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The introduction of new technologies is vital to get ahead of mosquito adaptation in India.

Uniting the global effort to eliminate malaria is like solving a puzzle. The pieces span across innovation and technology, multi-sectoral and [public-private partnerships](#), supply chains and health systems, and they all need to fit together. India has been making remarkable progress since 2015 owing to the scaling up of long-lasting insecticidal net (LLIN) coverage in the country. Surveillance has improved, early detection and prompt treatment have contributed to the reduction in deaths, and cases are reducing more than 40% year on year.

Two years on, [World Mosquito Day](#) reminds us of the progress we have made as well as the need to anticipate future obstacles to the work Vestergaard and partners are doing in collaboration with Government programmes around the world. [IR Mapper](#), an online interactive tool mapping insecticide resistance which launched in 2012, is one example of how digital innovation can respond to the biological threat of mosquito adaptation. A decade later, insecticide resistance is now growing here in India; the spectacular reduction of instances which followed the ramping up of bed-net coverage in the country is starting to level out. To ensure that preventative interventions such as bed nets remain effective, innovation and research must lead constructively into programming to anticipate mosquito adaptation and manage vector resistance.

Putting the pieces together

The plateau in cases that we are seeing in Asia affords us an opportunity to get ahead by learning from the strategies that have made change possible in other successful markets. Behaviour change communication has always been associated with better distribution. In 2017, the Government of Odisha initiated a resounding programme with the acronym [DAMaN](#) (English translation: "Malaria Elimination in Remote Areas") in partnership with NGOs to educate villages on knowledge and practices related to the hanging up of bed nets.

That was a very successful case of behaviour change communication leading to better uptake and use of LLINs in Odisha, which as a province used to report the highest instances in the country. I believe they are taking it to other states now.

India keeps on showing decline in malaria cases, which is great motivation for the Government programme and partners like Vestergaard to keep finding new ways of communicating with people on how to take care of your nets, why you should be sleeping under them, even down to the basics of what malaria is. We must continue providing better education to ensure the tools we already have available to us are being used properly, but it is also increasingly evident that now is not the time to be laggard when it comes to technology. Insecticide resistance is a threat that needs to be tackled by data. For current and future innovations to remain effective against transmission, we must acknowledge evolutions in the vector population sooner rather than later - and respond with urgency.



India can benefit from the scientific and technological advances that have been made in sub-Saharan Africa to ensure vector control solutions remain effective.

Embracing technology is key

Proactively embracing newer tools rather than waiting for cases to resurge before acting will be essential for getting ahead of insecticide resistance. The time-period which is required for the introduction of a new technology is anywhere between four to five years so it's extremely expensive and slow: finding technological solutions that are quicker to market, learning from successes in other countries, will help us to get ahead.

The *Anopheles culicifacies* remains the dominant mosquito vector in India and is showing resistance to the early class of insecticides. We are also seeing an increased presence of *Anopheles stephensi*, an interesting vector in that it adapts very well to urban areas. The scale of resistance is not so pronounced as what we are seeing in Africa, but it is only going to get worse from here. There is growing evidence of success from vector resistance strategies being adopted in other countries, such as indoor residual spraying (IRS) and bed-nets treated with newer molecules, that could mediate risk in Asia.

As the decline in cases is levelling out, now is the time for us to learn from steps that have been taken in sub-Saharan Africa to unite the malaria intervention community in the face of mosquito adaptation. They have been very proactive in the adoption of new technologies and data-driven strategies informed by lab modelling. Working in collaboration with a laboratory in Ghana, scientists can simulate different scenarios of mosquito evolution in the future by modelling changes to climate and mosquitoes living conditions. Not only does this feed directly into innovation of Vestergaard interventions, but it is also a great capacity-building exercise to develop the knowledge and expertise on the ground in Africa, enabling them to make decisions about mosquito elimination on their own.

The path to progress

There have been plenty of successes in the Asia Pacific region too. Bhutan should be certified malaria-free by 2030. Nepal, Bangladesh, Cambodia, Vietnam, and Thailand are also doing quite well when it comes to malaria control. Most cases outside of Africa remain concentrated in India, which is even more reason to look at the science and data which has been tried and tested around new technology tools, and to feed that into the programme. Ultimately, it reinforces the importance of innovation and research driven by reliable

partners like Vestergaard to anticipate and respond to mosquito adaptation and insecticide resistance. We have made great strides, but we still have a lot to learn.