

**5th Capacity Building for IRS Work Stream Meeting
9.00-14.00, Thursday 20th February 2014
Salle V, IFRC, Geneva**

**Chairs: Manuel Lluberas and Shiva Murugasampillay
Rapporteur: Lucy Tusting**

Introductions – Shiva Murugasampillay, World Health Organization, Switzerland

Shiva Murugasampillay opened the meeting and outlined its aim, to discuss current and emerging issues around the scaling-up and maintenance of IRS for malaria control and elimination. The major WHO publications on IRS policy and use were reviewed: (1) *Indoor Residual Spraying: Use of Indoor Residual Spraying for Scaling-Up Malaria Control and Elimination*, (2) *WHO Technical Consultation on Indoor Residual Spraying and Long-Lasting Insecticidal Net Interventions* and (3) *Indoor Residual Spraying: An Operational Manual for Indoor Residual Spraying (IRS) for Malaria Transmission Control and Elimination*. Different types of country needs for IRS support were outlined, ranging from countries who are at the early stage of piloting IRS (e.g. Malawi, Nigeria), to countries that have now started and are moving to phased expansion (e.g. Ghana, The Gambia) and countries that have been implementing IRS for longer and are scaling up coverage (e.g. Mozambique, Zambia, Yemen), or are working to improve quality (e.g. India, Ethiopia, Pakistan). Data from the 2013 World Malaria Report indicates that 81 countries recommend IRS as part of the malaria control programme, but that overall IRS coverage fell from 5% of the global population at risk in 2011 to 4% in 2012. Depending on how one calculates, the costs of IRS remain relatively high (per person per year of protection) compared to LLINs and these may increase as a result of needing to introduce more expensive insecticides in response to insecticide resistance. The targeted use of IRS with non-pyrethroid insecticides may become increasingly important for managing insecticide resistance.

Sub groups of the Work Stream include IRS Evidence and Reporting (Raj Maharaj and Immo Kleinschmidt), IRS Procurement and Supply Management (Rabindra Abeyasinghe and Gerhard Hesse), IRS Training and Country Capacity Building (Manuel Lluberas and Steve Knowles), IRS Supervision, Reviews and Evaluation (John Govere and John Rwakimari) and IRS Advocacy and Financing (Steve Knowles). Achievements in 2013 included the IRS symposium at MIM Durban; the fostering of private-public partnerships, for example the Accra workshop in collaboration with GBHealth, AngloGold Ashanti, Syngenta and others; and increased collaboration with countries in the Middle East and Asia including Sudan, Yemen, Iran, Pakistan, Afghanistan and India. Work in 2014 should aim to more actively involve core work stream members, countries and partners and discuss how best to bring new IRS products to market.

IRS for malaria control and elimination in India – Rajander Sharma, Ministry of Health, India

IRS is used in India to control malaria (primary vector *Anopheles culicifacies* and secondary vectors *An. fluviatilis*, *An. minimus*, *An. sondaicus*, *An. stephensi* and *An. dirus*) and visceral leishmaniasis (VL) (*Phlebotomus argentipes*). VL is endemic in the eastern states of India, namely Bihar, Jharkhand, Uttar Pradesh and West Bengal. 48 districts are endemic with sporadic cases reported elsewhere. An estimated 165.4 million people are at risk, primarily in poorer, rural areas. The target population for IRS is 40.7m for DDT, 10.3m for malathion and 35.3m for pyrethroids (Figure 1). Resistance to malathion, DDT and pyrethroids had been detected in a number of districts by 2010. A strong

program of capacity building is in place; this includes national level workshops and state level training programs run in Orissa (malaria) and Bihar (VL). Monitoring and evaluation is conducted by collecting both entomological data (susceptibility status, bio-efficacy measured by cone bioassays and human biting rates) and clinical data (annual parasite index, slide positivity rate). Data on the likely impact of IRS on malaria and VL was presented alongside operational details of the program.

