WORLD MALARIA DAY 2017

# MALARIA PREVENTION WORKS

let's close the gap

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# FOREWORD

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As World Malaria Day 2017 approaches, there is much to celebrate. According to the latest estimates from WHO, many countries with ongoing malaria transmission have reduced their disease burden significantly. On a global scale, the rate of new malaria cases fell by 21% between 2010 and 2015. Malaria death rates fell by 29% in the same 5-year period (figure 1).

In sub-Saharan Africa, where malaria is heavily concentrated, access to key interventions is expanding rapidly, particularly for the groups most vulnerable to infection and death. Since 2010, a sharp increase in malaria diagnostic testing for children and preventive treatment for pregnant women has been reported across the region. Many other regions have made impressive progress in delivering malaria control tools to those most in need.

But there is a massive unfinished agenda. In 2015 alone, there were an estimated 212 million new cases of malaria. That same year, malaria claimed the lives of some 429 000 people worldwide, mainly young African children. One child died from malaria every 2 minutes.

Why does malaria continue to take such a heavy toll? Simply put, many people in endemic countries lack access to the tools that prevent, diagnose and treat the disease. This is particularly true in low-income countries with a high malaria burden.

## LET'S CLOSE THE GAP

Closing gaps in access to proven malaria control tools is a top priority for the WHO Global Malaria Programme. This year, on World Malaria Day, we place a special focus on prevention gaps. Next year, we will publish a more comprehensive analysis on gaps in prevention, diagnostic testing and treatment worldwide.

This brochure offers a brief summary of WHO-recommended tools in the malaria prevention arsenal. It is divided into two parts: the first chapter focuses on core vector control measures, and the second on preventive treatment strategies for the most vulnerable groups. We touch on a key biological threat – mosquito resistance to insecticides – and highlight the need for new anti-malaria tools.

In recent years, the scale-up of effective prevention tools has had a major impact in the fight against malaria. Increased investment in proven prevention measures, and in the development and deployment of new tools, will accelerate progress towards elimination and bring us one step closer to our common goal of a world free from malaria.

# MALARIA
## AT A GLANCE

Malaria is a preventable and curable disease transmitted through the bites of female *Anopheles* mosquitoes. Among the five parasite species that cause malaria in humans, two pose the greatest threat:

### *P. FALCIPARUM*

is responsible for 99% of malaria deaths globally. It is the most prevalent malaria parasite on the African continent.

### *P. VIVAX*

is the dominant malaria parasite in most countries outside of sub-Saharan Africa.

### KEY FACTS ON THE GLOBAL MALARIA BURDEN (2015)

- There were an estimated 212 million new cases of malaria and 429 000 malaria-related deaths in 2015.
- Approximately 90% of malaria cases and 92% of deaths occurred in the WHO African Region.
- Thirteen countries, mainly in sub-Saharan Africa, accounted for 76% of malaria cases and 75% deaths globally.
- 70% of all malaria deaths occurred among children under the age of five.

Source: WHO *World Malaria Report 2016*

## SYMPTOMS OF MALARIA

The classic symptoms of malaria – fever, headache and chills – typically appear 10 to 15 days after the infective mosquito bite.

*P. falciparum* malaria causes anaemia and, left untreated, can rapidly progress to severe illness and death.

