



Malaria prevention through insecticide treated nets

- ▶ Universal coverage of ITNs should be achieved and maintained, even when malaria incidence rates fall, as long as there is ongoing transmission, to avoid resurgence.
- ▶ Although insecticide resistance poses a major threat to malaria control, ITNs should continue to be distributed and used, as they still offer protection.
- ▶ Donors should increase investment in the procurement and distribution of ITNs and the research and development of new insecticides to tackle growing resistance.
- ▶ National governments should prioritise increasing access to ITNs through multiple channels and promote their consistent use.

▶ Women receiving their nets during a universal net distribution campaign in Uganda in 2014

The importance of insecticide-treated nets

Sleeping under an insecticide-treated net (ITN) is the most widely adopted preventive measure against malaria. ITNs are effective because in the majority of malaria-endemic regions of the world, the female mosquito that transmits malaria only bites at night. ITNs – and in particular long-lasting insecticidal nets (LLINs), represent a cost effective means of malaria prevention for at risk populations¹.

This highly effective vector control method protects people from malaria-carrying mosquitoes in at least three ways:

- ▶ By acting as a physical barrier between mosquitoes and the people sleeping under the net;
- ▶ The chemical in ITNs repels mosquitoes, or kills them when they land on the net;
- ▶ Through the ‘community effect’, which occurs when the majority of people in a community sleep under an ITN, resulting in an overall reduction of the mosquito population and its lifespan, thereby reducing the transmission of malaria.

As a result, over one billion nets have been distributed to Africa alone since 2000. Of the US\$1.6 billion invested in malaria commodities in 2014, 63 percent was spent on ITNs – roughly US\$1 billion².

Types of insecticide treated nets

Insecticide-treated net (ITN): A mosquito net that is treated with an insecticide that kills mosquitoes that come into contact with it, or repels them.

Long-lasting insecticidal net (LLIN): A mosquito net that has been treated with insecticide during the manufacturing process and lasts for a recommended three years. LLINs do not require retreatment with insecticide, and are currently the recommended first choice net by the World Health Organization (WHO).

Untreated nets: Mosquito nets that have not been treated with insecticide.

Conventionally treated net: A mosquito net that has been treated by dipping in a WHO-recommended insecticide. To ensure its continued insecticidal effect, the net should be re-treated after three washes, or at least once a year.

Pyrethroid+PBO combination net: A LLIN consisting of a pyrethroid insecticide and a PBO (*Piperonyl Butoxide*) synergist. A synergist is a chemical that does not have any insecticidal properties itself, but inhibits enzymes in the mosquito that usually break down toxins, thereby enhancing the potency of the insecticide.

¹ World Health Organization (2015). *World Malaria Report 2015*. Geneva, WHO.

² World Health Organization (2015). *World Malaria Report 2015*. Geneva, WHO.

Moving towards universal coverage of ITNs

Due to their effectiveness as a vector control method, the WHO recommends that every person at risk from malaria, in areas identified for ITN use, should sleep under a net. Malaria Consortium supports the WHO recommendation that LLINs should be the primary mosquito net to be distributed, when available and appropriate for the local context. This is called 'universal coverage', and features heavily in most global malaria prevention and control programmes.

Following the increased financing for and effort to combat malaria with the Millennium Development Goals, ITN coverage in Africa rose from below two percent in 2000 to an estimated 55 percent in 2015. The increased number of people sleeping under an ITN is one of the main contributing factors to the 60 percent reduction in malaria deaths since 2000, and the 6.2 million lives saved since 2001³.

However, it is important that high coverage of ITNs is continued, even in the face of significant reductions in malaria rates, otherwise the disease will resurge. One of the key challenges facing global malaria control and elimination in the Sustainable Development Goals era is increasing and sustaining ITN coverage.

