 762	8 690	8 000
	Confirmed with microscopy	541	299	408	191	887	603	266	747
	RDT examined	–	–	–	–	–	–	–	0
	Confirmed with RDT	–	–	–	–	–	–	–	0
	Imported cases	506	297	396	187	828	587	260	727
Angola	Presumed and confirmed	2 080 348	2 329 316	3 687 574	3 501 953	3 031 546	3 144 100	3 180 021	3 254 270
	Microscopy examined	–	–	1 947 349	1 765 933	2 245 223	3 025 258	3 398 029	3 345 693
	Confirmed with microscopy	–	889 572	1 324 264	1 147 473	1 056 563	1 462 941	1 431 313	1 396 773
	RDT examined	–	–	639 476	833 753	1 069 483	1 103 815	1 855 400	3 009 305
	Confirmed with RDT	–	–	358 606	484 809	440 271	536 927	867 666	1 372 532
	Imported cases	–	–	–	–	–	–	–	–
Benin	Presumed and confirmed	–	803 462	1 432 095	1 424 335	1 513 212	1 670 273	1 509 221	1 495 375
	Microscopy examined	–	–	–	88 134	243 008	291 479	155 205	296 264
	Confirmed with microscopy	–	–	–	68 745	–	99 368	108 714	108 061
	RDT examined	–	–	–	475 986	825 005	1 158 526	1 335 582	1 486 667
	Confirmed with RDT	–	–	–	354 223	705 839	979 466	935 521	1 160 286
	Imported cases	–	–	–	–	–	–	–	–
Botswana	Presumed and confirmed	71 555	11 242	12 196	1 141	308	506	1 485	340
	Microscopy examined	–	–	–	–	–	–	–	–
	Confirmed with microscopy	–	–	1 046	432	–	–	–	–
	RDT examined	–	–	–	–	–	–	–	1 284
	Confirmed with RDT	–	–	–	–	193	456	1 346	326
	Imported cases	–	–	–	–	–	–	–	48
Burkina Faso	Presumed and confirmed	–	1 615 695	5 723 481	5 024 697	6 970 700	7 146 026	8 280 183	8 286 453
	Microscopy examined	–	73 262	177 879	400 005	223 372	183 971	198 947	222 190
	Confirmed with microscopy	–	21 335	88 540	83 857	90 089	82 875	83 259	92 589
	RDT examined	–	–	940 985	450 281	4 516 273	4 296 350	6 224 055	8 290 188
	Confirmed with RDT	–	–	715 999	344 256	3 767 957	3 686 176	5 345 396	6 922 857
	Imported cases	–	–	–	–	–	–	–	–
Burundi	Presumed and confirmed	3 252 692	2 334 067	4 255 301	3 298 979	2 570 754	4 469 007	4 831 758	5 243 410
	Microscopy examined	484 249	903 942	2 825 558	2 859 720	2 659 372	4 123 012	4 471 998	3 254 670
	Confirmed with microscopy	308 095	327 464	1 599 908	1 485 332	1 484 676	2 366 134	2 718 391	1 964 862
	RDT examined	–	–	273 324	181 489	1 148 965	2 933 869	2 903 679	5 076 107
	Confirmed with RDT	–	–	163 539	86 542	666 400	1 775 253	1 866 882	3 194 844
	Imported cases	–	–	–	–	–	–	–	–
Cabo Verde	Presumed and confirmed	144	68	47	36	36	46	46	28
	Microscopy examined	6 843	7 902	–	–	8 715	10 621	6 894	3 117
	Confirmed with microscopy	144	68	47	–	36	46	46	28
	RDT examined	–	–	–	26 508	–	–	–	–
	Confirmed with RDT	–	–	–	36	–	–	–	–
	Imported cases	–	–	–	29	35	24	20	21
Cameroon	Presumed and confirmed	–	277 413	1 845 691	1 829 266	1 589 317	1 824 633	1 369 518	2 321 933
	Microscopy examined	–	–	–	1 110 308	1 182 610	1 236 306	1 086 095	1 024 306
	Confirmed with microscopy	–	–	–	–	–	–	–	592 351
	RDT examined	–	–	–	120 466	93 392	591 670	1 254 293	1 128 818
	Confirmed with RDT	–	–	–	–	–	–	–	570 433
	Imported cases	–	–	–	–	–	–	–	–
Central African Republic	Presumed and confirmed	89 614	131 856	66 484	221 980	459 999	407 131	495 238	953 535
	Microscopy examined	–	–	–	–	–	63 695	55 943	139 241
	Confirmed with microscopy	–	–	–	–	–	36 943	41 436	106 524
	RDT examined	–	–	–	–	55 746	136 548	369 208	724 303
	Confirmed with RDT	–	–	–	–	46 759	79 357	253 652	492 309
	Imported cases	–	–	–	–	–	–	–	–
Chad	Presumed and confirmed	437 041	501 846	544 243	528 454	660 575	1 272 841	1 513 772	1 490 556
	Microscopy examined	45 283	37 439	89 749	–	69 789	–	–	–
	Confirmed with microscopy	40 078	31 668	75 342	86 348	–	206 082	160 260	149 574
	RDT examined	–	–	309 927	114 122	–	621 469	1 137 455	937 775
	Confirmed with RDT	–	–	125 106	94 778	–	548 483	753 772	637 472
	Imported cases	–	–	–	–	–	–	–	–

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Comoros	Presumed and confirmed	801 784	29 554	103 670	76 661	65 139	62 565	2 465	1 517
	Microscopy examined	–	–	87 595	63 217	125 030	154 824	93 444	89 634
	Confirmed with microscopy	–	6 086	35 199	22 278	45 507	46 130	1 987	963
	RDT examined	–	–	5 249	20 226	27 714	21 546	9 839	11 479
	Confirmed with RDT	–	–	1 339	2 578	4 333	7 026	216	337
	Imported cases	–	–	–	–	–	–	–	–
Congo	Presumed and confirmed	15 751	67	446 656	277 263	120 319	183 026	248 159	264 574
	Microscopy examined	–	–	–	–	–	69 375	88 764	87 547
	Confirmed with microscopy	–	–	–	37 744	120 319	43 232	54 523	51 529
	RDT examined	–	–	–	–	–	0	19 746	0
	Confirmed with RDT	–	–	–	–	–	0	11 800	0
	Imported cases	–	–	–	–	–	–	–	–
Côte d'Ivoire	Presumed and confirmed	–	1 280 914	1 721 461	2 588 004	2 795 919	4 708 425	4 658 774	3 606 725
	Microscopy examined	–	–	–	49 828	195 546	395 914	568 562	811 426
	Confirmed with microscopy	–	–	62 726	29 976	107 563	215 104	306 926	478 870
	RDT examined	–	–	–	–	1 572 785	3 384 765	4 904 066	4 174 097
	Confirmed with RDT	–	–	–	–	1 033 064	2 291 849	3 405 905	2 897 034
	Imported cases	–	–	–	–	–	–	–	–
Democratic Republic of the Congo	Presumed and confirmed	964 623	6 334 608	9 252 959	9 442 144	9 128 398	11 363 817	9 968 983	11 627 473
	Microscopy examined	3 758	5 531	3 678 849	4 226 533	4 329 318	4 126 129	3 533 165	2 877 585
	Confirmed with microscopy	897	2 971	2 374 930	2 700 818	2 656 864	2 611 478	2 126 554	1 902 640
	RDT examined	–	–	54 728	2 912 088	3 327 071	6 096 993	11 114 215	13 574 891
	Confirmed with RDT	–	–	42 850	1 861 163	2 134 734	4 103 745	7 842 429	9 724 833
	Imported cases	–	–	–	–	–	–	–	–
Equatorial Guinea	Presumed and confirmed	–	–	78 095	37 267	20 890	25 162	20 417	15 142
	Microscopy examined	–	–	42 585	23 004	33 245	27 039	47 322	21 831
	Confirmed with microscopy	–	–	39 636	20 601	13 196	11 235	17 685	8 564
	RDT examined	–	–	16 772	2 899	6 826	5 489	9 807	46 227
	Confirmed with RDT	–	–	14 177	1 865	1 973	1 894	2 732	6 578
	Imported cases	–	–	–	–	–	–	–	–
Eritrea	Presumed and confirmed	–	24 192	53 750	39 567	42 178	34 678	35 725	24 310
	Microscopy examined	–	48 937	79 024	67 190	84 861	81 541	63 766	59 268
	Confirmed with microscopy	–	9 073	13 894	15 308	11 557	10 890	10 993	8 332
	RDT examined	–	–	–	25 570	33 758	39 281	53 032	47 744
	Confirmed with RDT	–	–	22 088	19 540	10 258	10 427	19 775	11 040
	Imported cases	–	–	–	–	–	–	–	–
Ethiopia	Presumed and confirmed	–	3 901 957	4 068 764	3 549 559	3 876 745	3 316 013	2 513 863	2 174 707
	Microscopy examined	–	1 364 194	2 509 543	3 418 719	3 778 479	8 573 335	7 062 717	5 679 932
	Confirmed with microscopy	–	538 942	1 158 197	1 480 306	1 692 578	2 645 454	2 118 815	1 867 059
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	–
Gabon	Presumed and confirmed	127 024	235 479	185 105	178 822	188 089	185 196	185 996	217 287
	Microscopy examined	–	129 513	54 714	–	66 018	90 185	90 275	79 308
	Confirmed with microscopy	50 810	70 644	12 816	–	18 694	26 432	27 687	20 390
	RDT examined	–	–	7 887	–	4 129	10 132	11 812	12 761
	Confirmed with RDT	–	–	1 120	–	1 059	2 550	4 213	3 477
	Imported cases	–	–	–	–	–	–	–	–
Gambia	Presumed and confirmed	–	329 426	194 009	261 967	300 363	279 829	166 229	249 437
	Microscopy examined	–	–	290 842	172 241	156 580	236 329	286 111	272 604
	Confirmed with microscopy	–	–	52 245	71 588	29 325	65 666	66 253	49 649
	RDT examined	–	–	123 564	–	705 862	614 128	317 313	609 852
	Confirmed with RDT	–	–	64 108	190 379	271 038	175 126	99 976	190 733
	Imported cases	–	–	–	–	–	–	–	–
Ghana	Presumed and confirmed	3 349 528	3 452 969	3 849 536	4 154 261	10 676 731	7 200 797	8 453 557	10 186 510
	Microscopy examined	–	–	2 031 674	1 172 838	4 219 097	1 394 249	1 987 959	2 023 581
	Confirmed with microscopy	–	655 093	1 029 384	624 756	2 971 699	721 898	970 448	934 304
	RDT examined	–	–	247 278	781 892	1 438 284	1 488 822	3 610 453	5 478 585
	Confirmed with RDT	–	0	42 253	416 504	783 467	917 553	2 445 464	3 385 615
	Imported cases	–	–	–	–	–	–	–	–