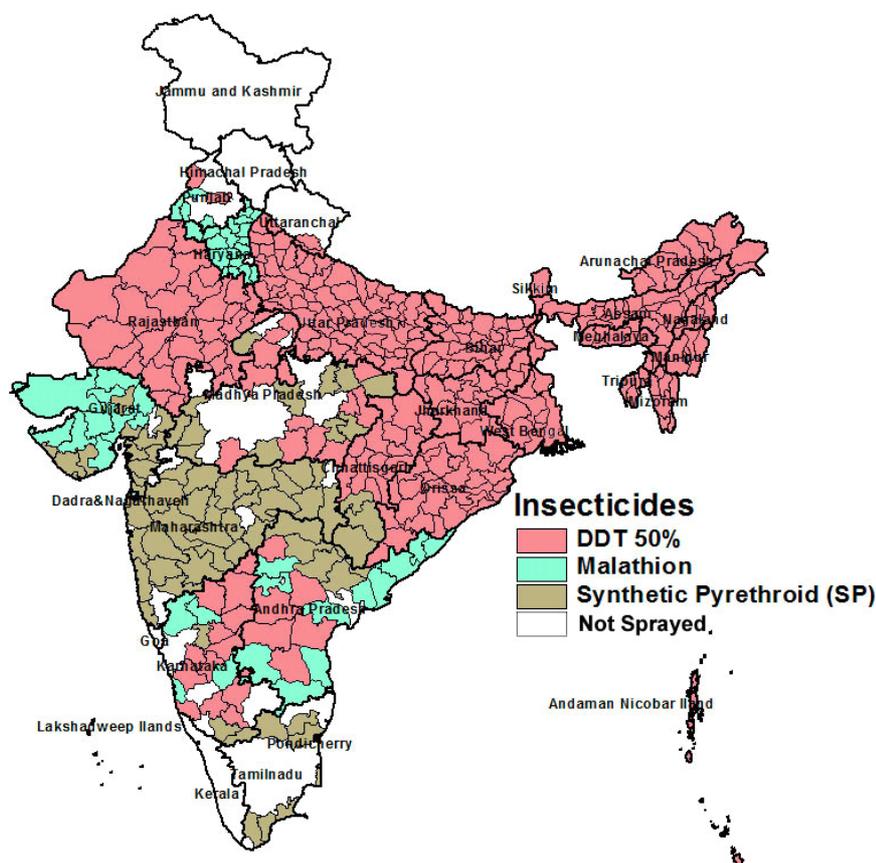


Figure 1. Districts of India targeted for IRS in 2014.

Tools for monitoring and evaluation and quality control of IRS in Pakistan – Muhammad Mukhtar, Directorate of Malaria Control, Pakistan

24 species of *Anopheles* transmit malaria in Pakistan, the primary vector being *An. culicifacies* and the secondary vector being *An. stephensi*. There are eight sentinel sites for entomological surveillance. IRS has been a major component of the malaria control program since the 1960s. Pakistan has a Quality Assurance Protocol which outlines the epidemiology of malaria in Pakistan; the role of quality assurance in IRS and the development of quality assurance systems; the roles and responsibility of various stakeholders for the implementation and management of IRS; standard operating procedures; and information on handling of insecticides. Tools for IRS in Pakistan include the preparation of a work plan, reporting and recording tools such as daily spray reports, gap analysis, M&E plans, checklists for storing facilities and pre-spray activities, technical assistance, training plans and curricula, a training module for the maintenance of sprayers, safety measures for IRS and reporting mechanisms for IRS.