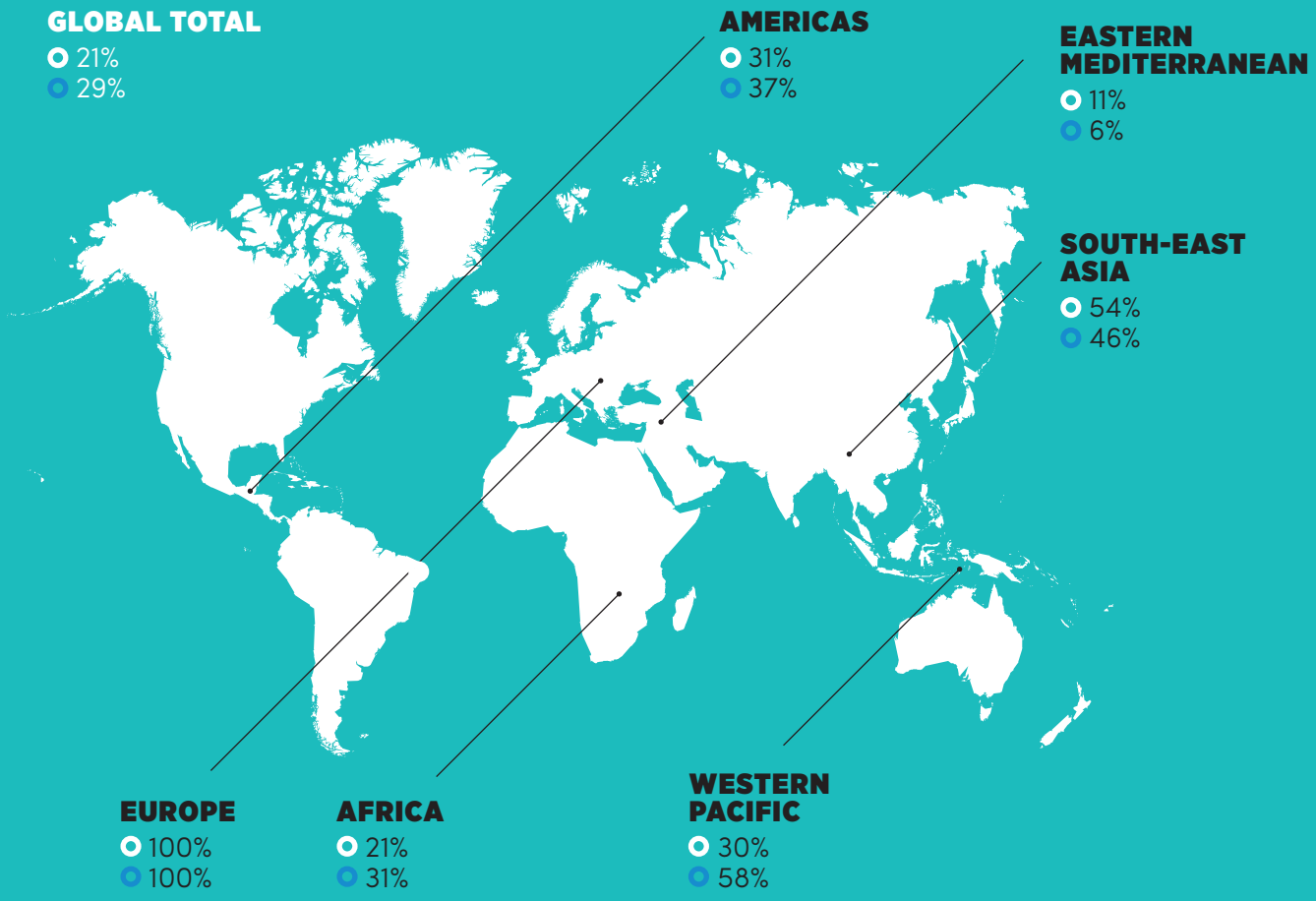

## WHO IS AT RISK?

Nearly half of the world's population is at risk of malaria. While most malaria cases and deaths occur in Africa, four other WHO regions carry a significant disease burden: the Americas, the Eastern Mediterranean, South-East Asia and the Western Pacific.

In areas with high malaria transmission, young children and pregnant women are particularly vulnerable to malaria infection and death. Outside of high-transmission areas, where populations do not acquire significant immunity to malaria, all age groups are at risk.