Annex 4 – H. Reported malaria cases by method of confirmation, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Guinea	Presumed and confirmed	816 539	850 309	1 092 554	1 189 016	1 220 574	775 341	1 595 828	891 175
	Microscopy examined	–	–	–	43 549	–	–	116 767	78 377
	Confirmed with microscopy	4 800	50 452	20 936	5 450	191 421	63 353	82 818	52 211
	RDT examined	–	–	–	139 066	–	–	–	1 092 523
	Confirmed with RDT	–	–	–	90 124	125 779	147 904	577 389	758 768
	Imported cases	–	–	–	–	–	–	–	–
Guinea-Bissau	Presumed and confirmed	246 316	185 493	140 143	174 986	129 684	132 176	98 952	–
	Microscopy examined	–	33 721	48 799	57 698	61 048	58 909	106 882	–
	Confirmed with microscopy	–	14 659	30 239	21 320	23 547	17 733	35 546	–
	RDT examined	–	–	56 455	139 531	97 047	102 079	197 536	–
	Confirmed with RDT	–	–	20 152	50 662	26 834	36 851	57 885	–
	Imported cases	–	–	–	–	–	–	–	–
Kenya	Presumed and confirmed	4 216 531	9 181 224	6 071 583	11 120 812	9 335 951	9 750 953	9 655 905	7 676 980
	Microscopy examined	–	–	2 384 402	3 009 051	4 836 617	6 606 885	7 444 865	7 772 329
	Confirmed with microscopy	–	–	898 531	1 002 805	1 426 719	2 060 608	2 415 950	1 025 508
	RDT examined	–	–	–	–	164 424	655 285	850 884	1 965 661
	Confirmed with RDT	–	–	–	–	26 752	274 678	392 981	473 519
	Imported cases	–	–	–	–	–	–	–	–
Liberia	Presumed and confirmed	–	44 875	2 675 816	2 480 748	1 800 372	1 483 676	1 066 107	1 781 092
	Microscopy examined	–	8 718	335 973	728 443	772 362	818 352	1 318 801	509 062
	Confirmed with microscopy	–	5 025	212 927	577 641	507 967	496 269	302 708	305 981
	RDT examined	–	57 325	998 043	1 593 676	1 276 521	1 144 405	912 382	947 048
	Confirmed with RDT	–	39 850	709 246	1 338 121	899 488	747 951	561 496	625 105
	Imported cases	–	–	–	–	–	–	–	–
Madagascar	Presumed and confirmed	1 392 483	1 229 385	293 910	255 814	395 149	387 045	433 101	752 176
	Microscopy examined	31 575	37 943	24 393	34 813	38 453	42 573	37 362	39 604
	Confirmed with microscopy	6 946	6 753	2 173	3 447	3 667	4 947	3 853	4 748
	RDT examined	–	–	604 114	739 572	906 080	1 026 110	926 998	1 488 667
	Confirmed with RDT	–	–	200 277	221 051	355 753	380 651	374 110	739 355
	Imported cases	–	–	–	–	–	–	–	1 167
Malawi	Presumed and confirmed	3 646 212	3 688 389	6 851 108	5 338 701	4 922 596	3 906 838	5 065 703	4 933 416
	Microscopy examined	–	–	–	119 996	406 907	132 475	198 534	216 643
	Confirmed with microscopy	–	–	–	50 526	283 138	44 501	77 635	75 923
	RDT examined	–	–	–	580 708	2 763 986	3 029 020	5 344 724	7 030 084
	Confirmed with RDT	–	–	–	253 973	1 281 846	1 236 391	2 827 675	3 585 315
	Imported cases	–	–	–	–	–	–	–	–
Mali	Presumed and confirmed	546 634	962 706	2 171 542	1 961 070	2 171 739	2 327 385	2 590 643	3 317 001
	Microscopy examined	–	–	–	–	–	–	–	–
	Confirmed with microscopy	–	–	–	–	97 995	190 337	219 637	243 151
	RDT examined	–	–	1 380 178	974 558	–	1 889 286	–	3 389 449
	Confirmed with RDT	–	–	227 482	307 035	788 487	1 176 881	1 820 216	2 052 460
	Imported cases	–	–	–	–	–	–	–	–
Mauritania	Presumed and confirmed	–	223 472	244 319	154 003	169 104	128 486	156 529	181 562
	Microscopy examined	–	–	5 449	3 752	1 865	5 510	–	–
	Confirmed with microscopy	–	–	909	1 130	255	957	–	–
	RDT examined	–	–	2 299	7 991	3 293	3 576	47 500	60 253
	Confirmed with RDT	–	–	1 085	1 796	1 633	630	15 835	22 631
	Imported cases	–	–	–	–	–	–	–	–
Mayotte	Presumed and confirmed	–	500	396	92	72	82	15	–
	Microscopy examined	–	–	2 023	1 214	1 463	–	–	–
	Confirmed with microscopy	–	500	396	92	72	82	15	–
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	236	51	47	71	14	–
Mozambique	Presumed and confirmed	–	–	3 381 371	3 344 413	3 203 338	3 924 832	7 117 648	7 718 782
	Microscopy examined	–	–	1 950 933	2 504 720	2 546 213	2 058 998	2 295 823	2 313 129
	Confirmed with microscopy	–	–	644 568	1 093 742	886 143	774 891	1 009 496	735 750
	RDT examined	–	–	2 287 536	2 966 853	2 234 994	5 215 893	9 944 222	11 928 263
	Confirmed with RDT	–	–	878 009	663 132	927 841	2 223 983	6 108 152	6 983 032
	Imported cases	–	–	–	–	–	–	–	–

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Namibia	Presumed and confirmed	–	339 204	25 889	14 406	3 163	4 911	15 914	12 050
	Microscopy examined	–	–	14 522	13 262	7 875	1 507	1 894	–
	Confirmed with microscopy	–	23 339	556	335	194	136	222	–
	RDT examined	–	–	–	48 599	–	32 495	185 078	207 612
	Confirmed with RDT	–	–	–	1 525	–	4 775	15 692	12 050
	Imported cases	–	–	–	–	–	–	–	2 888
Niger	Presumed and confirmed	–	817 707	3 643 803	3 157 482	4 592 519	4 288 425	3 222 613	3 817 634
	Microscopy examined	–	107 092	165 514	130 658	1 781 505	1 799 299	2 872 710	295 229
	Confirmed with microscopy	–	46 170	49 285	68 529	1 119 929	1 176 711	0	206 660
	RDT examined	–	21 230	7 426 774	1 130 514	1 781 505	1 799 299	2 872 710	2 657 057
	Confirmed with RDT	–	9 873	570 773	712 347	1 119 929	1 176 711	1 953 309	2 065 340
	Imported cases	–	–	–	–	–	–	–	–
Nigeria	Presumed and confirmed	2 476 608	3 532 108	3 873 463	4 306 945	6 938 519	12 830 911	16 512 127	14 732 621
	Microscopy examined	–	–	–	672 185	1 953 399	1 633 960	1 681 469	851 183
	Confirmed with microscopy	–	–	523 513	–	–	–	1 233 654	569 036
	RDT examined	–	–	45 924	242 526	2 898 052	7 194 960	9 188 933	8 655 024
	Confirmed with RDT	–	–	27 674	–	–	–	6 593 300	6 281 746
	Imported cases	–	–	–	–	–	–	–	–
Rwanda	Presumed and confirmed	–	1 654 246	638 669	208 858	483 470	962 618	1 610 812	2 505 794
	Microscopy examined	–	1 438 603	2 708 973	1 602 271	2 904 793	2 862 877	4 010 202	5 811 267
	Confirmed with microscopy	–	683 769	638 669	208 858	422 224	879 316	1 528 825	2 354 400
	RDT examined	–	–	–	–	190 593	201 708	168 004	281 847
	Confirmed with RDT	–	–	–	–	61 246	83 302	81 987	151 394
	Imported cases	–	–	–	–	–	–	–	–
Sao Tome and Principe	Presumed and confirmed	32 149	22 370	3 346	8 442	12 550	9 243	1 754	2 058
	Microscopy examined	66 076	68 819	48 366	83 355	103 773	73 866	33 355	11 941
	Confirmed with microscopy	31 975	18 139	2 233	6 373	10 706	6 352	569	140
	RDT examined	–	–	9 989	33 924	23 124	34 768	58 090	72 407
	Confirmed with RDT	–	–	507	2 069	1 844	2 891	1 185	1 918
	Imported cases	–	–	–	–	–	–	–	2
Senegal	Presumed and confirmed	1 123 377	1 346 158	707 772	604 290	634 106	772 222	628 642	502 084
	Microscopy examined	56 169	105 093	27 793	18 325	19 946	24 205	19 343	26 556
	Confirmed with microscopy	44 959	33 160	17 750	14 142	15 612	20 801	12 636	17 846
	RDT examined	–	–	651 737	555 614	524 971	668 562	697 175	1 384 834
	Confirmed with RDT	–	–	325 920	263 184	265 468	325 088	252 988	474 407
	Imported cases	–	–	–	–	–	–	–	352
Sierra Leone	Presumed and confirmed	460 881	233 833	934 028	856 332	1 945 859	1 715 851	1 898 852	1 569 606
	Microscopy examined	–	10 605	718 473	46 280	194 787	185 403	66 277	75 025
	Confirmed with microscopy	–	3 702	218 473	25 511	104 533	76 077	39 414	37 820
	RDT examined	–	3 452	1 609 455	886 994	1 975 972	2 377 254	2 056 722	2 176 042
	Confirmed with RDT	–	1 106	715 555	613 348	1 432 789	1 625 881	1 335 062	1 445 556
	Imported cases	–	–	–	–	–	–	–	–
South Africa	Presumed and confirmed	64 624	7 755	8 060	9 866	6 846	8 851	13 988	8 976
	Microscopy examined	–	–	–	178 387	121 291	364 021	300 291	13 917
	Confirmed with microscopy	–	7 755	3 787	5 986	1 632	2 572	4 101	785
	RDT examined	–	–	276 669	204 047	30 053	239 705	240 622	17 446
	Confirmed with RDT	–	–	4 273	3 880	3 997	6 073	7 604	3 572
	Imported cases	–	–	–	–	–	–	–	3 568
South Sudan[1]	Presumed and confirmed	–	337 582	900 283	795 784	1 125 039	1 855 501	–	–
	Microscopy examined	–	–	–	–	–	–	–	–
	Confirmed with microscopy	–	–	900 283	112 024	225 371	262 520	–	–
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	–
Swaziland	Presumed and confirmed	29 374	6 066	1 722	797	626	962	711	651
	Microscopy examined	–	4 587	–	–	–	–	–	–
	Confirmed with microscopy	–	279	87	130	345	488	711	43
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	181	419	217	474	–	152
	Imported cases	–	–	–	170	153	234	322	282

