THE TRUE MEANING OF ERADICATION.

Exploring the wider implications of ending malaria for good.





TOGETHER ERADICATION IS POSSIBLE.

The world has made tremendous strides in the fight to end malaria. But there is still a lot of work to be done. Hundreds of thousands of lives are lost to malaria each year, and every one matters. Every two minutes a child dies of malaria,¹ so every second counts. 87 countries are affected,¹ which means that every helping hand is needed.

Eradication requires the use of effective public health insecticides and tools. Millions of deaths have been averted since the start of this millennium, 78% of which have been through vector control efforts including insecticide-treated bed nets and indoor residual spraying.² But now is the time for a recommitment to the cause, because the annual decline in the malaria burden has stalled. This is attributed to malaria's continued rise in countries with the highest burden of the disease, inadequate international and domestic funding, the continued emergence of mosquito resistance to insecticides and parasite resistance to antimalarial medicines.

To regain the momentum, we must collaborate like never before and innovate in ways we never thought possible. We must set ambitious goals and hold ourselves accountable to reach them. This is the essence of ZERO by 40, an unprecedented partnership between five of the world's leading agriculture companies–BASF, Bayer, Mitsui Chemicals, Sumitomo Chemical and Syngenta–to stay the course and share ideas and resources that will lead to innovative vector control products and tools.

This commitment will combat insecticide resistance and help eradicate malaria by 2040.



We must collaborate like we never thought possible

- 1 WHO. 2018. "World Malaria Report 2018." WHO. http://www.who.int/malaria/ publications/world-malaria-report-2018/report/en/.
- 2 Bhatt S, Weiss DJ, Cameron E, et al.: The effect of malaria control on *Plasmodium falciparum* in Africa between 2000 and 2015. *Nature*. 2015; 526(7572): 207–11.

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PREDICTING THE IMPACT OF ENDING MALARIA.

The goal of malaria eradication by 2040 is ambitious. Suppressing malaria in rural, agricultural communities in sub-Saharan Africa will be one of the greatest challenges to achieving eradication given the poverty and high malaria burden in these regions. As part of ZERO by 40, IVCC set out to analyse the potential economic and societal impact of malaria on these communities. The result is research, conducted by Derek W. Willis, Ph.D. and Nick Hamon, Ph.D., which highlights how malaria not only creates a health burden but also affects regions and countries on a significant social and economic level.

Using agricultural census data and malaria morbidity data, the research developed estimates of the number of malaria cases among agricultural households for 35 countries in sub-Saharan Africa. Using these estimates, the research analysed two paths for the malaria burden among agricultural households from 2018 through 2040. The first path, the Status Quo Path, assumes that the annual malaria morbidity burden among agricultural households remains at its current level through 2040. The second path, the Malaria Elimination Path, assumes that malaria cases among households will decrease annually from 2018 levels to zero in 2040. For each path, the research looked at annual indicators related to average daily income, health, poverty, education and gender equality for individuals in agricultural households. It then estimated the impact of eradicating malaria by 2040 on these indicators of the Status Quo Path and compared with the Malaria Elimination Path(s).

never before and innovate in ways e.

EXPLORING MALARIA'S IMPACT ON AGRICULTURAL HOUSEHOLDS.

The research set out to estimate how eradicating malaria by 2040 would affect agricultural households in sub-Saharan Africa. Using agricultural census data and malaria morbidity data, it developed estimates of the number of malaria cases in 2018 among agricultural households and found that achieving malaria eradication by 2040 would prevent approximately 841 million cases of malaria. By combining these estimates with additional evidence from the literature, it analysed how achieving malaria eradication by 2040 would affect indicators related to four UN Sustainable Development Goals: health, poverty, education and gender equality.

More work days. Higher productivity and yields.

Eliminating malaria by 2040 could have an economic impact that extends into the billions.

Reduced poverty.

Higher agriculture yields and education lead to higher incomes and improved economic status in sub-Saharan Africa and beyond. The impact of eradicating malaria by 2040 could have significant impacts on agricultural productivity. **AN ESTIMATED 3.2 BILLION WORK DAYS COULD BE GAINED (3-7 WORK DAYS PER CASE).**

Some early research indicates additional work days could result in a significant increase in the harvest values and productivity gains as progress toward malaria eradication continues.



fewer caregiving days by women

841 MILLION malaria cases prevented

Improved education and gender equality.