IRS in Swaziland – Teclar Maphosa, National Malaria Control Program, Swaziland

Swaziland is characterized by seasonal malaria transmission (November to May) and is at the pre-elimination stage, with 2015 the target date for elimination. The total population at risk in 2012-2013 was 285,972, approximately 30% of the overall population. Between June 2012 and July 2013 there were 379 confirmed cases, of which 26% were autochthonous. The primary vector is *An. arabiensis*. The elimination program has four main components: (1) Good Case Management, (2) Integrated Vector Management (joint IRS and LLIN distribution to the population at risk), (3) Surveillance and Epidemic Preparedness and Response and (4) Information, Education, and Communication (mass media campaigns for the whole population and travelers and community outreach to endemic areas). Malaria vector control is centralised, with no community teams. A vector control sub-committee at national level under the Swaziland Malaria Elimination Advisory Group (SMEAG) provides input on policies, gives technical guidance on implementation and monitors progress towards implementation. The target for IRS is 85% coverage of the population of households at risk. DDT is used for traditional structures and ICON[®] for modern structures. There are three spray teams each with 18 members, comprising 12 seasonal spray operators, 5 foremen and a team leader. 93% and 90% coverage was achieved in 2011 and 2012 respectively in targeted areas, 101,030 structures were sprayed in the 2011/2012 season and 73,217 structures were sprayed in the 2012/2013 season. The community is involved by working with Rural Health Motivators (RHMs), community leaders and school teachers.

Community based Indoor Residual Spraying in Tanzania: Findings and recommendations from pilot testing - Joshua Mutagahywa Rubona, Research Triangle Institute (RTI) International, USA

With PMI support, IRS was initiated in Muleba and Karagwe districts in 2007 and 2008 respectively. It was expanded to all seven districts of Kagera in 2009, to six districts in Mwanza and five districts in Mara regions in 2010, covering 18 districts in the Lake Zone by the end of 2010 (Figure 2). Different modes of implementation have been used, ranging from highly centralized to partially decentralized and community-based IRS. From 2007 to 2009, IRS was organized at highly centralized camps with large camps accommodating >100 people, staff provided with food and sleeping places, large spray areas serving $\geq 20,000$ sprayable structures and large storage facilities to accommodate bulky insecticides, Personal Protective Equipment and other commodities. The disadvantages of this system were the difficulties in organizing the large number of people and related logistics, the expense of the accommodation, food, water supply and transportation and difficulties in managing transportation. IRS became part decentralized in 2010-2012 with a shift from large camps to medium size IRS sites, which served 5,000-10,000 sprayable structures, with an average of 40 spray operators per site and no accommodation or food costs.

Since 2012, RTI, in collaboration with regional and district authorities, has been working to further decentralize IRS, with the aim of organizing and implementing IRS at village level, referred to as community based IRS (CBIRS). The specific objectives of CBIRS are to (1) reduce costs, (2) increase the level of community participation and ownership, (3) reduce the organizational complexity of IRS, (4) achieve an acceptable level of IRS quality and (5) comply with environmental protection requirements. In CBIRS, IRS is organized and implemented at the village level, with recruitment of spray operators by village governments, recruitment of village IEC mobilisers, a switch from using vehicles to bicycles for transportation and water for spray sub-sites supplied by the village. The scheme was piloted in November and December 2013 in collaboration with regional and district

authorities. Preliminary results indicate that CBIRS increases community participation and ownership, reduces the organizational complexity, achieves an acceptable quality and complies with environmental protection requirements.