Annex 4 – H. Reported malaria cases by method of confirmation, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Togo	Presumed and confirmed	–	437 662	983 430	519 450	768 287	882 430	1 130 251	1 113 928
	Microscopy examined	–	–	478 354	502 977	579 507	560 096	621 119	621 119
	Confirmed with microscopy	–	–	224 087	237 305	260 535	272 855	310 207	305 727
	RDT examined	–	–	575 245	390 611	660 627	882 475	1 135 581	1 135 581
	Confirmed with RDT	–	–	393 014	282 145	436 839	609 575	820 044	808 200
	Imported cases	–	–	–	–	–	–	–	–
Uganda	Presumed and confirmed	3 552 859	9 867 174	13 208 169	12 173 358	13 591 932	16 541 563	13 724 345	13 421 804
	Microscopy examined	–	2 107 011	3 705 284	385 928	3 466 571	3 718 588	2 048 185	3 684 722
	Confirmed with microscopy	–	1 104 310	1 581 160	134 726	1 413 149	1 502 362	578 289	1 248 576
	RDT examined	–	–	–	194 819	2 449 526	7 387 826	7 060 545	12 126 996
	Confirmed with RDT	–	–	–	97 147	1 249 109	–	3 053 650	5 889 086
	Imported cases	–	–	–	–	–	–	–	–
United Republic of Tanzania	Presumed and confirmed	45 643	11 466 713	12 893 535	10 164 967	8 477 435	8 585 482	7 403 562	7 746 258
	Microscopy examined	53 533	8 037 619	3 637 659	5 656 907	6 931 025	6 804 085	727 130	673 223
	Confirmed with microscopy	17 734	2 764 049	1 277 024	1 813 179	1 772 062	1 481 275	572 289	412 702
	RDT examined	–	–	136 123	1 628 092	1 091 615	813 103	17 740 207	16 620 299
	Confirmed with RDT	–	–	1 974	337 582	214 893	71 169	107 728	3 830 030
	Imported cases	–	–	–	–	–	–	–	2 550
Mainland	Presumed and confirmed	–	11 441 681	12 819 192	10 160 478	8 474 278	8 582 934	7 399 316	7 741 816
	Microscopy examined	–	7 993 977	3 573 710	5 513 619	6 784 639	6 720 141	592 320	532 118
	Confirmed with microscopy	–	2 756 421	1 276 660	1 812 704	1 771 388	1 480 791	571 598	411 741
	RDT examined	–	–	–	1 315 662	701 477	369 444	17 566 750	16 416 675
	Confirmed with RDT	–	–	–	333 568	212 636	69 459	106 609	3 827 749
	Imported cases	–	–	–	–	–	–	–	–
Zanzibar	Presumed and confirmed	45 643	25 032	74 343	4 489	3 157	2 548	4 246	4 442
	Microscopy examined	53 533	43 642	63 949	143 288	146 386	83 944	134 810	141 105
	Confirmed with microscopy	17 734	7 628	364	475	674	484	691	961
	RDT examined	–	–	136 123	312 430	390 138	443 659	173 457	203 624
	Confirmed with RDT	–	–	1 974	4 014	2 257	1 710	1 119	2 281
	Imported cases	–	–	–	–	–	–	–	2 550
Zambia	Presumed and confirmed	3 337 796	4 121 356	4 229 839	4 607 908	4 695 400	5 465 122	5 972 933	5 094 123
	Microscopy examined	–	–	–	–	–	–	–	–
	Confirmed with microscopy	–	–	–	–	–	–	–	–
	RDT examined	–	–	–	–	–	–	5 964 354	7 207 500
	Confirmed with RDT	–	–	–	–	–	–	4 077 547	4 184 661
	Imported cases	–	–	–	–	–	–	–	–
Zimbabwe	Presumed and confirmed	–	1 494 518	648 965	–	–	–	535 983	391 651
	Microscopy examined	–	–	–	10 004	–	–	–	–
	Confirmed with microscopy	–	–	–	–	–	–	–	–
	RDT examined	–	–	513 032	470 007	727 174	1 115 005	1 420 894	1 384 893
	Confirmed with RDT	–	–	249 379	319 935	276 963	422 633	535 931	391 651
	Imported cases	–	–	–	–	–	–	–	180
AMERICAS									
Belize	Presumed and confirmed	1 486	1 549	150	79	37	26	19	13
	Microscopy examined	18 559	25 119	27 366	22 996	20 789	25 351	24 122	26 367
	Confirmed with microscopy	1 486	1 549	150	79	37	26	19	13
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	7	4	4	0	4
Bolivia (Plurinational State of)	Presumed and confirmed	31 469	21 442	13 769	7 143	7 415	7 342	7 401	6 907
	Microscopy examined	143 990	202 021	133 463	143 272	121 944	133 260	124 900	159 167
	Confirmed with microscopy	31 469	20 142	12 252	6 108	6 293	6 272	7 401	6 907
	RDT examined	–	6 000	7 394	7 390	10 960	10 789	–	–
	Confirmed with RDT	–	1 300	1 517	1 035	1 122	1 070	–	–
	Imported cases	–	–	–	–	–	–	–	–
Brazil	Presumed and confirmed	613 241	606 067	334 668	267 146	242 758	178 546	143 415	143 162
	Microscopy examined	2 562 576	2 660 539	2 711 432	2 476 335	2 325 775	1 873 518	1 658 976	1 488 072
	Confirmed with microscopy	613 241	606 067	334 667	266 713	237 978	174 048	142 031	139 844
	RDT examined	–	–	–	1 486	23 566	19 500	11 043	14 655
	Confirmed with RDT	–	–	–	433	4 780	3 719	1 384	3 205
	Imported cases	–	–	–	–	–	–	–	4 949

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AMERICAS									
Colombia	Presumed and confirmed	144 432	121 629	117 650	64 436	60 179	51 722	40 768	55 866
	Microscopy examined	478 820	493 562	521 342	396 861	346 599	284 332	325 713	316 451
	Confirmed with microscopy	144 432	121 629	117 637	60 121	50 938	44 293	36 166	48 059
	RDT examined	–	–	–	21 171	70 168	42 723	77 819	11 983
	Confirmed with RDT	–	–	13	4 188	9 241	7 403	4 602	3 535
	Imported cases	–	–	–	–	–	–	–	7 785
Dominican Republic	Presumed and confirmed	1 233	3 837	3 414	1 616	952	579	496	661
	Microscopy examined	427 297	397 108	469 052	421 405	415 808	431 683	362 304	316 947
	Confirmed with microscopy	1 233	3 837	2 482	1 616	952	579	496	661
	RDT examined	–	–	26 585	56 150	90 775	71 000	54 425	50 220
	Confirmed with RDT	–	–	932	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	30
Ecuador	Presumed and confirmed	104 528	17 050	1 888	1 233	558	378	241	686
	Microscopy examined	544 646	358 361	481 030	460 785	459 157	397 628	370 825	261 824
	Confirmed with microscopy	104 528	17 050	1 888	1 233	558	378	241	686
	RDT examined	–	–	7 800	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	14	14	10	–	68
El Salvador	Presumed and confirmed	753	67	24	16	19	7	8	9
	Microscopy examined	279 072	102 479	115 256	100 883	124 885	103 748	106 915	89 267
	Confirmed with microscopy	753	67	24	15	19	7	8	9
	RDT examined	–	–	–	1	–	–	–	0
	Confirmed with RDT	–	–	–	1	–	–	–	0
	Imported cases	–	–	7	6	6	1	2	6
French Guiana	Presumed and confirmed	3 708	3 414	1 632	1 209	900	875	448	434
	Microscopy examined	48 162	32 402	14 373	14 429	13 638	22 327	14 651	11 558
	Confirmed with microscopy	3 708	3 414	688	505	401	324	187	272
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	944	704	499	551	261	162
	Imported cases	–	–	–	–	–	–	–	–
Guatemala	Presumed and confirmed	53 311	39 571	7 384	6 817	5 346	6 214	4 931	6 836
	Microscopy examined	246 642	178 726	235 075	195 080	186 645	153 731	264 269	295 246
	Confirmed with microscopy	53 311	39 571	7 384	6 817	5 346	6 214	4 931	5 538
	RDT examined	–	–	2 000	–	0	0	50 025	6 500
	Confirmed with RDT	–	–	0	–	0	0	754	1 298
	Imported cases	–	–	–	–	–	–	–	2
Guyana	Presumed and confirmed	24 018	38 984	22 935	29 506	31 656	31 479	12 354	9 984
	Microscopy examined	209 197	210 429	212 863	201 693	196 622	205 903	142 843	132 941
	Confirmed with microscopy	24 018	38 984	22 935	29 471	31 601	31 479	12 354	9 984
	RDT examined	–	–	–	0	–	0	0	0
	Confirmed with RDT	–	–	–	35	55	0	0	0
	Imported cases	–	–	–	–	–	–	–	–
Haiti	Presumed and confirmed	16 897	21 778	84 153	32 969	25 423	26 543	17 696	17 583
	Microscopy examined	21 190	3 541 506	270 427	184 934	167 726	165 823	134 766	69 659
	Confirmed with microscopy	16 897	21 778	84 153	32 969	25 423	20 957	10 893	5 224
	RDT examined	–	–	–	–	46	5 586	126 637	233 081
	Confirmed with RDT	–	–	–	–	–	–	6 803	12 359
	Imported cases	–	–	–	–	–	–	–	–
Honduras	Presumed and confirmed	35 125	15 943	9 685	7 618	6 439	5 428	3 380	3 564
	Microscopy examined	175 577	153 474	152 961	152 451	155 165	144 436	151 420	150 854
	Confirmed with microscopy	35 125	15 943	9 685	7 465	6 439	5 364	3 380	3 555
	RDT examined	–	2 500	4 000	4 000	4 000	237	1 427	3 052
	Confirmed with RDT	–	–	–	45	10	64	102	20
	Imported cases	–	–	–	–	–	–	–	0
Mexico	Presumed and confirmed	7 390	2 967	1 226	1 130	842	499	664	551
	Microscopy examined	2 003 569	1 559 076	1 192 081	1 035 424	1 025 659	1 017 508	900 578	867 853
	Confirmed with microscopy	7 390	2 967	1 226	1 130	842	499	664	551
	RDT examined	–	–	–	–	–	0	0	0
	Confirmed with RDT	–	–	–	–	–	0	0	0
	Imported cases	–	–	7	6	9	4	8	34