Suppressing malaria makes it more likely that children attend and complete school. And decreasing the number of caregiving days provided by women could lead to improvements in their economic standing.

The research found that achieving malaria eradication by 2040 could decrease the number of lost work days among agricultural households by approximately 3.2 billion days. The most conservative analysis generated an estimate of 904 million lost work days prevented and the least conservative scenario estimates that 6.3 billion lost work days could be prevented.

Approximately 1.5 billion school days could be gained from 2018 through 2040 by achieving malaria elimination in 2040. The most conservative analysis generated an estimate of 678 million additional school days being attended and the least conservative scenario estimated that 2.7 billion school days could be attended as a result of reduced sickness.

The number of school days gained for girls from 2018 through 2040 could be approximately 762 million and the number of caregiving days by women could be reduced by 1.3 billion days.

2019

2020

Between

and

13 MILLION

84 MILLION

in agricultural

individuals

households

poverty

by 2040.*

would escape

2025

2030

2035

2040

2045

Impact is defined as the number of individuals who escape poverty when malaria is eliminated minus the number who would escape poverty if malaria remained at its current levels.

THE POTENTIAL TO PULL MILLIONS OUT OF POVERTY.

There are approximately 54 million households in the malarious regions of sub-Saharan Africa. Around half of the population in agricultural households live in poverty, with approximately 151 million individuals living in countries in which the median daily per capita income is less than \$1.90. The research examined how malaria eradication could impact poverty levels in agricultural households from 2018 through 2040 by comparing a Status Quo Path with 10 Elimination Path scenarios.

The analysis found that between 13 million and 84 million individuals in agricultural households would escape poverty by 2040 if malaria were eliminated by that year. This decrease in poverty represents a 33- to 76-percent decrease in the percentage of individuals in poverty relative to 2018 levels. In contrast, if the malaria burden were to remain at its current level in sub-Saharan Africa through to 2040, the data suggests that only 40 million individuals in agricultural households would escape poverty in that time, a decrease of only 24 percent. The impact, therefore, of eliminating malaria by 2040 is that approximately 13 million to 84 million individuals in agricultural households would escape poverty.

Willis DW and Hamon N. Impact of eliminating malaria by 2040 on poverty rates among agricultural households in Africa, version 1. Gates Open Res 2018, 2:69. https://doi.org/10.12688/gatesopenres.12849.1.

UNDERSTANDING THE LONG-TERM ECONOMIC IMPACT OF ERADICATION.

In addition to demonstrating the significant impact that suppressing malaria over the next two decades may have on poverty among agricultural households in sub-Saharan Africa, the research also developed a conceptual framework for understanding the potential long-term impact of suppressing malaria on the incomes of agricultural households.

ELIMINATING MALARIA BY 2040 WOULD INCREASE THE OVERALL PRODUCTIVITY OF AGRICULTURAL HOUSEHOLDS

- X Reduce lost work days
- \times Increase school days attended
- \times Reduce caregiving days by women
- X Reduce poverty
- X Increase the effectiveness of multi-sectoral nutrition programmes
- \times Reduce stunting in children
- X Higher incomes would lead to more resources to invest in agricultural inputs

Malaria decreases

Increased support for vector control Health improves

MALARIA

Decisions: Crops to plant Agricultural inputs Technology Nutrition security improves

Increased productivity

AGRICULTURAL HOUSEHOLDS

Household income increases

Increase in harvest value

Willis DW and Hamon N. Evidence for the impact of malaria on agricultural household income in sub-Saharan Africa, version 1. Gates Open Res 2019, 3:9. https://doi.org/10.12688/gatesopenres.12907.1. REDUCING POVERTY IS ESSENTIAL FOR MULTI-SECTORAL NUTRITION PROGRAMMES IN SUB-SAHARAN AFRICA TO REDUCE STUNTING



CHILDREN UNDER THE AGE OF 5 WITH STUNTING IN SUB-SAHARAN AFRICA ARE IN AGRICULTURAL HOUSEHOLDS IN MALARIOUS REGIONS IN 2018



CHILDREN UNDER THE AGE OF 5 IN AGRICULTURAL HOUSEHOLDS IN MALARIOUS REGIONS OF SUB-SAHARAN AFRICA IN 2017

30% of Africa's total population experienced chronic hunger and malnutrition*

38%

of children in sub-Saharan Africa were stunted (chronic malnutrition is one of the most important factors that leads to stunting)*

"How to Feed the World 2050, High-Level Expert Forum." Food and Agriculture Organization of the United Nations, Rome. 12-13 October 2009 NOTE: All data without footnotes is derived from:

Willis DW and Hamon N. Potential relationship between malaria elimination and reducing stunting in children in sub-Saharan Africa, version 1. Gates Open Res 2019, 3:12. https://doi.org/10.12688/gatesopenres.12908.1.