ITNs are distributed in two ways:

- ▶ **Mass campaigns:** Time-limited operations to distribute ITNs to a defined population. Mass campaigns are a cost-effective way to rapidly scale-up and achieve equitable coverage, yet gaps appear almost as soon as a campaign is concluded, so must generally be repeated every three years.
- ▶ **Continuous distribution systems:** These involve delivering ITNs continuously, or creating conditions to make ITNs available continuously. Continuous distribution systems often operate through antenatal clinics, schools or private providers, and are important to provide an uninterrupted supply of nets to replace those that are lost or damaged.

Malaria Consortium supports a 'mixed-model' strategy that combines both mass campaigns and continuous distribution as the best way to achieve and maintain universal coverage of ITNs. Furthermore, all distribution strategies should be underpinned by a sound understanding of local conditions, requirements and cost-effectiveness.

An important aspect of achieving universal coverage of ITNs is by successfully promoting their correct and regular use. Behaviour change communication (BCC) campaigns that encourage consistent ITN usage and care are critical to ensuring that a culture of net use is established and maintained.

Historically, ITN distribution has largely been funded by donor countries and multilateral agencies. The Global Fund to Fight AIDS, Tuberculosis and Malaria, in particular, bought and distributed 600 million ITNs in 2015 alone⁴. While donor support will have to continue in the medium term, the governments of endemic countries should also increase domestic funding of ITN distribution, and improve their monitoring and evaluation systems. To ensure sustainability, it is important that a stronger commercial sector for ITNs is also promoted and supported.

³ World Health Organization (2015). *World Malaria Report 2015*. Geneva, WHO.

⁴ The Global Fund to Fight AIDS, TB and Malaria (2015). *Results Report 2015*. Geneva, Global Fund.

► A young child under a net in Cambodia
Photo: Peter Caton



Insecticide treated nets in numbers

- Over one billion ITNs distributed in Africa since 2000.
- In sub-Saharan Africa, the estimated proportion with access to an ITN in their household was 56 percent in 2014.
- The proportion of children under five sleeping under an ITN in sub-Saharan Africa increased to 68 percent in 2015.
- It is estimated that based upon the number of cases averted since 2000, and the cost associated with care in the public sector, ITNs and LLINs saved US\$900 million between 2001 and 2014.
- However, an estimated 269 million of 840 million people at risk of malaria in sub-Saharan Africa lived in households without any ITNs or IRS in 2014.
- It is estimated that 300 million new nets are needed each year to ensure universal coverage of ITNs in countries where it is the primary method of vector control⁷.

Insecticide resistance

Resistance to the insecticides used in ITNs is a growing problem that directly undermines their effectiveness in preventing malaria. In 2014 insecticide resistance had been reported in three quarters of endemic countries. Resistance is known to affect all classes of insecticides currently being used, and some mosquito populations may be resistant to multiple insecticides. Since 2010, of 78 countries reporting monitoring data, 60 reported resistance to at least one insecticide in one vector population, and 49 reported resistance to insecticides from two or more insecticide classes⁵.

Existing strategies for managing insecticide resistance include the rotation of insecticides, especially in indoor residual spraying (IRS) programmes, combining interventions, mosaic spraying, and the use of mixture insecticides. However, there is clearly an urgent need for new, cost-effective insecticides to maintain the effectiveness of ITNs.

Despite growing resistance of mosquitoes to the insecticide used in ITNs, the net itself still provides a physical barrier offering the user protection. Furthermore, a recent analysis found that ITNs remain at least somewhat effective even when resistance has developed, and remain more effective in malaria control than untreated nets⁶. It is, therefore, advisable for ITNs to be continued to be used, despite growing insecticide resistance.

⁵ World Health Organization (2015). *World Malaria Report 2015*. Geneva, WHO.

⁶ Strode C, Donegan S, Garner P, Enayati AA, Hemingway J (2014) 'The impact of pyrethroid resistance on the efficacy of insecticide-treated bed nets against African anopheline mosquitoes: systematic review and meta-analysis.' *PLoS Med* 2014, 11:e1001619.