Annex 4 – H. Reported malaria cases by method of confirmation, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AMERICAS									
Nicaragua	Presumed and confirmed	23 878	6 642	692	925	1 235	1 194	1 163	2 307
	Microscopy examined	509 443	516 313	535 914	521 904	536 278	519 993	605 357	604 418
	Confirmed with microscopy	23 878	6 642	692	925	1 235	1 196	1 163	2 307
	RDT examined	–	–	18 500	14 201	16 444	19 029	15 620	–
	Confirmed with RDT	–	–	0	–	0	–	0	–
	Imported cases	–	–	–	–	–	–	–	29
Panama	Presumed and confirmed	1 036	3 667	418	354	844	705	874	562
	Microscopy examined	149 702	208 582	141 038	116 588	107 711	93 624	80 701	64 511
	Confirmed with microscopy	1 036	3 667	418	354	844	705	874	562
	RDT examined	–	–	–	0	0	0	0	0
	Confirmed with RDT	–	–	–	0	0	0	0	0
	Imported cases	–	–	–	–	–	–	–	16
Peru	Presumed and confirmed	68 321	87 699	31 546	25 039	31 570	43 139	65 252	66 609
	Microscopy examined	1 483 816	1 438 925	744 627	702 894	758 723	863 790	864 413	865 980
	Confirmed with microscopy	68 321	87 699	31 545	25 005	31 436	48 719	65 252	66 609
	RDT examined	–	–	23	58	562	858	1 634	0
	Confirmed with RDT	–	–	1	34	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	–
Suriname	Presumed and confirmed	11 361	9 131	1 771	795	569	729	400	376
	Microscopy examined	63 377	59 855	16 533	15 135	17 464	13 693	17 608	15 083
	Confirmed with microscopy	11 361	9 131	1 574	751	306	530	98	345
	RDT examined	–	–	541	1 025	4 008	6 043	15 489	153
	Confirmed with RDT	–	–	138	20	50	199	303	31
	Imported cases	–	–	–	–	–	–	–	274
Venezuela (Bolivarian Republic of)	Presumed and confirmed	29 736	45 049	45 155	45 824	52 803	78 643	90 708	136 402
	Microscopy examined	261 866	420 165	400 495	382 303	410 663	476 764	522 617	625 174
	Confirmed with microscopy	29 736	45 049	45 155	45 824	52 803	78 643	90 708	136 402
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	1 594
EASTERN MEDITERRANEAN									
Afghanistan	Presumed and confirmed	203 911	326 694	392 463	482 748	391 365	319 742	290 079	350 044
	Microscopy examined	257 429	338 253	524 523	531 053	511 408	507 145	1 028 932	538 789
	Confirmed with microscopy	94 475	116 444	69 397	77 549	54 840	39 263	122 724	86 895
	RDT examined	–	–	–	0	0	0	155 919	–
	Confirmed with RDT	–	–	–	0	0	0	22 558	–
	Imported cases	–	–	–	–	–	–	–	–
Djibouti	Presumed and confirmed	4 667	2 469	1 010	230	27	1 684	9 439	–
	Microscopy examined	–	1 913	–	124	1 410	7 189	39 284	–
	Confirmed with microscopy	–	413	1 010	–	22	1 684	9 439	–
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	3	–	–	–
	Imported cases	–	–	–	–	–	–	–	–
Iran (Islamic Republic of)	Presumed and confirmed	19 716	18 966	3 031	3 239	1 629	1 373	1 243	1 378
	Microscopy examined	1 732 778	1 674 895	614 817	530 470	479 655	385 172	468 513	610 337
	Confirmed with microscopy	19 716	18 966	3 031	3 239	1 629	1 373	1 243	799
	RDT examined	–	–	–	–	0	–	–	20 549
	Confirmed with RDT	–	–	–	–	0	–	–	579
	Imported cases	7 422	4 570	1 184	1 529	842	853	867	632
Pakistan	Presumed and confirmed	3 337 054	4 022 823	4 281 356	4 065 802	4 285 449	3 472 727	3 666 257	3 776 244
	Microscopy examined	–	4 776 274	4 281 346	4 168 648	4 497 330	3 933 321	4 343 418	4 619 980
	Confirmed with microscopy	82 526	127 826	220 870	287 592	250 526	196 078	193 952	137 401
	RDT examined	–	–	279 724	518 709	410 949	628 504	779 815	691 245
	Confirmed with RDT	–	–	19 721	46 997	40 255	85 677	81 197	64 612
	Imported cases	–	290	–	–	–	–	–	–
Saudi Arabia	Presumed and confirmed	6 608	1 059	1 941	2 788	3 406	2 513	2 305	2 620
	Microscopy examined	–	715 878	944 723	1 062 827	1 186 179	1 309 783	1 249 752	1 306 700
	Confirmed with microscopy	6 608	1 059	1 941	2 788	3 406	2 513	2 305	2 620
	RDT examined	–	–	–	–	0	–	–	–
	Confirmed with RDT	–	–	–	–	0	–	–	–
	Imported cases	1 872	855	1 912	2 719	3 324	2 479	2 254	2 537

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
EASTERN MEDITERRANEAN									
Somalia	Presumed and confirmed	10 364	28 404	24 553	41 167	35 712	9 135	26 174	39 169
	Microscopy examined	–	47 882	20 593	26 351	–	–	–	–
	Confirmed with microscopy	–	12 516	5 629	1 627	–	–	–	–
	RDT examined	–	–	200 105	35 236	37 273	67 464	64 480	100 792
	Confirmed with RDT	–	–	18 924	1 724	6 817	7 407	11 001	20 953
	Imported cases	–	–	–	–	–	–	–	–
Sudan	Presumed and confirmed	4 332 827	2 515 693	1 465 496	1 214 004	964 698	989 946	1 207 771	1 102 186
	Microscopy examined	–	–	–	–	–	–	–	–
	Confirmed with microscopy	368 557	628 417	625 365	506 806	526 931	592 383	579 038	586 827
	RDT examined	–	–	1 653 300	2 222 380	2 000 700	1 800 000	788 281	–
	Confirmed with RDT	–	–	95 192	–	–	–	489 468	–
	Imported cases	–	–	–	–	–	–	–	–
Yemen	Presumed and confirmed	1 394 495	200 560	198 963	142 147	165 678	149 451	97 089	95 287
	Microscopy examined	–	472 970	645 463	645 093	685 406	723 691	643 994	529 932
	Confirmed with microscopy	1 394 495	44 150	78 269	60 207	68 849	63 484	51 768	38 254
	RDT examined	–	–	97 289	108 110	150 218	157 457	141 519	111 787
	Confirmed with RDT	–	–	28 428	30 203	41 059	39 294	34 939	30 728
	Imported cases	–	–	–	–	–	–	–	–
EUROPEAN									
Tajikistan	Presumed and confirmed	233 785	216 197	112	78	33	14	7	5
	Microscopy examined	233 785	216 197	173 523	173 367	209 239	213 916	200 241	–
	Confirmed with microscopy	19 064	2 309	112	78	33	14	7	–
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	1	13	15	7	5	5
SOUTH-EAST ASIA									
Bangladesh	Presumed and confirmed	437 838	290 418	91 227	51 773	29 518	3 864	10 216	6 608
	Microscopy examined	360 300	220 025	308 326	270 253	253 887	74 755	78 719	69 093
	Confirmed with microscopy	55 599	48 121	20 519	20 232	4 016	1 866	3 249	1 612
	RDT examined	–	–	152 936	119 849	35 675	19 171	46 482	53 713
	Confirmed with RDT	–	–	35 354	31 541	5 885	1 998	6 967	4 996
	Imported cases	–	–	–	–	–	–	–	129
Bhutan	Presumed and confirmed	5 935	1 825	487	207	82	45	48	104
	Microscopy examined	76 445	60 152	54 709	44 481	42 512	31 632	33 586	26 149
	Confirmed with microscopy	5 935	1 825	436	194	82	45	48	84
	RDT examined	–	–	–	–	–	–	–	47 938
	Confirmed with RDT	–	–	–	–	–	–	–	20
	Imported cases	–	–	–	–	0	23	29	70
Democratic People's Republic of Korea	Presumed and confirmed	204 428	11 507	13 520	16 760	23 537	15 673	11 212	7 409
	Microscopy examined	–	–	25 147	26 513	39 238	71 453	38 201	29 272
	Confirmed with microscopy	90 582	11 315	13 520	16 760	21 850	14 407	10 535	7 010
	RDT examined	–	–	–	–	0	0	0	61 348
	Confirmed with RDT	–	–	–	–	0	0	0	12
	Imported cases	–	–	–	–	0	0	0	205
India	Presumed and confirmed	2 031 790	1 816 569	1 599 986	1 310 656	1 067 824	881 730	1 102 205	1 169 261
	Microscopy examined	86 790 375	104 120 792	108 679 429	108 969 660	109 033 790	113 109 094	124 066 331	121 141 970
	Confirmed with microscopy	2 031 790	1 816 569	1 599 986	1 310 656	1 067 824	881 730	1 102 205	1 169 261
	RDT examined	–	–	10 600 000	10 500 384	13 125 480	14 782 104	14 562 000	19 699 260
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	–
Indonesia	Presumed and confirmed	256 993	315 394	465 764	422 447	417 819	1 833 256	252 027	217 025
	Microscopy examined	1 752 763	1 178 457	1 335 445	962 090	1 429 139	1 447 980	1 300 835	1 224 504
	Confirmed with microscopy	245 612	315 394	465 764	422 447	417 819	343 527	252 027	217 025
	RDT examined	–	–	255 734	250 709	471 586	260 181	249 461	342 946
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	–