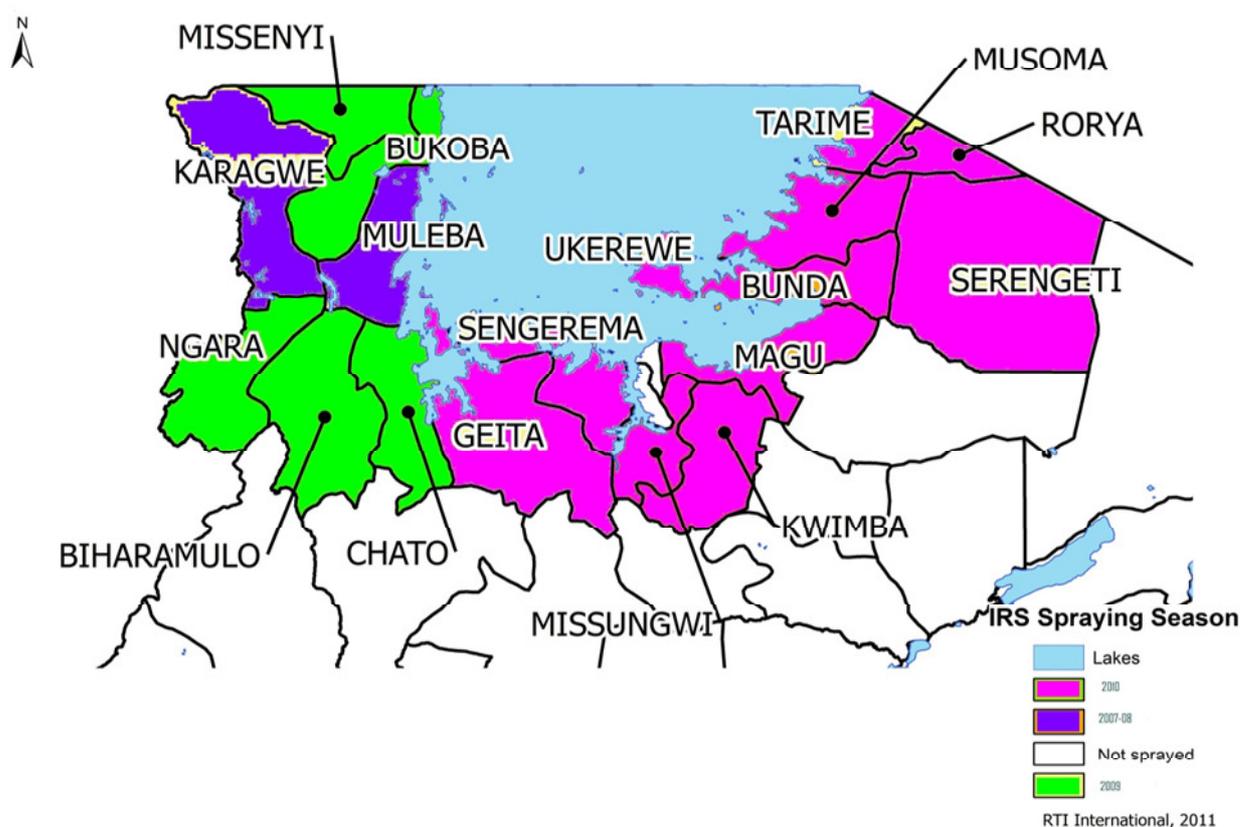


Figure 2. Scale-up of IRS in the Lake Zone of Tanzania, 2007-2010.

Public-private partnerships for IRS – Sancia Dalley, GBCHealth, USA

GBCHealth developed as a result of efforts by forward-thinking international leaders, originally Nelson Mandela in 1997, who recognized the power of business to help HIV/AIDS in the developing world. By 2001, the ambassador Richard Holbrooke had grown the network to over 100 companies with support from Soros, Turner and Gates. The mandate of GBCHealth was expanded to include tuberculosis and malaria in 2007. In 2014, the organisational vision is being redefined to further accelerate corporate investments and competencies in support of the Millennium Development Goals 4, 5 and 6. GBCHealth aims to unlock the power of business in the following ways: (1) convene and connect businesses, governments, multilaterals and civil society, (2) drive the creation of high-impact partnerships (business-to-business and business-to-government), (3) provide recognition and visibility to companies, (4) champion best practices in business engagement on health, (5) represent business in key global health settings and (6) provide guidance to companies on their workplace and corporate social investment initiatives.

Malaria remains a core focus, a good example being the corporate-led IRS programs typical of the Oil & Gas and Mining Sectors, for whom malaria control yields a clear return on investment. In Simandou, Guinea, at an iron ore project, a joint venture between Rio Tinto, Chinalco and the IFC reduced annual malaria cases in the controlled zone from 120 to 2 within two years. GBCHealth also works to facilitate knowledge exchange on IRS. Four conferences and workshops have been hosted

in Africa between 2009-2013, collectively reaching more than 450 participants primarily from the private sector, national malaria control programs and implementing agencies. Key outcomes included increased collaboration between business and implementers e.g. RTI, Chevron, Exxon, BHP Billiton. Priority areas for future work are regions where the greatest impact can be made, specifically Nigeria, DRC, Ghana, Angola, which have a high disease burden, strong corporate presence and on-ground partners/implementers.