## FIGURE 1

**Global and regional progress in the fight against malaria by WHO region: 2010-2015**

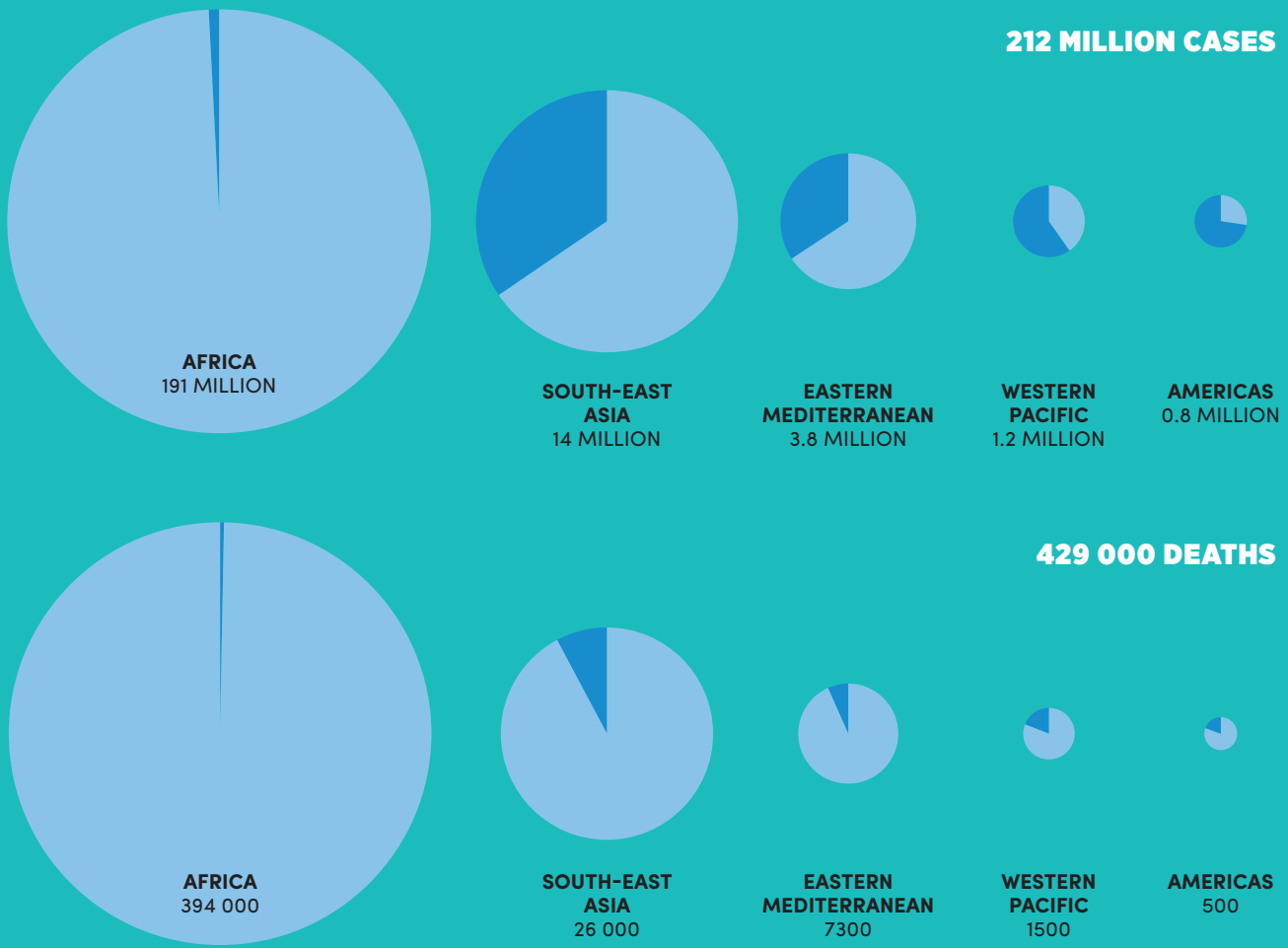



Source: WHO *World Malaria Report 2016*

## FIGURE 2

**Estimated malaria cases and deaths in 2015 by WHO region**

The size of the following graphs represents the relative number of cases and deaths




Source: WHO *World Malaria Report 2016*

# A GLOBAL **STRATEGY**

The WHO *Global Technical Strategy for Malaria 2016-2030* was adopted by the World Health Assembly in May 2015 following an extensive consultative process with more than 400 experts from 70 Member States. It provides a framework for all countries working to control and eliminate malaria, with approaches that are flexible and tailored to local contexts.

The Strategy sets ambitious but attainable targets for 2030, with milestones along the way to track progress. The near-term milestones for 2020 include:

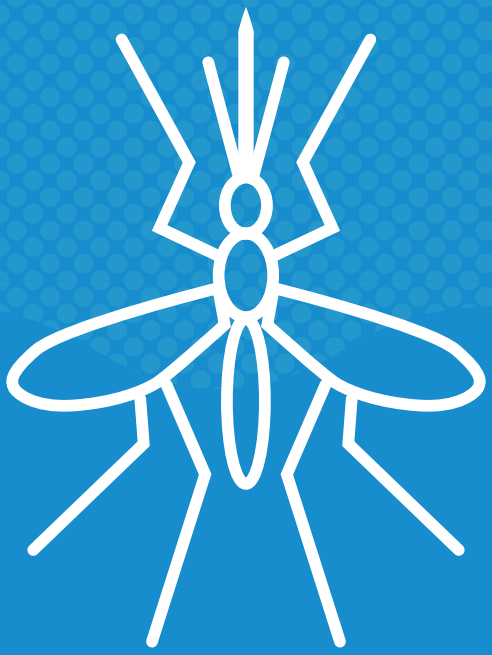
**REDUCING MALARIA CASE INCIDENCE** BY AT LEAST **40%**

**REDUCING MALARIA MORTALITY** RATES BY AT LEAST **40%**

**ELIMINATING MALARIA** IN AT LEAST **10 COUNTRIES**

**PREVENTING RE-ESTABLISHMENT** OF MALARIA IN ALL COUNTRIES THAT ARE **MALARIA FREE**

# VECTOR CONTROL



Vector control is the main approach to prevent malaria and reduce transmission. Two forms of vector control are effective in a wide range of circumstances: insecticide-treated mosquito nets (ITNs) and indoor residual spraying of insecticides (IRS). Since 2000, progress in malaria control has resulted primarily from expanded access to ITNs and, to a lesser extent, IRS.