⁷ World Health Organization (2015). *World Malaria Report 2015*. Geneva, WHO.

Malaria Consortium's response

- ▶ **Universal access to preventive tools:** Malaria Consortium believe that every person at risk of malaria should have access to key vector control tools, namely ITNs or IRS. Extending access to affordable and effective ITNs is one of the most efficient means of reducing malaria morbidity and mortality rates.
- ▶ **Distribution of ITNs:** Malaria Consortium promote a mixed-model strategy, and believe any delivery strategy should be underpinned by a sound understanding of local conditions and requirements and cost-effectiveness of the strategy.
- ▶ **Strengthening monitoring and evaluation:** Robust monitoring and evaluation is an integral part of ITN programmes. We work with national programmes to use the results of monitoring and evaluation to inform and design ITN strategies, invest in testing new, cost-effective data collection methods, and strengthen health information systems.
- ▶ **Promoting ITN use:** Malaria Consortium support promoting a culture of net use and care, including through BCC, is an important part of any ITN strategy as a way to improve sustained and correct usage of nets, and stimulate demand for replacement nets.
- ▶ **Addressing barriers to ITN uptake:** Encouraging ITN use goes beyond simply providing effective and affordable interventions. Malaria Consortium promote the addressing of systemic social barriers to their use, such as poverty and a lack of physical security.
- ▶ **Technical considerations:** Malaria Consortium promote and distribute only LLINs that have achieved at least an interim recommendation from the WHO Pesticide Evaluation Scheme, except when we undertake product testing.
- ▶ **Understanding the vector:** The nature of malaria transmission and the effectiveness of ITNs is determined by the interaction between the vector and the behaviour of human populations. Malaria Consortium works to improve the understanding of vector behaviour and ecology.
- ▶ **Tackling insecticide resistance:** Insecticide resistance poses a threat to malaria control and could lead to an increase in the global malaria burden. While we support efforts to combat insecticide resistance, we also promote the consistent use of ITNs regardless of whether resistance has been reported.

Key messages

National governments in endemic countries play a critical role the achievement of universal access to ITNs by:

- ▶ Ensuring every national malaria control/elimination programme has an ITN strategy that details how universal coverage of ITNs is going to be achieved and maintained in the country
- ▶ Adopting a 'mixed model' strategy of ITN distribution, which combines mass campaigns and continuous distribution through multiple channels to achieve and sustain universal net coverage
- ▶ Strengthening monitoring and evaluation systems, and using results to inform the design and implementation of future ITN campaigns
- ▶ Incorporating effective BCC programmes into ITN strategies to promote ITN uptake and ensure correct net use and care
- ▶ Promoting the use of ITNs, regardless of whether resistance has been reported, as ITNs still provide protection
- ▶ Following WHO guidelines on the combined use of ITNs and IRS where appropriate
- ▶ Continuing financial and technical support for endemic countries to achieve and maintain universal coverage of ITNs even when malaria incidence falls significantly, to avoid the risk of resurgence

Development partners are essential in providing support and resources for national and international efforts to achieve universal access to ITNs. These partners should support these efforts by:

- ▶ Increasing investment in the research and development of new insecticide products, which are essential to combat growing insecticide resistance
- ▶ Support the development of a viable commercial market for ITNs

About Malaria Consortium

Malaria Consortium is one of the world's leading international non-governmental organisations dedicated to comprehensive malaria control in Africa and Asia. While malaria control is at the heart of our strategy, we also undertake complementary work on child health including integrated community case management of childhood illness, severe acute malnutrition and the control of neglected tropical diseases. Our mission is to improve lives in Africa and Asia through sustainable, evidence-based programmes that combat targeted diseases and promote child and maternal health. We undertake programmes in prevention, diagnosis, treatment, surveillance, operational research and health system strengthening in Nigeria, Uganda, Ethiopia, South Sudan, Mozambique, Burkina Faso, Chad, Thailand, Cambodia, Myanmar, Lao PDR and Vietnam.

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