Building capacity for IRS in Africa – Allison Belemvire and Kristen George, President’s Malaria Initiative (PMI), USA

An update on the PMI IRS program and capacity building was given. In 2012, PMI sprayed more than 7 million houses, protecting more than 30 million residents. Approximately 34,000 personnel were trained to conduct IRS operations; this figure excludes ancillary personnel such as drivers, mobilisers or pump technicians. The coverage rate continued to be high; all 16 countries achieved a coverage of 92% or more, and 11 countries achieved coverage of 95% or more. The data for 2013 are still being finalized, however initial data indicate that PMI sprayed ~5.5 million structures, protecting ~21.8 million residents. In 2014, the proposed total IRS budget is ~US\$90 million, similar to 2013. This will assist IRS programs in 15 countries in the areas of technical assistance, environmental compliance and entomological monitoring. The major PMI focus continues to be on Tanzania, Uganda, Zambia, and Ethiopia. The emergence of pyrethroid resistance has led to a shift in the predominant class of insecticide used from pyrethroids to organophosphates. PMI closely monitors insecticide resistance levels. For example pyrethroids were the main insecticide used in Ghana as the PMI program was scaled-up from 5 to 9 districts, however emerging insecticide resistance necessitated a switch to Actellic® CS in 2011. The higher cost of Actellic® CS forced a reduction in program size from 9 to 4 districts. Capacity building is also a major focus of PMI, for example in Ethiopia, community-based IRS has been piloted in 6 districts using the existing government health extension worker structure.

New Tools for IRS – Manual Lluberas, H. D. Hudson Manufacturing Company, USA

New tools for IRS from H. D. Hudson include the IRS Commodity Calculator (patent pending) which uses country-specific parameters to generate a three-page detailed summary with (1) number of houses to be sprayed, (2) total surface area to be sprayed, (3) size of spray teams and personal protection equipment needed, (4) storage and handling requirements, (5) transport and logistics needs, (6) a four-year budget and (7) activity plan based on end date. All calculations and estimates are easily modified by the user to fit program needs and parameters. Other new developments from H.D. Hudson include WHOPEs-approved field kits for the Hudson X-Pert® Sprayer. Existing tools include the WHOPEs-approved Constant Flow Valve™ which ensures even spray. H.D. Hudson is also developing remote sensing tools to guide IRS operations, using 65cm resolution satellite imagery from a 50x50km grid to identify and categorize IRS homes and identify and categorize mosquito sources with 95-97% accuracy.

Benefits of flow control valves in hand compression pumps for IRS - Iñigo Garmendia, Goizper Group, Spain

The 2006 WHOPEs Vector Control Equipment specifications state that a flow rate control device shall be fitted and its type declared. The device shall maintain a uniform output at the nozzle $\pm 5\%$ of the specified discharge rate. Low pressure control flow valves (CFVs) differ from traditional spraying equipment with pressure gauges in that they provide an even tank pressure and flow rate. There are

a number of benefits to using low pressure CFVs including (1) a reduction of insecticide deposit variations on walls, (2) a 25% reduction in the volume of water required to spray 250 m² (7.5 litres instead of 10l), (3) a 50% reduction in insecticide loss due to rebound and atomization, by ensuring optimum droplet size and (4) a seven-fold reduction in the exposure of workers to insecticides and (5) 50% less nozzle tip abrasion.