# INSECTICIDE-TREATED MOSQUITO NETS

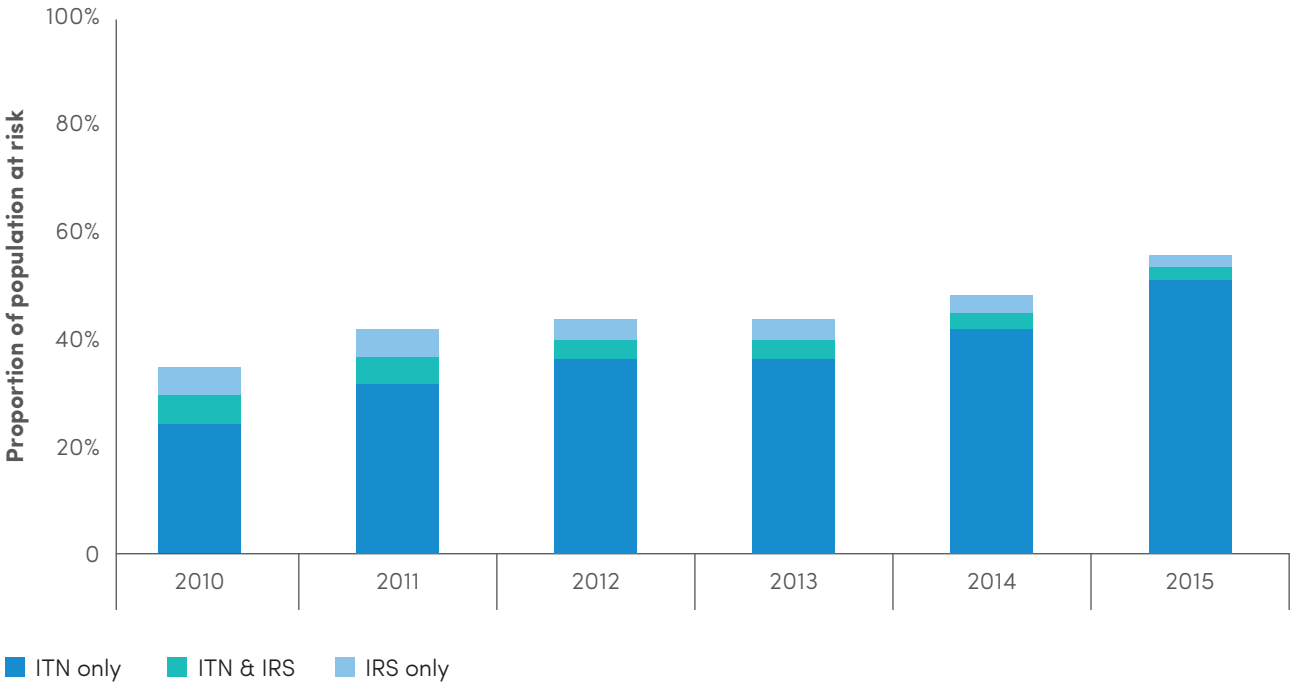
ITNs are the mainstay of malaria prevention efforts, particularly in sub-Saharan Africa. Across the region, the use of ITNs has increased substantially over the last decade. However, major coverage gaps remain: in 2015, an estimated 47% of the population at risk of malaria did not sleep under a treated net. Access to this core tool must be significantly expanded, particularly in countries with ongoing malaria transmission.

Long-lasting insecticidal nets (LLINs) are designed to kill mosquitoes for 3 years, after which time they need to be replaced. Mechanisms are needed to replace nets that are damaged before this period has elapsed.

WHO recommends LLIN coverage for all people at risk of malaria. Effective behaviour change communication strategies can help ensure that people at risk of malaria sleep under an LLIN every night, and that the net is properly maintained.

## FIGURE 3

**Expanded access to insecticide-treated mosquito nets (ITNs) and indoor residual spraying (IRS) of insecticides in sub-Saharan Africa**




Source: WHO *World Malaria Report 2016*

## LET'S CLOSE THE GAP:

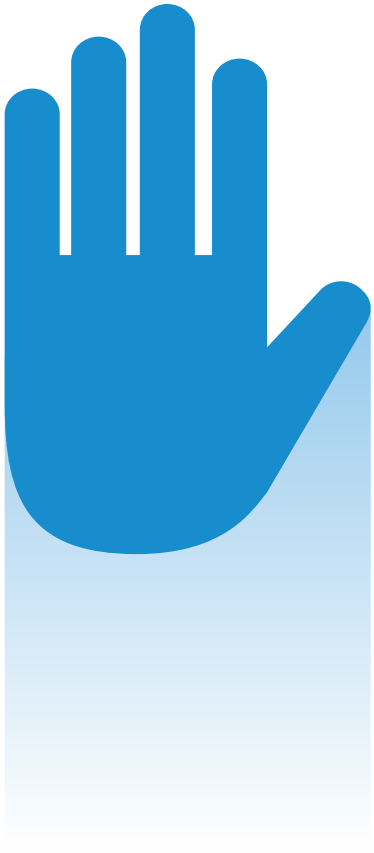
In 2015, an estimated 43% of people at risk of malaria in sub-Saharan Africa were not protected by either ITNs or IRS. On World Malaria Day, WHO is calling on all malaria-affected countries and their development partners to close the gap in coverage of these critical, life-saving tools.

