SUMMARY

Envisioning insecticide resistance management and integrated vector management a ZERO by 40 perspective

ZERO 40

Maintaining insecticide susceptibility is a *Common Good* and the responsibility of all of us, public and private, agriculture, public health, and civil society to preserve. Growing insecticide resistance to the limited range of vector control products poses an immediate and grave threat to progress towards malaria elimination and our ability to manage other emerging vector-borne diseases.

The ZERO by 40 partners (BASF, Bayer, Mitsui Chemicals Agro, Sumitomo Chemical and Syngenta) are committed to a comprehensive and collaborative Insecticide Resistance Management (IRM) Strategy, both through the continued development and stewardship of an expanded vector control toolbox, and by engaging with partners to implement IRM through the five elements of the Integrated Vector Management Framework (IVM).

We commit to working with all stakeholders, including the World Health Organization (WHO), National Malaria Control Programmes (NMCPs), regulators and other departments of national and local government, through the following means:

Assisting national malaria programmes and their country-level vector control advisory committees in reviewing current IRM strategies through the lens of WHO guidance, local resistance data and available vector control tools to identify gaps and opportunities to optimize deployment for sustained effectiveness over time, i.e., recognising the IRM long-term return on investment.

- Providing technical assistance to national programmes in updating IRM strategies and planning effective implementation in coordination with relevant stakeholders.
- Continued development and delivery of a toolbox of new products, using novel mode–of action insecticides, designed and deployed to minimise resistance development.
- Promoting product rotations that aim to expose mosquito populations to multiple modes of action over time and best-practice insecticide use to further reduce the likelihood of resistance development.
- Ensuring product-related information is clear in the context of IRM guidance, for example through product labels (as already practised in agriculture), regular stakeholder engagement, communication, training and educational materials to inform all those involved in vector control programmes of best practice IRM.
- Supporting the monitoring of insecticide susceptibility in mosquito populations, which is the foundation on which all IRM is based. Preserving and extending the efficacy of all insecticide-based tools used in vector control through scientifically sound insecticide resistance prevention and management is critical to achieving our collective goal of eradicating malaria by 2040.

The information included herein is not intended to replace or displace existing resistance management guidelines at the global (WHO, Insecticide Resistance Action Committee (IRAC)) or country level, but is provided by the ZERO by 40 members as an IVM/IRM framework to complement and update guidelines with current technical and stewardship information for new products and other vector-control tools.

Foundations

Maintaining insecticide susceptibility is a Common Good, especially among malaria vectors with limited control options, requiring a broad multi sector and multi-faceted approach. The ZERO by 40 Partners endorse the WHO Global Plan for Insecticide Resistance Management (GPIRM), reaffirmed by the more recent WHO Guidelines for Malaria Vector control recognizing the urgency of IRM and that short-term additional costs of IRM should be balanced against the long-term potential negative public health impact and costs of insecticide resistance.

ZERO by 40 is a bridge to the agriculture sector, including the CropLife International, IRAC, and recognizes both the parallels and the differences in IRM and Integrated Pest Management (IPM) in agriculture and how these lessons and ongoing engagements with agriculture can support public health efforts for IRM among disease vectors.

Integrated Vector Management (IVM) and Insecticide Resistance Management

IVM is defined as "a rational decision-making process to optimise the use of vector control" and comprises five core elements that can frame IRM, emphasising a comprehensive, multi-sector, data-driven approach to protect insecticide susceptibility. The IVM strategy has evolved into the WHO Global Vector Control Response and retains these five core elements with an added emphasis on capacity and applied research/ innovation. The aim of both agriculture and public health IRM is to reduce the continuous use of insecticides with a single mode of action (MoA) until it fails. In addition, use the IPM/IVM model of multiple interventions, both non-chemical as well as different MoAs, in a comprehensive pre-emptive IRM strategy.

IVM core elements	IRM
Advocacy, legislation and community engagement	Pesticide stewardship Market and long-term cost-benefit considerations Harmonised approval/ regulatory processes Judicious use of agricultural and domestic pesticides
Cross-sector collaboration	Ministries of Health, Ag. and Environment National training/research Institutions Industry and private sector
Integrated approaches	Inclusion of alternate chemical and non-chemical control, including combinations Development and stewardship of new tools and strategies
Evidence-based decision-making	Entomological and resistance monitoring Pre-emptive resistance management Modelling
Capacity-building	Product testing and development facilities Systems and strategies for effective IRM

Comprehensive Insecticide Resistance Management through the five elements of Integrated Vector Management

