

# New study projects considerable public health impact for RTS,S malaria vaccine

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The researchers found that over a 15 year time horizon, an average of 116,500 cases of clinical malaria disease and 484 deaths would be averted for every 100,000 children vaccinated under a four-dose schedule of immunizations at 6, 7.5, 9 and 27 months of age. This translates to approximately 1.2 cases averted per vaccinated child and one malaria death averted for every 200 children vaccinated. These data apply to children living in regions of Africa that experience moderate to high malaria transmission—countries where prevalence rates for the most deadly malaria parasite, *Plasmodium falciparum*, range from 10 to 65 percent—and assumes a vaccine coverage rate at fourth dose of approximately 70%.

"We took a realistic look at expected coverage of the RTS,S vaccine in a variety of African settings and found it would have significant impact on [malaria](#) disease in all but the lowest malaria transmission regions," said study author Dr. Melissa Penny from the Swiss Tropical and Public Health Institute. "Our numbers indicate that 6 to 29 percent of malaria deaths in children younger than age five could potentially be averted by the vaccine in the areas in which it is implemented, when used alongside other malaria control interventions."

This is the first modelling study to use final site-specific results of the RTS,S Phase III safety and efficacy clinical trial coordinated by GlaxoSmithKline Vaccines (GSK), conducted at 11 sites in seven African countries, and it accounts for implementation of the vaccine alongside use of long-lasting insecticide-treated bed nets.

There was consensus across the predictions from all four groups that took part in the study, according to the researchers. The participating institutions are Imperial College London (Imperial), the Swiss Tropical and Public Health Institute (Swiss TPH), the Institute for Disease Modeling (IDM) in the United States, and GSK in Belgium.

According to the study authors, public health authorities require these types of impact estimates on malaria disease and deaths to inform vaccine implementation. Models can account for differences between the trial and real-life settings in transmission levels and health care accessibility, and predict RTS,S impact on malaria mortality that was not possible to assess in the trial. Despite progress, malaria remains a leading cause of [death](#) in [children](#) of all ages in sub-Saharan Africa. The WHO estimated there were 214 million new malaria cases and 438,000 malaria deaths in 2015, the vast majority (190 million malaria cases and 400,000 malaria deaths) in sub-Saharan Africa.

## Cost-Effectiveness

As part of the modelling study, the authors considered a range of possible vaccine prices, from \$2 to \$10. Compared to current malaria interventions, they found that the vaccine would be cost-effective to implement under an assumed price of USD\$5 per dose in areas of moderate and high malaria transmission.

"The cost-effectiveness of RTS,S is similar to what we've seen for other recently introduced childhood vaccines," said Prof. Azra Ghani of Imperial College London, one of the study collaborators. "It also overlaps within the ranges of cost-effectiveness of other malaria control interventions like bed nets and indoor residual sprays. However, it is important that the vaccine is introduced in addition to these other highly cost-effective interventions."

The authors measured cost-effectiveness in terms of DALYs—disability-adjusted life years. DALYs are a metric used by health economists to compare the impacts of health interventions in populations over time. One DALY is equivalent to one lost year of healthy life. The lower the amount spent per DALY averted, the greater the cost-effectiveness of an intervention.

At a price of \$5 per dose the researchers estimated a median cost of \$87 per DALY averted for a four-dose vaccine schedule across the range of transmission settings with parasite prevalence 10 to 65%. This cost was estimated to vary depending on the level of malaria transmission found in a particular location - with the vaccine being increasingly cost-effective in areas with a higher malaria burden.

The authors outline that, according to earlier studies, the cost per DALY averted for other malaria interventions indicate averages of \$27 for long-lasting insecticide-treated bed nets, \$143 for indoor residual spraying, and \$24 for intermittent preventative treatment respectively.

### **Caveats**

Among the limitations of the analysis noted by the researchers is remaining uncertainty in the vaccine efficacy after the four years of follow-up observed in the trial. They also noted that since the Phase III trial of RTS,S was not large enough to test for reduction in deaths from malaria (versus reduction in incidence of malaria cases) and the quality of care provided to participants was high, the modelling studies' projection of deaths requires further validation during the implementation phase.

"It will be important to continue to track the long-term impact of this [vaccine](#) to ensure that the effectiveness predicted by the models is borne out in practice," said Dr. Caitlin Bever of the Institute for Disease Modeling.

Provided by Swiss Tropical and Public Health Institute

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