Annex 4 – H. Reported malaria cases by method of confirmation, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
SOUTH-EAST ASIA									
Myanmar	Presumed and confirmed	581 560	516 041	693 124	567 452	480 586	315 509	152 195	77 842
	Microscopy examined	381 610	437 387	275 374	312 689	265 135	138 473	93 842	52 076
	Confirmed with microscopy	120 083	165 737	103 285	91 752	75 220	25 215	11 952	6 569
	RDT examined	–	–	729 878	795 618	1 158 831	1 162 083	797 071	661 999
	Confirmed with RDT	–	–	317 523	373 542	405 366	226 058	140 243	71 273
	Imported cases	–	–	–	–	–	–	–	345
Nepal	Presumed and confirmed	48 686	178 056	96 383	71 752	70 272	38 113	122 874	113 595
	Microscopy examined	100 063	188 930	102 977	95 011	152 780	100 336	127 130	63 946
	Confirmed with microscopy	7 981	5 050	3 115	1 910	1 659	1 197	1 469	1 112
	RDT examined	–	–	17 887	25 353	22 472	32 989	48 444	49 649
	Confirmed with RDT	–	–	779	1 504	433	777	–	725
	Imported cases	–	–	–	–	–	–	–	517
Thailand	Presumed and confirmed	78 561	29 782	32 480	24 897	32 569	41 362	37 921	14 755
	Microscopy examined	4 403 739	2 524 788	1 695 980	1 354 215	1 130 757	1 830 090	1 756 528	1 358 953
	Confirmed with microscopy	78 561	29 782	22 969	14 478	32 569	33 302	37 921	14 135
	RDT examined	–	–	81 997	96 670	–	–	–	10 888
	Confirmed with RDT	–	–	9 511	10 419	–	–	–	0
	Imported cases	–	–	–	–	–	–	–	9 890
Timor-Leste	Presumed and confirmed	15 212	130 679	119 072	36 064	6 148	1 042	342	80
	Microscopy examined	–	97 781	109 806	82 175	64 318	56 192	30 515	30 275
	Confirmed with microscopy	15 212	43 093	40 250	19 739	5 211	1 025	342	80
	RDT examined	–	–	85 643	127 272	117 599	121 991	86 592	90 835
	Confirmed with RDT	–	–	7 887	–	–	–	0	0
	Imported cases	–	–	–	–	–	–	–	–
WESTERN PACIFIC									
Cambodia	Presumed and confirmed	203 164	67 036	49 356	57 423	45 553	24 130	26 278	33 930
	Microscopy examined	122 555	88 991	90 175	86 526	80 212	54 716	48 591	49 357
	Confirmed with microscopy	51 320	26 914	14 277	13 792	10 124	4 598	5 288	7 423
	RDT examined	18 167	58 791	103 035	130 186	108 974	94 600	92 525	114 323
	Confirmed with RDT	11 122	22 522	35 079	43 631	30 352	16 711	19 864	26 507
	Imported cases	–	–	–	–	–	–	–	–
China	Presumed and confirmed	–	100 106	7 855	4 498	2 678	4 121	2 921	3 116
	Microscopy examined	–	3 814 715	7 115 784	9 189 270	6 918 657	5 554 960	4 403 633	4 052 588
	Confirmed with microscopy	–	21 936	4 990	3 367	2 603	4 086	2 921	3 088
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	2 632	–	–	2 399	4 007	2 864	3 055
Lao People's Democratic Republic	Presumed and confirmed	279 903	30 359	23 047	17 904	46 819	41 385	48 071	36 056
	Microscopy examined	256 273	156 954	150 512	213 578	223 934	202 422	133 916	110 084
	Confirmed with microscopy	40 106	13 615	4 524	6 226	13 232	10 036	8 018	4 167
	RDT examined	–	–	127 790	7 743	145 425	133 337	160 626	173 919
	Confirmed with RDT	–	–	16 276	11 609	32 970	28 095	40 053	31 889
	Imported cases	–	–	–	–	–	–	–	0
Malaysia	Presumed and confirmed	874 894	573 788	6 650	5 306	4 725	3 850	3 923	2 311
	Microscopy examined	1 832 802	1 425 997	1 619 074	1 600 439	1 566 872	1 576 012	1 443 958	1 066 470
	Confirmed with microscopy	12 705	5 569	6 650	5 306	4 725	3 850	3 923	2 311
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	831	1 142	924	865	766	435
Papua New Guinea	Presumed and confirmed	1 751 883	1 788 318	1 379 787	1 151 343	878 371	1 125 808	644 688	553 103
	Microscopy examined	225 535	267 132	198 742	184 466	156 495	139 972	83 257	112 864
	Confirmed with microscopy	79 839	92 957	75 985	70 603	67 202	70 658	68 114	64 719
	RDT examined	–	–	20 820	27 391	228 857	468 380	475 654	541 760
	Confirmed with RDT	–	–	17 971	13 457	82 993	209 336	213 068	233 068
	Imported cases	–	–	–	–	–	–	–	–
Philippines	Presumed and confirmed	36 596	46 342	19 106	9 617	8 154	7 720	4 903	5 135
	Microscopy examined	–	581 871	301 031	327 060	332 063	317 360	286 222	224 843
	Confirmed with microscopy	–	–	18 560	9 552	7 133	5 826	3 618	4 988
	RDT examined	–	12 125	–	–	–	1 523	28 598	35 789
	Confirmed with RDT	–	–	–	–	–	688	1 285	134
	Imported cases	–	–	–	–	–	–	–	18

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
WESTERN PACIFIC									
Republic of Korea	Presumed and confirmed	4 183	1 369	1 772	838	555	443	638	699
	Microscopy examined	–	–	–	–	–	–	–	–
	Confirmed with microscopy	–	–	1 772	838	555	443	638	699
	RDT examined	–	–	–	–	–	–	–	–
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	56	64	47	50	78	65
Solomon Islands	Presumed and confirmed	368 913	393 288	95 006	80 859	57 296	53 270	51 649	50 916
	Microscopy examined	300 806	316 898	212 329	182 847	202 620	191 137	173 900	124 376
	Confirmed with microscopy	68 107	76 390	35 373	23 202	21 904	21 540	13 865	14 793
	RDT examined	–	–	17 300	17 457	13 987	26 216	26 658	40 750
	Confirmed with RDT	–	–	4 331	3 455	2 479	4 069	4 539	9 205
	Imported cases	–	–	–	–	–	–	–	–
Vanuatu	Presumed and confirmed	33 779	34 912	16 831	5 764	3 435	2 381	982	697
	Microscopy examined	31 668	61 092	29 180	19 183	16 981	15 219	18 135	4 870
	Confirmed with microscopy	6 768	9 834	4 013	2 077	733	767	190	15
	RDT examined	–	–	10 246	12 529	16 292	13 724	17 435	9 794
	Confirmed with RDT	–	–	4 156	2 743	2 702	1 614	792	408
	Imported cases	–	–	–	–	–	–	–	0
Viet Nam	Presumed and confirmed	274 910	84 473	54 297	45 588	43 717	35 406	27 868	19 252
	Microscopy examined	2 682 862	2 728 481	2 760 119	2 791 917	2 897 730	2 684 996	2 357 536	2 204 409
	Confirmed with microscopy	74 316	19 496	17 515	16 612	19 638	17 128	15 752	9 331
	RDT examined	–	–	7 017	491 373	514 725	412 530	416 483	459 332
	Confirmed with RDT	–	–	–	–	–	–	–	–
	Imported cases	–	–	–	–	–	–	–	–

RDT, rapid diagnostic test

Cases reported before 2000 can be presumed and confirmed cases, or only confirmed cases, depending on the country.

1 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf)

Annex 4 – I. Reported malaria cases by species, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Algeria	Suspected	27 733	18 392	12 224	11 974	15 790	12 762	8 690	8 000
	No *Pf*	261	242	7	4	48	14	5	0
	No *Pv*	277	57	4	0	11	2	0	0
	No Other	–	–	1	0	0	0	0	0
Angola	Suspected	2 080 348	2 329 316	4 591 529	4 469 357	4 849 418	5 273 305	6 134 471	6 839 963
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Benin	Suspected	–	803 462	1 432 095	1 565 487	1 875 386	2 041 444	1 955 773	2 009 959
	No *Pf*	–	–	–	68 745	0	–	–	–
	No *Pv*	–	–	–	0	0	–	–	–
	No Other	–	–	–	0	0	–	–	–
Botswana	Suspected	71 555	11 242	12 196	1 141	308	506	1 485	1 298
	No *Pf*	–	–	1 046	432	193	456	1 346	326
	No *Pv*	–	–	0	0	–	–	0	0
	No Other	–	–	–	–	–	–	–	–
Burkina Faso	Suspected	–	1 667 622	6 037 806	5 446 870	7 852 299	7 857 296	9 274 530	9 783 385
	No *Pf*	–	0	–	–	–	–	–	–
	No *Pv*	–	0	–	–	–	–	–	–
	No Other	–	0	–	–	–	–	–	–
Burundi	Suspected	3 428 846	2 910 545	5 590 736	4 768 314	4 228 015	7 384 501	7 622 162	8 414 481
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Cabo Verde	Suspected	6 843	7 902	47	26 508	8 715	10 621	6 894	3 117
	No *Pf*	144	68	47	7	1	22	26	7
	No *Pv*	0	0	0	0	0	0	0	0
	No Other	0	0	0	0	0	0	0	0
Cameroon	Suspected	–	277 413	1 845 691	3 060 040	2 865 319	3 652 609	3 709 906	3 312 273
	No *Pf*	–	–	–	–	–	–	–	592 351
	No *Pv*	–	–	–	–	–	–	–	0
	No Other	–	–	–	–	–	–	–	–
Central African Republic	Suspected	89 614	131 856	66 484	221 980	468 986	491 074	625 301	1 218 246
	No *Pf*	–	–	–	–	–	–	295 088	598 833
	No *Pv*	–	–	–	–	–	–	0	0
	No Other	–	–	–	–	–	–	0	–
Chad	Suspected	442 246	507 617	743 471	528 454	730 364	1 272 841	1 737 195	1 641 285
	No *Pf*	20 977	14 770	–	–	–	–	–	–
	No *Pv*	19 101	16 898	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Comoros	Suspected	–	29 554	159 976	135 248	168 043	185 779	103 545	101 330
	No *Pf*	–	–	33 791	21 387	43 681	45 669	2 203	1 300
	No *Pv*	–	–	528	334	637	72	0	0
	No Other	–	–	880	557	1 189	363	0	0
Congo	Suspected	–	–	446 656	277 263	117 640	209 169	290 346	300 592
	No *Pf*	–	–	–	37 744	120 319	43 232	66 323	51 529
	No *Pv*	–	–	–	0	0	0	0	0
	No Other	–	–	–	0	0	0	0	0
Côte d'Ivoire	Suspected	–	1 280 914	1 721 461	2 607 856	3 423 623	5 982 151	6 418 571	5 216 344
	No *Pf*	–	–	–	–	–	–	3 712 831	3 375 904
	No *Pv*	–	–	–	–	–	–	0	0
	No Other	–	–	–	–	–	–	0	0
Democratic Republic of the Congo	Suspected	967 484	6 337 168	10 568 756	12 018 784	11 993 189	14 871 716	14 647 380	16 452 476
	No *Pf*	889	2 844	0	0	0	0	–	–
	No *Pv*	0	110	0	0	0	0	–	–
	No Other	–	–	0	0	0	0	–	–
Equatorial Guinea	Suspected	–	–	83 639	40 704	45 792	44 561	57 129	68 058
	No *Pf*	–	–	53 813	22 466	15 169	13 129	17 452	–
	No *Pv*	–	–	0	0	0	0	0	–
	No Other	–	–	–	–	–	–	–	–
Eritrea	Suspected	–	64 056	96 792	97 479	138 982	134 183	121 755	111 950
	No *Pf*	–	7 506	9 785	10 263	12 121	12 482	23 787	14 510
	No *Pv*	–	1 567	3 989	4 932	9 204	7 361	6 780	4 780
	No Other	–	5	57	19	346	1 350	94	21