Discussion – all

- *IRS tools and equipment:*
 - New tool kits for field teams designed to extend the operational life of a compression sprayers are now available. These are designed for team leaders and spray operators and contain the most commonly-replaced components of a sprayer, to allow field replacement without the need to return to a central warehouse or workshop.
 - Spray teams should consider the benefits derived from the use of flow valves (as recommended by WHOPEs) during spray operations. However, team leaders and program managers must remember that most of these units were designed for use with emulsifications. While they could help in generating better spray patterns and reducing excessive spraying, their use with suspensions (wetable powders) may result in clogging of valves. In these instances, spray concentration adjustments must be made, but these are frequently beyond the capacity of spray operators. Therefore, the formulation adjustments and the potential for field re-adjustments if they fail, coupled with the added expense associated with these units, must be weighed against the potential benefit associated with their use relative to the impact on the quality of the spray if last-minute field adjustments are required.
 - A new, web-based tool (IRS Commodity Calculator) that will facilitate the planning of IRS operations and estimation of IRS program requirements will be made available this year.
- *Program structure and funding:*
 - There is a good case for investing in IRS. The program established by the private sector in Ghana, for example, has generated approximately 4000 jobs directly or indirectly linked to the vector control program. Examples from Ghana, the Copper Belt in Zambia, South Africa and elsewhere demonstrate that a properly structured and funded IRS campaign is beneficial both to those funding the program and to the surrounding populations.
 - In Ghana, the IRS program started as a corporate campaign and was later extended to a national program. It will soon cover 35 districts. This corporate structure provides security and stability that has been instrumental in securing external financial funding for the national campaign.
 - NMCP managers must explore how to coordinate effort between operations, i.e. how best to use the infrastructure set up by an IRS campaign to assist in the distribution and evaluation of LLINs and to identify larval sources around family compounds. This could be done simply by adding a few lines to IRS operator worksheets.
- *Capacity building:*

- Viable career paths in public health entomology are needed to make mosquito control operations, including IRS, sustainable and adoptable. Without this, the accomplishments of the past few years will fade away soon after external funding expires or is no longer available.
- Attention must be focused on building positions for field technicians and team leaders and supervisors at a national level, as advanced degrees in entomology are available in most countries or in regional groups.
- Information can be exchanged between mosquito control professionals outside Africa and malaria vector control workers within Africa. This is especially valuable where outdoor transmission is problematic and IRS and LLINs will not be of significant value.
- *Role of the VCWG:*
 - The VCWG has become an academic exercise. While it is necessary to have proper documentation and reliable data to justify the interventions used, a good portion of the programs that have produced tangible effects and eliminated or reduced malaria rates in the areas where they operate do not meet the criteria for a Cochrane Review.
 - Discussions during the meeting revolved around study design, statistical analyses and other academic aspects with little consideration of program design and implementation. Some participants of the IRS work stream voiced concern that the operational constraints and timelines of their respective programs preclude them from submitting their findings and observations for publication in peer-reviewed journals and/or findings are not considered publishable because of improper study design. This does not mean that these programs are not successful.
 - It was suggested that the era for pilot projects on malaria vector control is over. There is sufficient evidence to begin adapting and implementing programs that have produced significant results in other parts of the African continent, and the VCWG should focus its attention on this.
- *World Health Day 2014:* A display at the World Health Day celebrations with examples of vector control operations around Africa would be beneficial.

Priority areas of work for 2014:

1. Identify the more active core members.
2. Involve more closely the core countries and partners including Tanzania and Zanzibar, Uganda, Nigeria, Ghana, South Africa and Swaziland; and RBM-SARN, Hudson, Arysta-Syngenta, Goizper, MRC-Durban, RTI, Abt, Anglo Gold Ashanti, GBCHealth, Bayer, IVCC and PMI.
3. RBM led negotiations on financing new IRS products from market to delivery and quality control (Kenya and Ghana).
4. Outline the role of IRS in elimination and prevention of re-introduction and develop thresholds and guidance to transform IRS from a blanket to a more targeted approach (India and Swaziland).
5. Develop Microsoft Excel tools for improving planning, quality, monitoring and reporting.
6. Explore new technologies including the use of mobile phones for public messaging and remote sensing and GIS for targeting IRS.

7. Evaluate how IRS can be combined with LSM and LLINs (India and Swaziland).
8. Aligning the labelling of compression pumps with the labelling of insecticide sachets.
9. Encourage decentralization of IRS programmes to the village level with support for supervision to ensure timing, coverage and quality (Tanzania and Ethiopia).
10. Develop private-public partnerships on malaria and maternal and child health (Nigeria, Angola, DRC and Ghana).
11. Expand the AngloGold Ashanti model in Ghana, the Rio Tinto model in Guinea, the Anglo Ashanti Gold Mine model in Tanzania and the Ilovo sugar model in Malawi.
12. Develop a new PMI IRS paradigm with greater efforts to build national program capacity structures and systems for sustainability.