IMPROVING CHILDHOOD HEALTH AND PROTECTING THE FUTURE.

The United Nations Sustainable Development Goals (SDGs) include aims to reduce malaria and stunting. Stunting is a result of childhood undernutrition. The research estimates that there are approximately 21.5 million children suffering from stunting in agricultural households in malarious regions of sub-Saharan Africa, and the rate of stunting among the under-five population in Africa was the highest in the world in 2016.

The research found that suppressing malaria could reduce poverty rates among agricultural households in Africa, and that poverty reduction was found to be a necessary condition to reduce stunting via a multisectoral nutrition approach, as demonstrated in a research programme undertaken in Peru. The potential impact of suppressing malaria on the poverty rate of agricultural households could therefore play an important role in nutrition programs aiming to reduce stunting in Africa. Reducing the number of children with stunting in these households would improve their health and productivity as adults.





COLLABORATION. INNOVATION. ERADICATION.

Investing in malaria eradication is both complex and challenging. The impact of malaria within a family, a community and across a region or country can trigger a spiral of devastating consequences, including: increased poverty as a direct result of reduced agricultural productivity, a reduced level of educational attainment through lost school days and additional health complications such as stunting. This research shows that malaria eradication in rural, agricultural communities in sub-Saharan Africa would not only be significant for public health but could have an impact on these wider issues as well.

The World Health Organisation World Malaria Report has highlighted how we are, today, at a critical crossroads. With the decline in morbidity stalling, new concerted efforts need to be undertaken to put us back on track. This will require all stakeholders to redouble their efforts to find new ways to innovate and deliver effective malaria eradication programmes. As a key stakeholder, the crop protection industry is rising to this challenge through ZERO by 40—not only committing to staying the course but challenging themselves to find new ways in which they can collaborate for product innovation. The faster we can get new resistance-beating products deployed, the faster we can eradicate malaria.

We are, today, at a critical crossroads.

OUR COMMITMENT.

On 18 April, 2018, BASF, Bayer, Mitsui Chemicals, Sumitomo Chemical and Syngenta made their commitment official at the Commonwealth Heads of Government Meeting in London, United Kingdom. These forward-thinking agricultural companies became the founding members of ZERO by 40 with the public signing of a declaration to unite to help eradicate malaria by the year 2040.

TOGETHER, WE WILL ...

- Continue to screen new chemistry for potential use in existing and new vector control solutions.
- Sustain and **extend programmes** that will support the development of existing and novel insecticide tools and solutions to help eradicate malaria.
- Advance R&D, through bilateral partnerships, as appropriate, to find and bring to market a toolbox of nextgeneration vector control interventions.
- Where appropriate, **collaborate with industry colleagues** to better understand and manage the bioavailability of new chemistries on diverse surfaces, supporting the development of improved efficiency and cost effectiveness of application technologies.
- Establish a multi-industry coalition of partners, via the intermediaries of IVCC or similar platforms, to facilitate the integration of vector control and broader science technologies (e.g., drones/robotics/big data/vitro mosquito attractant screening) to improve the public health of rural communities, advancing basic and implementation research and capacity building.

- Where possible, **identify potential synergies and share knowhow** between the Crop Protection and Pharma industries to drive innovation across drug and vector control interventions.
- Work collaboratively to ensure technically sound IRM and IVM best practices, ensuring optimum performance and reduced probability of resistance development.
- Ensure that the global supply chain continues to deliver the vector control interventions needed in a timely and cost-effective manner.
- Prioritise and effectively leverage organisational skill-set and know-how to meet our malaria eradication ambitions.
- Continue to focus attention on the health and well-being of smallholder farmers in malaria endemic countries.
- Track and provide updates on the progress of our commitments toward achieving the global goals of malaria eradication.

With the hard work, commitment and collaboration of the world's leading vector control innovators, the journey to malaria eradication now has a focused destination.

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