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Ethiopia	Suspected	–	4 727 209	5 420 110	5 487 972	5 962 646	9 243 894	7 457 765	5 987 580
	No *Pf*	–	374 335	732 776	814 547	946 595	1 687 163	1 250 110	1 188 627
	No *Pv*	–	158 658	390 252	665 813	745 983	958 291	868 705	678 432
	No Other	–	5 949	0	–	–	–	–	–
Gabon	Suspected	127 024	294 348	233 770	178 822	238 483	256 531	256 183	285 489
	No *Pf*	50 810	70 644	2 157	–	–	26 432	26 117	–
	No *Pv*	0	0	720	–	–	0	0	–
	No Other	–	–	2 015	–	–	0	–	–
Gambia	Suspected	–	329 426	492 062	261 967	862 442	889 494	603 424	891 511
	No *Pf*	–	–	64 108	190 379	271 038	175 126	99 976	240 382
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	–	–	–	–	–	–	–
Ghana	Suspected	3 349 528	3 452 969	5 056 851	5 067 731	12 578 946	8 444 417	10 636 057	13 368 757
	No *Pf*	–	–	926 447	593 518	3 755 166	1 629 198	3 415 912	4 319 919
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	–	102 937	31 238	0	0	0	0
Guinea	Suspected	816 539	850 309	1 092 554	1 276 057	1 220 574	775 341	1 595 828	1 251 096
	No *Pf*	4 800	50 452	20 936	5 450	191 421	63 353	660 207	810 979
	No *Pv*	0	0	0	0	0	0	0	0
	No Other	–	–	–	–	–	0	–	–
Guinea-Bissau	Suspected	246 316	204 555	195 006	300 233	237 398	238 580	309 939	–
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Kenya	Suspected	4 216 531	9 181 224	7 557 454	13 127 058	12 883 521	14 677 837	15 142 723	15 915 943
	No *Pf*	–	–	898 531	1 002 805	1 453 471	2 335 286	2 808 931	1 499 027
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	–	–	–	–	–	–	–
Liberia	Suspected	–	66 043	3 087 659	2 887 105	2 441 800	2 202 213	2 433 086	2 306 116
	No *Pf*	–	44 875	212 927	577 641	1 407 455	1 244 220	864 204	931 086
	No *Pv*	–	0	0	0	0	0	0	0
	No Other	–	–	0	–	–	0	0	0
Madagascar	Suspected	1 417 112	1 260 575	719 967	805 701	980 262	1 071 310	977 228	1 536 344
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Malawi	Suspected	3 646 212	3 688 389	6 851 108	5 734 906	6 528 505	5 787 441	7 703 651	8 518 905
	No *Pf*	–	–	–	–	–	–	2 905 310	3 585 315
	No *Pv*	–	–	–	–	–	–	0	0
	No Other	–	–	–	–	–	–	–	–
Mali	Suspected	546 634	962 706	3 324 238	2 628 593	2 171 739	2 849 453	2 590 643	4 410 839
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Mauritania	Suspected	–	223 472	250 073	162 820	172 374	135 985	188 194	219 184
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Mayotte	Suspected	–	500	2 023	1 214	1 463	82	15	–
	No *Pf*	–	–	138	38	21	9	1	–
	No *Pv*	–	–	3	2	2	0	0	–
	No Other	–	–	19	0	2	–	0	–
Mozambique	Suspected	–	–	6 097 263	7 059 112	6 170 561	8 200 849	12 240 045	14 241 392
	No *Pf*	–	–	878 009	663 132	927 841	2 998 874	7 117 648	7 718 782
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	–	–	–	–	–	–	–
Namibia	Suspected	–	339 204	39 855	74 407	10 844	34 002	186 972	207 612
	No *Pf*	–	–	556	335	194	136	15 914	12 050
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	–	0	0	0	0	0	0
Niger	Suspected	–	889 986	10 616 033	3 637 778	5 915 671	5 533 601	7 014 724	4 497 920
	No *Pf*	–	74 129	601 455	757 449	817 072	1 426 696	3 828 486	2 267 867
	No *Pv*	–	0	0	0	0	0	0	0
	No Other	–	1 878	17 123	21 370	25 270	5 102	39 066	0

Annex 4 – I. Reported malaria cases by species, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN									
Nigeria	Suspected	2 476 608	3 532 108	3 873 463	5 221 656	11 789 970	21 659 831	19 555 575	17 388 046
	No *Pf*	–	–	523 513	–	–	–	–	–
	No *Pv*	–	–	0	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Rwanda	Suspected	–	2 409 080	2 708 973	1 602 271	3 095 386	3 064 585	4 178 206	6 093 114
	No *Pf*	–	–	638 669	208 858	483 470	962 618	1 623 176	–
	No *Pv*	–	–	0	0	–	–	0	–
	No Other	–	–	–	–	–	–	0	–
Sao Tome and Principe	Suspected	66 250	73 050	58 961	117 279	126 897	108 634	91 445	84 348
	No *Pf*	–	–	2 219	6 363	10 700	9 242	1 754	2 055
	No *Pv*	–	–	14	4	1	1	0	0
	No Other	–	–	0	6	0	0	0	0
Senegal	Suspected	1 134 587	1 418 091	1 043 632	900 903	897 943	1 119 100	1 079 536	1 421 221
	No *Pf*	44 959	38 746	343 670	277 326	281 080	345 889	265 624	491 901
	No *Pv*	0	0	0	0	–	0	0	0
	No Other	–	–	–	–	1	0	0	0
Sierra Leone	Suspected	460 881	243 082	2 327 928	1 150 747	2 579 296	2 576 550	2 647 375	2 337 297
	No *Pf*	–	3 702	218 473	25 511	1 537 322	1 701 958	1 374 476	1 483 376
	No *Pv*	–	0	0	0	0	0	0	0
	No Other	–	0	–	–	–	–	0	0
South Africa	Suspected	64 624	7 755	276 669	382 434	152 561	603 932	543 196	35 982
	No *Pf*	–	–	2 181	6 906	3 109	8 645	11 563	554
	No *Pv*	–	–	0	14	5	0	0	0
	No Other	–	–	5	0	7	0	0	1
South Sudan[1]	Suspected	–	337 582	900 283	795 784	1 125 039	1 855 501	–	–
	No *Pf*	–	–	–	112 024	–	–	–	–
	No *Pv*	–	–	–	0	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Swaziland	Suspected	29 374	10 374	1 722	797	626	669	711	651
	No *Pf*	0	279	87	–	–	–	389	157
	No *Pv*	0	0	0	0	0	0	0	0
	No Other	0	0	0	0	0	1	0	0
Togo	Suspected	–	437 662	1 419 928	893 588	1 311 047	1 442 571	1 756 700	1 756 701
	No *Pf*	–	–	224 080	237 282	260 526	272 847	1 130 234	1 113 910
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	–	7	23	9	8	0	0
Uganda	Suspected	3 552 859	10 869 875	15 332 293	12 522 232	16 845 771	26 145 615	19 201 136	22 095 860
	No *Pf*	–	1 082 223	1 565 348	231 873	2 662 258	1 502 362	3 631 939	7 137 662
	No *Pv*	–	0	15 812	0	0	–	0	0
	No Other	–	22 086	0	0	0	–	0	0
United Republic of Tanzania	Suspected	81 442	16 740 283	15 388 319	15 299 205	14 513 120	14 650 226	25 190 092	20 797 048
	No *Pf*	17 734	7 628	2 338	4 489	2 730	1 673	2 235	413 615
	No *Pv*	0	0	0	0	0	0	0	0
	No Other	–	–	0	0	201	52	106 764	175
Mainland	Suspected	–	16 679 237	15 116 242	14 843 487	13 976 370	14 122 269	24 880 179	20 451 119
	No *Pf*	–	–	–	–	–	–	0	411 741
	No *Pv*	–	–	–	–	–	–	0	0
	No Other	–	–	–	–	–	–	106 609	–
Zanzibar	Suspected	81 442	61 046	272 077	455 718	536 750	527 957	309 913	345 929
	No *Pf*	17 734	7 628	2 338	4 489	2 730	1 673	2 235	1 874
	No *Pv*	0	0	0	0	0	0	0	0
	No Other	–	–	0	0	201	52	155	175
Zambia	Suspected	3 337 796	4 121 356	4 229 839	4 607 908	4 695 400	5 465 122	7 859 740	8 116 962
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Zimbabwe	Suspected	–	1 494 518	912 618	480 011	727 174	1 115 005	1 420 946	1 384 893
	No *Pf*	–	–	249 379	319 935	276 963	422 633	535 931	391 651
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	–	–	0	–	–	–	0
AMERICAS									
Belize	Suspected	18 559	25 119	27 366	22 996	20 789	25 351	24 122	26 367
	No *Pf*	20	32	0	0	0	0	0	0
	No *Pv*	1 466	1 517	149	72	33	22	18	9
	No Other	–	0	0	0	0	0	0	0