# INDOOR SPRAYING
## WITH RESIDUAL INSECTICIDES

Indoor residual spraying (IRS) is another powerful way to rapidly reduce malaria transmission. It involves spraying insecticides on indoor walls and ceilings where malaria-carrying mosquitoes are likely to rest after biting household occupants. In 2015, 106 million people globally were protected by IRS.

To confer significant community protection, at least 80% of homes in targeted areas should be sprayed. IRS is effective for 3–6 months, depending on the insecticide formulation used and the type of surface that is sprayed. In some settings, multiple spray rounds are needed to protect the population for the entire malaria transmission season.

# MEASURING THE IMPACT OF CORE PREVENTION TOOLS



According to the *World Malaria Report 2015,* an estimated 663 million malaria cases were prevented in sub-Saharan Africa between 2001 and 2015 as a direct result of expanded access to ITNs, IRS and artemisinin-based combination therapies (ACTs). ITNs had the greatest impact, accounting for 69% of malaria cases prevented through interventions.

In addition to public health benefits, the prevention of new cases of malaria has resulted in major cost savings for endemic countries across sub-Saharan Africa. Reductions in malaria cases attributable to malaria control activities saved an estimated US$ 900 million in case management costs in the region between 2001 and 2014.

# INSECTICIDE RESISTANCE: A KEY THREAT

In many parts of the world, progress in the malaria fight is threated by the emergence and spread of mosquito resistance to insecticides. Since 2010, 60 countries have reported resistance of malaria mosquitoes to at least one insecticide class used in IRS or ITNs; of these, 50 countries reported resistance to two or more insecticide classes. Particularly worrying is the widespread emergence of pyrethroid resistance, the only insecticide currently approved for use on ITNs and LLINs.

In 2011, WHO launched a large multi-country evaluation to assess the impact of insecticide resistance on core malaria vector control tools, primarily LLINs. The evaluation, funded by the Bill & Melinda Gates Foundation, was conducted at 340 locations in five countries: Benin, Cameroon, India, Kenya and Sudan.

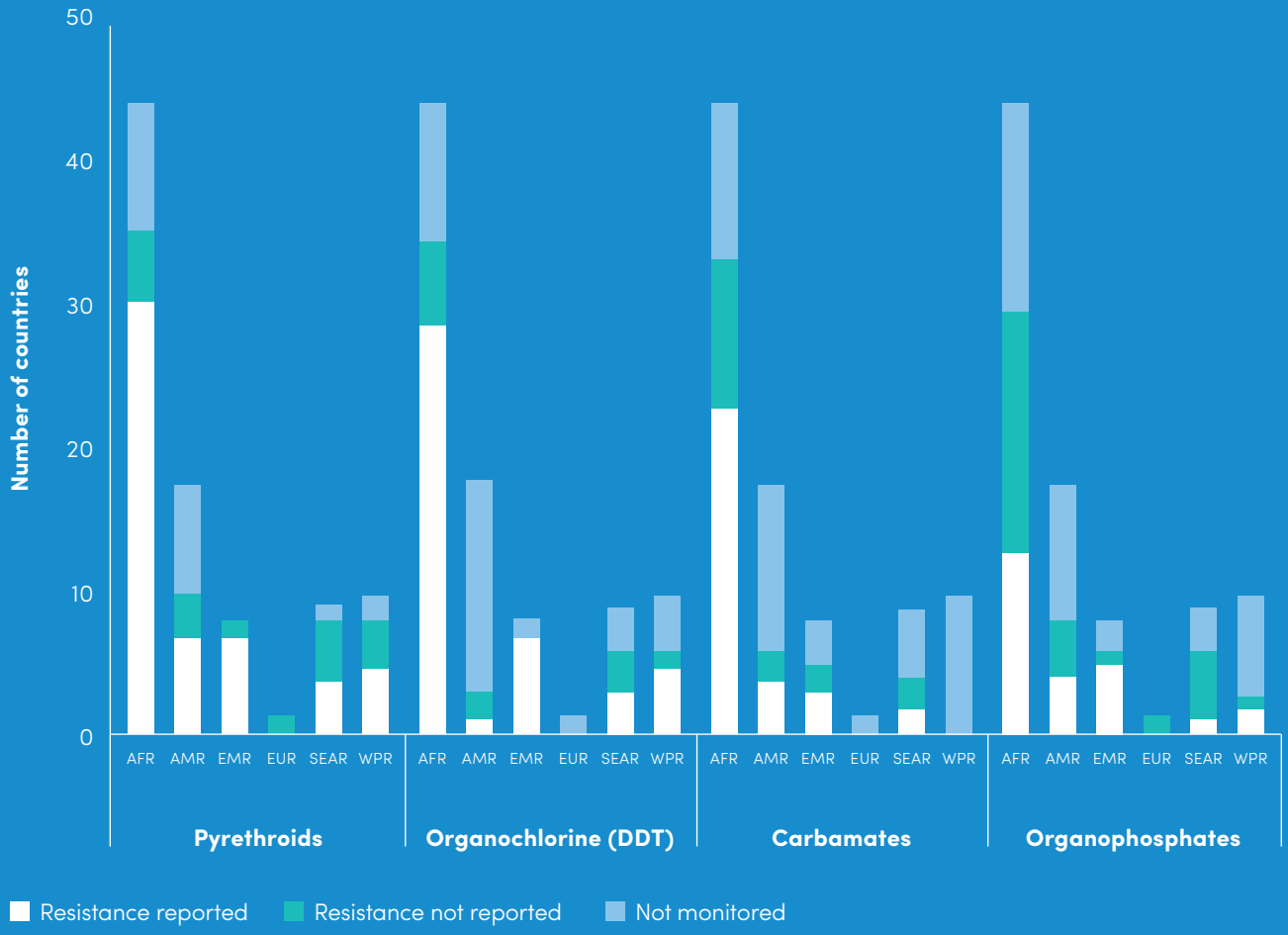
According to the findings of this evaluation, LLINs continue to be an effective tool in the fight against malaria, even in areas where mosquitoes have developed resistance to pyrethroids. These findings reaffirm the WHO recommendation of universal coverage of pyrethroid-treated LLINs for all populations at risk of malaria.

