

# High mosquito net coverage enables vaccine impact

## Summary

While current vaccines have demonstrated their ability to avert a substantial proportion of malaria cases in areas where they have been administered, these gains would not be possible without high insecticide-treated net (ITN) coverage already being in place to reduce transmission. To enable the vaccine to reach its full potential, it is therefore crucial for high ITN coverage to be implemented and sustained.

## WHO recommendations for malaria vaccines

Current vaccines recommended by the World Health Organization (WHO) (RTS,S and R21) work by reducing the risk that a person who receives a bite from an infectious mosquito will develop *Plasmodium falciparum* malaria. The most recent [WHO guidelines for malaria](#),<sup>1</sup> state that the RTS,S and R21 vaccines (both of which are WHO-prequalified) are recommended for use as part of a comprehensive malaria control strategy.

In clinical trials, both vaccines have been shown to perform similarly when administered as a four-dose regimen to children under 2 years, reducing malaria cases by more than half during the first year after vaccination, with a 22% reduction in severe malaria hospitalizations ([WHO vaccine Q&A](#)).<sup>2</sup>

## Vaccine evidence depends on ITNs

Studies have also demonstrated a reduction of 75% in cases when given seasonally in areas where transmission is high AND seasonal malaria chemotherapy is given. While these numbers are promising, it is important to highlight that these trials were performed in areas where insecticidal mosquito net (ITN) usage was also high ([approximately 60–90%](#)),<sup>3</sup> therefore the studies measure the additional impact of the vaccine over ITNs rather than the impact of vaccines in the absence of other interventions.

The currently recommended vaccines and ITNs affect both the individual and community's risk of malaria in different ways.

- Vaccines provide individuals (usually children from the age of 5 months up to 5 years) with a lower risk of developing malaria if bitten by infectious mosquitoes (~50% reduction for current vaccines), which in turn provides a small amount of community-level protection by reducing the proportion of mosquitoes that have fed on infected blood.
- ITNs protect individuals by preventing them from being bitten by infectious mosquitoes and have a more substantial [community effect](#),<sup>4</sup> by reducing the number of mosquitoes as well as the proportion of surviving mosquitoes that are infectious. ITNs can be used to protect individuals of any age, and each net can last up to 3 years.

## Vaccine efficacy increases as transmission decreases

An [analysis of trial data](#)<sup>5</sup> for the RTS,S vaccine was conducted to estimate how impactful the vaccine would be in different epidemiological settings. This study showed that in areas of high transmission (70% prevalence in 2-10 year olds), the vaccine had little impact, averting just 4% of cases in vaccinated people. In low to moderate transmission areas (10% - 20% prevalence in 2-10 year olds), the effect of the vaccine was much higher, with 41% (moderate) and 60% (low) of cases in vaccinated people being averted.

A [modelling study](#)<sup>6</sup> supported these findings, and demonstrated that increasing ITN coverage rather than adding in the vaccine was far more effective at reducing transmission, and had the added benefit that it would make any future vaccine campaign more effective.

## Dual active ingredient chlorfenapyr ITNs can reduce transmission by up to 75% in some settings<sup>7</sup>

Cost-effectiveness studies for the WHO-recommended vaccines have generally been conducted under the assumption that ITN coverage does not vary, with models using current ITN coverage estimates to establish the cost-effectiveness of the vaccine in different transmission settings. A recent study that looked at the relative cost-effectiveness of the RTS,S vaccine

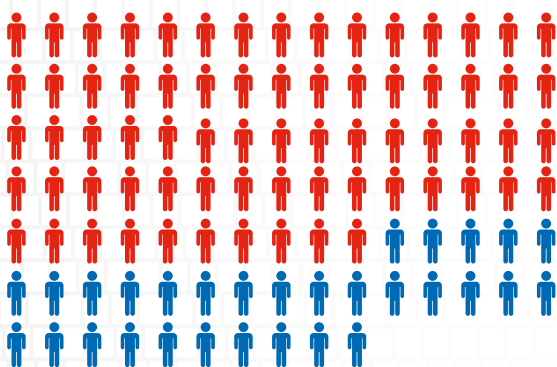
compared with investing more in other prevention and control methods concluded that increasing ITN usage or introducing seasonal malaria chemotherapy (SMC) was more cost-effective (measured in terms of cost per disability-adjusted life-year [DALY] averted),<sup>8</sup> compared with introducing the RTS,S vaccine, both as part of routine childhood vaccinations and seasonally.