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AMERICAS									
Bolivia (Plurinational State of)	Suspected	143 990	208 021	140 857	150 662	132 904	144 049	124 900	159 167
	No *Pf*	2 437	1 031	1 557	526	385	975	325	84
	No *Pv*	28 932	19 062	13 694	7 635	8 141	7 398	7 060	6 811
	No Other	0	0	0	0	0	2	0	0
Brazil	Suspected	2 562 576	2 660 539	2 711 433	2 477 821	2 349 341	1 893 797	1 670 019	1 502 840
	No *Pf*	124 939	147 150	47 406	32 100	31 913	29 201	21 105	14 764
	No *Pv*	478 212	450 687	283 435	231 368	203 018	143 050	115 299	122 615
	No Other	932	211	183	362	4 361	3 235	1 245	46
Colombia	Suspected	478 820	493 562	521 342	418 159	416 767	327 081	403 532	332 706
	No *Pf*	50 476	41 781	32 900	14 650	17 612	17 110	20 067	25 322
	No *Pv*	92 702	78 157	83 255	44 701	44 283	33 345	20 129	21 987
	No Other	0	0	48	16	175	177	130	739
Dominican Republic	Suspected	427 297	397 108	495 637	477 555	506 583	502 683	416 729	367 167
	No *Pf*	1 225	3 829	2 480	1 614	950	576	491	631
	No *Pv*	7	8	2	2	2	3	5	0
	No Other	0	0	0	0	0	0	0	0
Ecuador	Suspected	544 646	358 361	488 830	460 785	459 157	397 628	370 825	261 824
	No *Pf*	48 974	2 212	258	290	78	160	49	184
	No *Pv*	55 624	14 836	1 630	929	466	208	199	434
	No Other	0	0	0	0	0	0	–	0
El Salvador	Suspected	279 072	102 479	115 256	100 884	124 885	103 748	106 915	89 267
	No *Pf*	9	2	0	1	0	0	0	0
	No *Pv*	744	65	17	8	15	6	6	3
	No Other	0	0	0	0	0	0	0	0
French Guiana	Suspected	48 162	32 402	14 373	14 429	13 638	22 327	14 651	11 558
	No *Pf*	3 051	1 649	987	584	382	744	137	85
	No *Pv*	657	1 637	476	339	257	337	98	227
	No Other	214	71	548	489	377	345	200	116
Guatemala	Suspected	246 642	178 726	237 075	195 080	186 645	153 731	314 294	301 746
	No *Pf*	1 474	1 017	30	64	54	101	24	43
	No *Pv*	50 171	38 641	7 163	6 707	5 278	6 062	5 593	5 487
	No Other	36	48	0	0	0	0	0	0
Guyana	Suspected	209 197	210 429	212 863	201 693	196 622	205 903	142 843	132 941
	No *Pf*	12 188	15 558	11 244	15 945	16 722	13 655	3 943	3 219
	No *Pv*	11 694	21 255	8 402	9 066	11 244	13 953	7 173	6 002
	No Other	0	1 291	132	96	9	101	–	32
Haiti	Suspected	21 190	3 541 506	270 427	184 934	167 772	20 586	258 817	302 740
	No *Pf*	16 897	21 778	84 153	32 969	25 423	20 378	17 662	17 583
	No *Pv*	0	0	0	0	0	0	0	0
	No Other	0	0	0	0	0	0	0	0
Honduras	Suspected	175 577	153 474	152 961	152 604	155 165	144 673	151 420	153 906
	No *Pf*	1 425	976	866	585	560	1 153	564	904
	No *Pv*	33 679	15 011	8 759	7 044	5 865	4 293	2 881	2 631
	No Other	0	0	0	10	0	0	0	2
Mexico	Suspected	2 003 569	1 559 076	1 192 081	1 035 424	1 025 659	1 017 508	900 578	867 853
	No *Pf*	131	22	0	0	0	0	0	0
	No *Pv*	7 259	2 945	1 226	1 124	833	495	656	517
	No Other	0	0	0	0	0	0	0	0
Nicaragua	Suspected	509 443	516 313	554 414	536 105	552 722	536 170	620 977	604 418
	No *Pf*	1 369	1 114	154	150	236	220	161	338
	No *Pv*	22 645	5 498	538	775	999	974	1 000	1 937
	No Other	0	0	0	0	0	0	0	4
Panama	Suspected	149 702	208 582	141 038	116 588	107 711	93 624	80 701	64 511
	No *Pf*	45	764	20	1	1	6	8	0
	No *Pv*	991	2 901	398	353	843	699	866	546
	No Other	0	0	0	0	0	0	0	0
Peru	Suspected	1 483 816	1 438 925	744 650	702 952	759 285	864 648	866 047	865 980
	No *Pf*	20 618	14 954	2 291	2 929	3 399	6 630	10 282	13 618
	No *Pv*	47 690	72 611	29 169	21 984	28 030	36 285	54 394	52 919
	No Other	13	–	3	3	7	0	–	8
Suriname	Suspected	63 377	59 855	17 133	16 184	21 685	19 736	26 964	15 236
	No *Pf*	10 608	6 877	638	310	115	420	177	17
	No *Pv*	1 673	1 611	817	382	167	359	158	61
	No Other	811	589	36	17	2	64	35	21

Annex 4 – I. Reported malaria cases by species, 2000–2015

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
AMERICAS									
Venezuela (Bolivarian Republic of)	Suspected	261 866	420 165	400 495	382 303	410 663	476 764	522 617	625 174
	No *Pf*	5 491	5 725	10 629	9 724	10 978	22 777	21 074	24 018
	No *Pv*	24 829	38 985	32 710	34 651	39 478	50 938	62 850	100 880
	No Other	1	38	60	6	23	4 882	6 769	11 491
EASTERN MEDITERRANEAN									
Afghanistan	Suspected	366 865	548 503	847 589	936 252	847 933	787 624	743 183	801 938
	No *Pf*	5 115	5 917	6 142	5 581	1 231	1 877	3 000	4 004
	No *Pv*	89 240	110 527	63 255	71 968	53 609	43 369	58 362	82 891
	No Other	–	0	0	0	0	0	–	–
Djibouti	Suspected	–	3 969	–	354	1 412	–	39 276	–
	No *Pf*	–	413	1 010	–	20	939	–	–
	No *Pv*	–	0	0	–	0	0	–	–
	No Other	–	0	0	–	0	0	–	–
Iran (Islamic Republic of)	Suspected	–	–	–	–	–	–	–	–
	No *Pf*	2 546	2 219	166	152	44	72	21	84
	No *Pv*	0	16 747	1 656	1 502	711	426	351	632
	No Other	–	0	0	0	0	0	–	4
Pakistan	Suspected	–	8 671 271	8 601 835	8 418 570	8 902 947	7 752 797	8 514 341	8 885 456
	No *Pf*	–	42 056	73 857	73 925	95 095	46 067	33 391	30 075
	No *Pv*	–	85 748	143 136	205 879	228 215	283 661	232 332	163 872
	No Other	–	0	0	0	2 901	10 506	8 870	7 178
Saudi Arabia	Suspected	–	–	–	–	–	–	–	–
	No *Pf*	–	–	29	69	82	34	51	83
	No *Pv*	–	–	0	0	0	0	0	0
	No Other	–	1	0	0	0	0	6	0
Somalia	Suspected	–	63 770	220 698	99 403	70 459	85 174	79 653	119 008
	No *Pf*	–	12 516	5 629	–	–	–	–	–
	No *Pv*	–	0	0	–	–	–	–	–
	No Other	–	0	0	–	–	–	–	–
Sudan	Suspected	–	–	–	–	–	–	1 207 771	1 102 186
	No *Pf*	–	–	–	–	–	–	–	–
	No *Pv*	–	–	–	–	–	–	–	–
	No Other	–	–	–	–	–	–	–	–
Yemen	Suspected	–	629 380	835 018	804 940	891 394	927 821	725 169	668 024
	No *Pf*	–	42 627	77 271	59 689	109 504	102 369	67 261	68 655
	No *Pv*	–	1 442	966	478	398	408	239	300
	No Other	–	27	2	33	4	0	0	–
EUROPEAN									
Tajikistan	Suspected	233 785	216 197	173 523	173 367	209 239	213 916	200 241	–
	No *Pf*	831	81	0	0	0	0	0	0
	No *Pv*	18 233	2 228	111	65	18	7	2	0
	No Other	0	0	0	0	0	0	0	0
SOUTH-EAST ASIA									
Bangladesh	Suspected	742 539	462 322	496 616	390 102	309 179	93 926	125 201	122 806
	No *Pf*	39 475	37 679	52 012	49 084	9 428	3 597	8 981	5 279
	No *Pv*	16 124	10 442	3 824	2 579	396	262	489	477
	No Other	–	–	0	0	36	2	727	748
Bhutan	Suspected	76 445	60 152	54 760	44 494	42 512	31 632	28 716	74 087
	No *Pf*	2 738	853	140	87	33	14	17	14
	No *Pv*	3 197	871	261	92	47	9	31	20
	No Other	241	101	0	0	0	–	–	0
Democratic People's Republic of Korea	Suspected	204 428	11 507	25 147	26 513	40 925	72 719	38 878	91 007
	No *Pf*	–	0	0	0	0	0	0	0
	No *Pv*	–	6 728	13 520	16 760	21 850	14 407	10 535	6 817
	No Other	–	–	0	0	0	0	0	0
India	Suspected	86 790 375	104 120 792	119 279 429	119 470 044	122 159 270	127 891 198	138 628 331	140 841 230
	No *Pf*	1 047 218	805 077	830 779	662 748	524 370	462 079	720 795	774 627
	No *Pv*	984 572	1 011 492	765 622	645 652	534 129	417 884	379 659	390 440
	No Other	2 048	4 680	3 585	2 256	9 325	1 767	–	0
Indonesia	Suspected	3 178 212	2 113 265	2 205 293	2 092 187	2 051 425	1 833 256	1 575 907	1 599 427
	No *Pf*	89 289	127 594	220 077	200 662	199 977	170 848	124 051	103 315
	No *Pv*	156 323	147 543	221 176	187 989	187 583	150 985	107 260	94 267
	No Other	–	–	2 547	2 261	981	1 342	–	8