While this outcome is encouraging, all countries with ongoing malaria transmission should continue to develop and implement effective insecticide resistance management strategies.

In parallel, WHO highlights the urgent need for new and improved control tools to accelerate progress towards global malaria targets. A promising pipeline of new anti-mosquito tools is currently under development.

## FIGURE 4

### Insecticide resistance by WHO region




Source: WHO *World Malaria Report 2016* . Data is from 2010 onward.

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

DDT, dichloro-diphenyl-trichloroethane

# SUPPLEMENTARY VECTOR CONTROL METHODS

In specific settings and circumstances, the core vector control tools can be supplemented by other methods such as larval source management and personal protection measures.

**Larval source management**

Preventive approaches can be taken to limit or interrupt the development of adult malaria mosquitoes. These include modifying, manipulating or applying biological or chemical agents to mosquito water habitats.

Larviciding is only recommended in areas where the habitats are few, fixed and findable. It can be particularly useful in urban and periurban areas in sub-Saharan Africa, or in rural areas of Asia and the Americas. At present, 14 formulations are recommended by the WHO Pesticide Evaluation Scheme (WHOPES) for larval control.

Reports from national malaria control programmes in 2015 show that 34 malaria-endemic countries worldwide use larval control in certain foci of malaria transmission. Twenty-one countries reported use of vector habitat modification or manipulation, and 31 countries reported use of biological control or chemical larviciding.

**Personal protection measures**

Where necessary, LLINs and IRS can be supplemented with other personal protection measures to reduce contact between mosquitoes and humans. Supplementary measures may include, for example, window screens, insecticide-treated blankets, hammocks, window curtains, repellents, and protective clothing. These measures have yet to be formally recommended by WHO.

# PROTECTING HIGH-RISK GROUPS

Preventive therapies are recommended for the most vulnerable groups in malaria-endemic areas of sub-Saharan Africa: pregnant women, infants and children under 5 years of age. They target *P. falciparum* malaria and include: intermittent preventive treatment of pregnant women (IPTp), intermittent preventive treatment of infants (IPTi), and seasonal malaria chemoprevention (SMC).

# PREVENTIVE THERAPIES
## FOR VULNERABLE GROUPS

**Intermittent preventive treatment in pregnancy (IPTp)**

**Intermittent preventive treatment in infancy (IPTi)**

**Seasonal chemoprevention for children under 5 years of age (SMC)**

These safe, cost-effective strategies are recommended in sub-Saharan Africa in areas of moderate-to-high malaria transmission. Seasonal malaria chemoprevention is recommended only in areas of highly seasonal transmission across the Sahel subregion.

IPTi, IPTp and SMC are intended to complement ongoing malaria control activities such as vector control measures (LLINs, IRS), prompt diagnosis of suspected malaria, and treatment of confirmed cases with ACTs.

# PROTECTING WOMEN IN PREGNANCY

IPTp prevents maternal and infant mortality, anaemia, and other adverse effects of malaria in pregnancy. It should be given to all pregnant women at routine antenatal care visits in areas of stable malaria transmission in sub-Saharan Africa.