I. Legislation, advocacy and community engagement

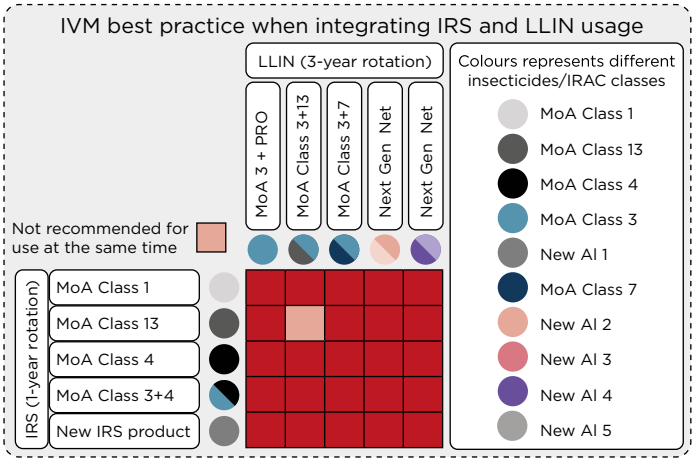
The ZERO by 40 partners bring unique resources to national IRM committees for policy and regulation of insecticide products, insecticide stewardship; advocacy on the cost-effectiveness of IRM and next-generation products; and community engagement through extensive networks of agricultural extension and rural advisory services to promote judicious use of pesticides.

II. Cross-Sector Collaboration

ZERO by 40 links with agriculture can draw upon lessons of Integrated Pest Management (IPM) and IRM to vastly strengthen a coordinated response to address IRM in both agriculture and public health, including the proliferation of vector larval habitats created by irrigation schemes for urban agriculture and other crops. Links with Ministries of Environment can help facilitate the availability of the full range of WHO-approved products and help reduce abuse of many of the same active ingredients used in public health insecticides. The strong engagement of research institutions, including agricultural research as well as the Africa Network for Vector Resistance and the Pan Africa Mosquito Control Association (PAMCA), adds support to national IRM efforts.

Integrated Approaches

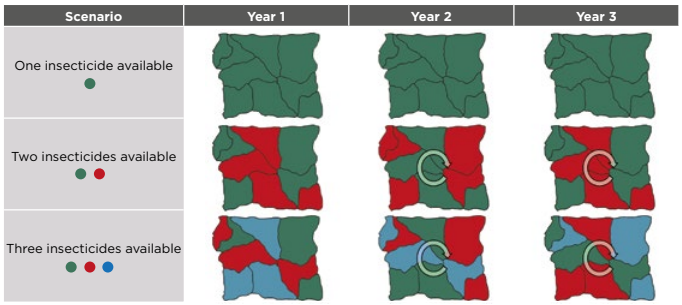
The strongest and most direct support to IRM is the development and stewardship of an expanded vector control toolbox, including next-generation products for Indoor Residual Spraying (IRS), Long Lasting Insecticidal Nets (LLINS) and Attractive Targeted Sugar Baits (ATSB®). With these additional tools, vector control programmes can finally implement the basic IRM principles of employing multiple tools with different modes of action. Illustrated here with LLINs and IRS, but also includes, where appropriate, larvicides, lethal house lures additional vector control tools under development.



Evidence-based Decision Making

Surveillance and monitoring are the cornerstone of a quality IRM programme. In addition to entomological and resistance monitoring, ZERO by 40 supports a range of additional tools including the monitoring of combined interventions, modelling integrated vector control interventions, and developing an IRM decision-making framework that includes mixtures, mosaics and pre-emptive rotations. This was not possible before the efforts of the ZERO by 40 Partnership working with IVCC.

Example of District-level resolution with sub-national rotation strategy.



Capacity-building

IVCC and the ZERO by 40 partners support capacity in three specific areas. First, the IVCC African Trials Facilities now includes seven vector control product research facilities in Africa that are moving towards Good Laboratory Practice certification. Second, ZERO by 40 is working with IVCC on a range of activities to improve access to information to design and deploy IRM strategies and build the evidence case for IRM. Third, specifically for product stewardship, ZERO by 40 is working to improve communication and distribution of labelling and application instructions for decision-makers and applicators to improve IRM best practices, aligned with best practices and standards in agriculture.

Conclusion

Preserving vector susceptibility to the limited range of these life-saving products that are the foundation of malaria and other vector-borne disease control demands a comprehensive approach addressed through an effective IVM framework. The ZERO by 40 partnership brings unique resources to this global effort, beyond product development and stewardship itself, but also through its stated commitment.

"Together we will win. When the world comes together toward a common goal, nothing is impossible. ZERO by 40 is an unprecedented partnership among the world's leading agricultural companies to collaborate toward the development of innovative vector control tools that will help eradicate malaria by the year 2040, because we believe that together, it can be done."

https://zeroby40.com/