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.