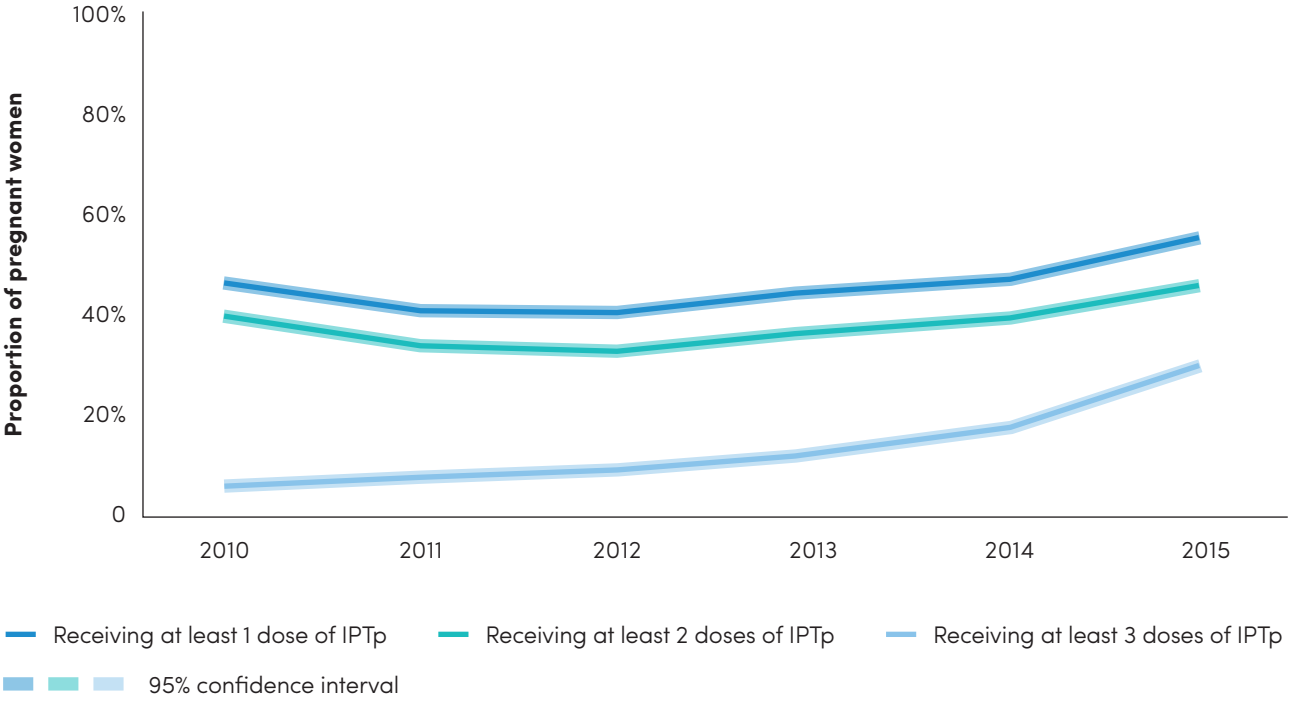
Between 2010 and 2015, there was a five-fold increase in the percentage of women receiving the recommended three or more doses of IPTp in 20 African countries. However, in 2015, coverage of this preventive treatment still remained low, at just 31%.

According to the *World Malaria Report 2016*, one in five pregnant women in the region did not receive antenatal care in 2015; of those who sought care, 30% did not receive a single dose of IPTp. Some women access the first or second dose of IPTp but do not complete the full WHO-recommended schedule.

On World Malaria Day, WHO is calling on all malaria-affected countries in sub-Saharan Africa and their development partners to urgently expand access to this critical, life-saving intervention. National malaria programmes should ensure that all pregnant women have access to IPTp and complete the full three-dose schedule.

## FIGURE 5

**Expanded access to intermittent preventive treatment in pregnancy (IPTp) in sub-Saharan Africa**




Source: WHO *World Malaria Report 2016*

## LET'S CLOSE THE GAP:

Despite expanded coverage, more than two thirds (69%) of pregnant women in sub-Saharan Africa are still not accessing the WHO-recommended three or more doses of IPTp. On World Malaria Day, WHO is calling on all malaria-affected countries in this region and their development partners to close the gap in coverage of this proven, life-saving tool.

# PROTECTING INFANTS

At approximately 3 months of age, infants in malaria-endemic areas become vulnerable to *P. falciparum* malaria when immunity acquired from the mother begins to wane. They are at increased risk of rapid disease progression, severe malaria and death.

IPTi is a full course of antimalarial medicine that has been shown to reduce infant mortality and other adverse effects of malaria in infancy. The treatment should be administered three times during the first year of life, regardless of whether the child is infected with malaria:  at approximately 10 weeks, 14 weeks and 9 months of age.