## Increasing ITN usage by 10% is 25x more cost effective than introducing childhood vaccination<sup>8</sup>

### At a glance: ITNs improve vaccine efficacy by reducing malaria transmission

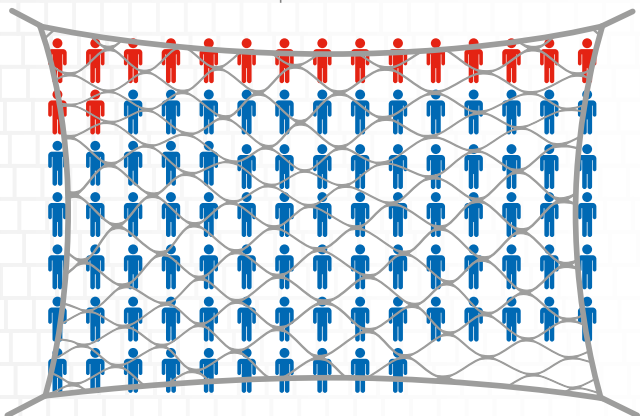
#### No intervention

In a high transmission (70%) setting with no malaria prevention interventions, 70 out of 100 children would be expected to be infected with malaria



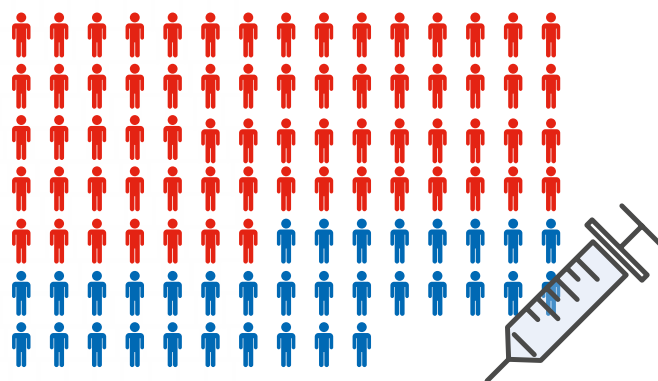
#### Dual chlorfenapyr ITNs only

Adding dual chlorfenapyr ITNs alone could reduce transmission by up to 75%, from high to moderate, with 17 out of 100 children expected to be infected with malaria<sup>7</sup>



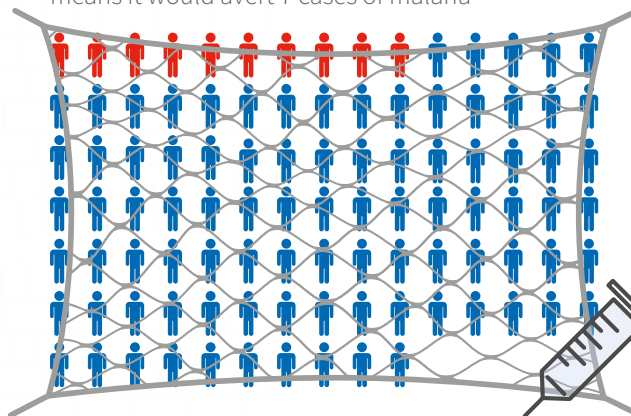
#### Vaccine only

Vaccine efficacy in high transmission setting is 4%, which means with no other interventions, it would avert 3 cases of malaria<sup>5</sup>



#### Dual chlorfenapyr ITNs plus vaccine

Adding the vaccine to this moderate transmission setting increases vaccine efficacy to 41%, which means it would avert 7 cases of malaria<sup>5</sup>



#### References

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