WHO region Country/area		2000	2005	2010	2011	2012	2013	2014	2015
SOUTH-EAST ASIA									
Myanmar	Suspected	843 087	787 691	1 277 568	1 210 465	1 423 966	1 364 792	890 913	714 075
	No *Pf*	95 499	124 644	70 941	59 604	314 676	222 770	104 863	49 311
	No *Pv*	21 802	37 014	29 944	28 966	135 388	98 860	41 866	26 316
	No Other	252	638	346	162	27 917	11 548	5 087	1 689
Nepal	Suspected	140 768	361 936	213 353	188 702	243 432	169 464	296 979	225 353
	No *Pf*	560	1 181	550	0	108	273	195	103
	No *Pv*	7 056	5 691	2 349	908	1 480	1 659	1 154	504
	No Other	–	–	0	0	0	22	–	40
Thailand	Suspected	4 403 739	2 524 788	1 777 977	1 450 885	1 130 757	1 838 150	1 756 528	1 370 461
	No *Pf*	43 717	14 670	9 401	5 710	11 553	14 449	13 743	3 291
	No *Pv*	37 975	14 921	13 401	8 608	17 506	15 573	20 513	4 655
	No Other	47	59	20	13	3 172	3 084	–	57
Timor-Leste	Suspected	15 212	185 367	266 384	225 772	182 854	178 200	117 107	121 110
	No *Pf*	–	43 093	28 350	14 261	1 962	373	118	33
	No *Pv*	–	15 523	11 432	3 758	2 288	512	139	24
	No Other	–	266	0	0	0	0	0	0
WESTERN PACIFIC									
Cambodia	Suspected	281 444	165 382	193 210	216 712	194 263	152 137	142 242	163 680
	No *Pf*	46 150	17 482	8 213	7 054	14 896	7 092	8 332	17 830
	No *Pv*	4 505	9 004	4 794	5 155	19 575	11 267	10 356	13 146
	No Other	665	428	0	0	4 971	2 418	5 582	2 498
China	Suspected	–	3 892 885	7 118 649	9 190 401	6 918 732	5 554 995	4 403 633	4 052 616
	No *Pf*	–	3 588	1 269	1 370	16	8	6	1
	No *Pv*	–	18 187	3 675	1 907	179	71	50	26
	No Other	–	161	20	50	60	0	1	0
Lao People's Democratic Republic	Suspected	496 070	173 698	280 549	221 390	369 976	339 013	294 542	284 003
	No *Pf*	38 271	13 106	4 393	5 770	37 692	24 538	23 928	14 430
	No *Pv*	1 689	473	122	442	7 634	12 537	22 625	20 804
	No Other	146	36	1	14	769	955	1 341	735
Malaysia	Suspected	2 694 991	1 994 216	1 619 074	1 600 439	1 566 872	1 576 012	1 443 958	1 066 470
	No *Pf*	6 000	2 222	1 344	634	651	422	177	110
	No *Pv*	5 953	2 729	3 387	1 750	915	385	241	84
	No Other	287	212	943	1 660	2 187	2 136	2 706	22
Papua New Guinea	Suspected	1 897 579	1 962 493	1 505 393	1 279 140	1 113 528	1 454 166	922 417	909 940
	No *Pf*	63 591	62 926	56 735	59 153	58 747	119 469	120 641	118 452
	No *Pv*	14 721	22 833	13 171	9 654	7 108	7 579	78 846	62 228
	No Other	729	2 632	1 990	632	609	1 279	77 759	114 320
Philippines	Suspected	36 596	593 996	301 577	327 125	333 084	320 089	314 820	260 645
	No *Pf*	25 912	20 033	11 824	6 877	4 774	4 968	3 760	4 145
	No *Pv*	0	6 482	2 885	2 380	2 189	1 357	834	694
	No Other	–	213	175	127	57	16	196	66
Republic of Korea	Suspected	4 183	1 369	1 772	838	555	443	638	699
	No *Pf*	–	–	27	20	36	0	0	0
	No *Pv*	–	–	1 691	754	473	383	557	627
	No Other	–	–	0	0	0	0	0	0
Solomon Islands	Suspected	601 612	633 796	284 931	254 506	249 520	245 014	233 803	192 044
	No *Pf*	46 703	54 001	22 892	14 454	14 748	13 194	9 835	10 478
	No *Pv*	21 322	22 515	12 281	8 665	9 339	11 628	7 845	12 150
	No Other	82	126	200	0	232	446	593	1 141
Vanuatu	Suspected	58 679	86 170	48 088	32 656	33 273	28 943	35 570	14 938
	No *Pf*	3 226	3 817	1 545	770	1 257	1 039	279	150
	No *Pv*	2 972	4 453	2 265	1 224	1 680	1 342	703	273
	No Other	10	64	10	2	470	0	0	0
Viet Nam	Suspected	2 883 456	2 793 458	2 803 918	3 312 266	3 436 534	3 115 804	2 786 135	2 673 662
	No *Pf*	57 605	14 231	12 763	10 101	11 448	9 532	8 245	4 327
	No *Pv*	15 935	5 102	4 466	5 602	7 220	6 901	7 220	4 756
	No Other	772	163	0	0	0	0	0	0

Pf, Plasmodium falciparum ; Pv, Plasmodium vivax

1 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf)

Annex 4 – J. Reported malaria deaths, 2000–2015

WHO region Country/area	2000	2005	2010	2011	2012	2013	2014	2015
AFRICAN								
Algeria	2	0	1	0	0	0	0	1
Angola	9 510	13 768	8 114	6 909	5 736	7 300	5 714	7 832
Benin	0	322	964	1 753	2 261	2 288	1 869	1 416
Botswana	0	11	8	8	3	7	22	5
Burkina Faso	0	5 224	9 024	7 001	7 963	6 294	5 632	5 379
Burundi	691	776	2 677	2 233	2 263	3 411	2 974	3 799
Cabo Verde	0	2	1	1	0	0	2	0
Cameroon	0	836	4 536	3 808	3 209	4 349	4 398	3 440
Central African Republic	439	668	526	858	1 442	1 026	635	1 763
Chad	712	558	886	1 220	1 359	1 881	1 720	1 572
Comoros	0	92	53	19	17	15	0	1
Congo	0	0	0	892	623	2 870	271	435
Côte d'Ivoire	0	0	1 023	1 389	1 534	3 261	4 069	2 604
Democratic Republic of the Congo	3 856	15 322	23 476	23 748	21 601	30 918	25 502	39 054
Equatorial Guinea	0	0	30	52	77	66	0	28
Eritrea	0	49	27	12	30	6	15	12
Ethiopia	0	1 086	1 581	936	1 621	358	213	662
Gabon	2 016	353	182	74	134	273	159	309
Gambia	0	426	151	440	289	262	170	167
Ghana	6 108	2 037	3 859	3 259	2 855	2 506	2 200	2 137
Guinea	626	490	735	743	979	108	1 067	846
Guinea-Bissau	0	565	296	472	370	418	357	0
Kenya	48 767	44 328	26 017	713	785	360	472	15 061
Liberia	0	41	1 422	0	1 725	1 191	2 288	1 379
Madagascar	591	699	427	398	552	641	551	841
Malawi	0	5 070	8 206	6 674	5 516	3 723	4 490	3 799
Mali	748	1 285	3 006	2 128	1 894	1 680	2 309	1 544
Mauritania	0	0	211	77	106	25	19	39
Mayotte	0	0	0	0	0	0	0	0
Mozambique	0	0	3 354	3 086	2 818	2 941	3 245	2 467
Namibia	0	1 325	63	36	4	21	61	45
Niger	1 244	2 060	3 929	2 802	2 825	2 209	2 691	2 778
Nigeria	0	6 494	4 238	3 353	7 734	7 878	6 082	0
Rwanda	0	2 581	670	380	459	409	496	516
Sao Tome and Principe	254	85	14	19	7	11	0	0
Senegal	1 275	1 587	553	472	649	815	500	526
Sierra Leone	0	50	8 188	3 573	3 611	4 326	2 848	1 107
South Africa	424	63	83	54	72	105	174	110
South Sudan[1]	0	0	1 053	406	1 321	1 311	0	0
Swaziland	0	17	8	1	3	4	4	5
Togo	0	1 024	1 507	1 314	1 197	1 361	1 205	1 205
Uganda	0	0	8 431	5 958	6 585	7 277	5 921	6 100
United Republic of Tanzania	379	18 322	15 867	11 806	7 820	8 528	5 373	6 313
Mainland	0	18 075	15 819	11 799	7 812	8 526	5 368	6 311
Zanzibar	379	247	48	7	8	2	5	2
Zambia	0	7 737	4 834	4 540	3 705	3 548	3 257	2 389
Zimbabwe	0	1 916	255	451	351	352	406	200
AMERICAS								
Belize	0	0	0	0	0	0	0	0
Bolivia (Plurinational State of)	11	0	0	0	0	0	1	0
Brazil	245	123	76	70	60	40	36	37
Colombia	124	87	42	23	24	10	17	18
Dominican Republic	6	16	15	10	8	5	4	3
Ecuador	66	22	0	0	0	0	0	0
El Salvador	0	0	0	0	0	0	0	0
French Guiana	0	2	1	2	2	3	0	0
Guatemala	0	4	0	0	0	1	1	1
Guyana	29	33	24	36	35	14	11	12
Haiti	16	29	8	5	6	10	9	15
Honduras	0	1	3	2	1	1	2	0
Mexico	0	0	0	0	0	0	0	0
Nicaragua	4	6	1	1	2	0	0	1

WHO region Country/area	2000	2005	2010	2011	2012	2013	2014	2015
AMERICAS								
Panama	1	1	1	0	1	0	0	0
Peru	20	4	0	1	7	4	5	3
Suriname	24	1	1	1	0	1	0	0
Venezuela (Bolivarian Republic of)	24	17	18	16	10	6	5	8
EASTERN MEDITERRANEAN								
Afghanistan	0	0	22	40	36	24	64	49
Djibouti	0	0	0	0	0	17	28	0
Iran (Islamic Republic of)	4	1	0	0	0	0	0	1
Pakistan	0	52	0	4	260	244	56	34
Saudi Arabia	0	0	0	0	0	0	0	0
Somalia	0	15	6	5	10	23	14	27
Sudan	2 162	1 789	1 023	612	618	685	823	868
Yemen	0	0	92	75	72	55	23	12
EUROPEAN								
Tajikistan	0	0	0	0	0	0	0	0
SOUTH-EAST ASIA								
Bangladesh	484	501	37	36	11	15	45	9
Bhutan	15	5	2	1	1	0	0	0
Democratic People's Republic of Korea	0	0	0	0	0	0	0	0
India	892	963	1 018	754	519	440	562	384
Indonesia	833	88	432	388	252	385	217	157
SOUTH-EAST ASIA								
Myanmar	2 556	1 707	788	581	403	236	92	37
Nepal	0	10	6	2	0	0	0	0
Thailand	625	161	80	43	37	47	38	33
Timor-Leste	0	71	58	16	3	3	1	0
WESTERN PACIFIC								
Cambodia	608	296	151	94	45	12	18	10
China	31	48	19	33	0	0	0	20
Lao People's Democratic Republic	350	77	24	17	44	28	4	2
Malaysia	35	33	13	12	12	10	4	8
Papua New Guinea	617	725	616	523	381	307	203	163
Philippines	536	145	30	12	16	12	10	20
Republic of Korea	0	0	1	2	0	0	0	0
Solomon Islands	38	38	34	19	18	18	23	13
Vanuatu	3	5	1	1	0	0	0	0
Viet Nam	142	18	21	14	8	6	6	3
REGIONAL SUMMARY								
African	77 642	137 269	150 486	104 068	104 105	116 333	99 381	117 886
Americas	570	346	190	167	156	95	91	98
Eastern Mediterranean	2 166	1 857	1 143	736	996	1 048	1 008	991
European	0	0	0	0	0	0	0	0
South-East Asia	5 405	3 506	2 421	1 821	1 226	1 126	955	620
Western Pacific	2 360	1 385	910	727	524	393	268	239
Total	**88 143**	**144 363**	**155 150**	**107 519**	**107 007**	**118 995**	**101 703**	**119 834**

Deaths reported before 2000 can be presumed and confirmed or only confirmed deaths depending on the country.

1 In May 2013, South Sudan was reassigned to the WHO African Region (WHA resolution 66.21, http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R21-en.pdf)

Notes

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Swiss TPH

For further information please contact:
Global Malaria Programme
World Health Organization
20, avenue Appia
CH-1211 Geneva 27
Web: www.who.int/malaria
Email: infogmp@who.int

ISBN 978 92 4 151171 1