By coordinating the delivery of IPTi with routine child vaccinations, high coverage of this preventive therapy can be rapidly achieved. Administration is safe, simple, cost-effective and well accepted by health workers and communities.

In recent years, uptake of WHO's IPTi policy[1] has been poor: according to the latest *World Malaria Report*, no countries had reported implementing the policy as of 2015. With support from the US Centers for Disease Control, Sierra Leone began implementing IPTi on a pilot basis in one district in 2016.

WHO is calling on all malaria-affected countries in sub-Saharan Africa and their development partners to adopt and implement this important, life-saving intervention, where appropriate.[2]

[1] WHO's IPTi policy recommendation was issued in 2010.

[2] IPTi should not be deployed in areas where seasonal malaria chemoprevention (SMC) is implemented.

# PREVENTING MALARIA
## AMONG CHILDREN UNDER FIVE

Children under 5 years of age are one of the most vulnerable groups affected by malaria: in 2015, they accounted for approximately 70% of the estimated 429 000 malaria deaths worldwide.

In addition to the prevention measures described above, WHO recommends a targeted intervention for children living in the Sahel, a subregion of Africa.

**Protecting children in the Sahel**

Across the Sahel, most malaria cases and deaths among children occur in the rainy season. The use of effective preventive treatment during this period of 3 to 4 months has been shown to reduce the incidence of severe malaria by about 75%.

Seasonal malaria chemoprevention (SMC) is a WHO-recommended treatment course

administered by community health workers at monthly intervals to children aged 3 to 59 months throughout the high malaria transmission season. In areas where SMC is implemented, IPTi should not be deployed.

WHO issued a policy recommendation on SMC in 2012 and, in 2013, an implementation guide to help countries adopt and roll out this new intervention. As of 2015, 10 countries had adopted the policy: Burkina Faso, Chad, Gambia, Guinea, Guinea Bissau, Mali, Niger, Nigeria, Senegal and Togo.

An estimated 25 million children in the Sahel subregion could benefit each year from SMC. WHO is calling on all countries in the subregion, and their development partners, to provide and sustain universal access to this important intervention for all children at risk of malaria.

# COMMUNITY MOBILIZATION

Community engagement is essential for the success of all malaria preventive activities. Well-planned public health communication and behavioural change programmes are critical to educate affected communities about the benefits, and correct use, of malaria prevention tools.

People living in remote or hard-to-reach areas with limited access to health facilities can only be supported through community-based approaches, often in partnership with non-governmental implementing partners.

# HARNESSING INNOVATION

Over the next 15 years, progress in the fight against malaria will likely be shaped by technological advances and innovations in new tools, such as new diagnostics and more effective antimalarial medicines.

For vector control, new interventions that target outdoor-biting mosquitoes are being explored. New chemical formulations to mitigate the threat of insecticide resistance are under development. New strategies are being tested to improve the delivery of treated nets and indoor spraying through, for example, the use of mobile phone technology and digital mapping.

**Malaria vaccine RTS,S**

More than 20 malaria vaccine candidates are in various stages of development; of these, RTS,S/AS01 (known as "RTS,S") is the most advanced. The vaccine has been shown in clinical trials to provide partial protection against *P. falciparum* malaria in young children.

In November 2016, WHO announced that the RTS,S vaccine would be piloted in three countries in sub-Saharan Africa. The pilot programme, coordinated by WHO, will assess the impact of RTS,S in reducing childhood deaths, its safety profile, and the feasibility of delivering the required four doses of the vaccine in the context of routine use.

WHO has mobilized funding for the first phase of the pilot programme (2017–2020) from the Global Fund to Fight AIDS, Tuberculosis and Malaria, UNITAID and Gavi, the Vaccine Alliance. Country consultations are now under way and vaccinations are due to begin in 2018.

RTS,S is being evaluated as a complementary malaria control tool in Africa that could potentially be added to the existing package of proven preventive, diagnostic and treatment measures.

# THE WAY FORWARD

Closing gaps in access to proven prevention tools is a critical strategy for achieving the malaria targets of the Global Technical Strategy and the 2030 Sustainable Development Goals (SDGs).[3]

Robust investments in the tools described in this brochure will accelerate country-level progress toward elimination. They will also contribute to other health-related SDGs – in particular, reductions in overall maternal and child mortality rates – and to the wider sustainable development agenda. A targeted response to malaria, for example, can improve the health of poor families, helping them break the cycle of disease and poverty.

Parallel investments in the research and development of new tools will also speed progress towards global malaria targets. With the required resources, and all partners united, we can transform our common vision of a malaria-free world into a shared reality.

[3] Target 3.3 of the Sustainable Development Goals calls for an end, by 2030, to malaria and other communicable diseases.

World Health Organization

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