



## **The Resistant Mosquito**

### Video Transcript

#### **A case study from Ghana**

In Ghana, AngloGold Ashanti, a gold mining company, started implementing an integrated vector control programme in response to the impact malaria was having on its employees and their productivity. In some cases, this was due to small-scale surface mining activities in the region that helped mosquitoes to breed, making the surrounding communities more vulnerable to malaria.

In 2006, the AGAMal programme was born. Indoor residual spraying was the major tool employed, in combination with bed-nets and larval source management. Following the success and subsequent international recognition, the program applied for, and received, Global Fund support to expand IRS to other districts in Ghana in 2012.

Issues with insecticide resistance, however, threaten to erode the gains achieved over the years. Urgent action was needed to reverse the situation as Ghana works towards eliminating malaria from endemic communities. During the period from 2006 to 2014, short-term acting residual insecticides were sprayed twice a year with organophosphates and carbamates, both of which are from the same insecticide mode of action class.

From 2015 to 2018 the number of applications was reduced to once a year, using an encapsulated organophosphate, which has longer residuality. Due to the lack of new mode of action insecticide alternatives, the IRS project continued to use the organophosphate until 2018 when a neonicotinoid insecticide became available.

The over-dependence on organophosphates and carbamates over a long period of time led to the development of resistance in the local malaria vectors around 2015. The insecticide resistance management strategy adopted by AGAMal comprises of a robust resistance monitoring system and rotation of different mode of action insecticides every 1 to 2 years.

Insecticide susceptibility assays and detection of the underlying mechanisms, if resistance is found, are carried out once every year at the end of the IRS campaign. Insecticide selection for the next IRS season is then based on this information. Consideration to rotate insecticide is also driven by the number of years a particular insecticide has been used.



Insecticide resistance management comes with its challenges, which include the indiscriminate use of agricultural pesticide by farmers in IRS operational areas. The unregulated and improper use of these pesticides results in further exposure of the mosquitoes to insecticides and contributes to the selection for resistance in the vector population. Additionally, insecticide resistance management is constrained by the limited arsenal of insecticides for vector control.

The lack of options leads to an overreliance on the same mode of action insecticide and makes it virtually impossible for programmes to execute a well-planned rotation strategy. However, the situation is improving as new mode of action insecticide products have been introduced into the malaria vector control space, with further active ingredients being developed for subsequent pre-qualification by the World Health Organization.