

RBM Partnership to End Malaria
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Co-chairs: Hannah Koenker & Allan Were
Secretariat: Konstantina Boutsika
Rapporteur: Erin Foley



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RBM Partnership to End Malaria Vector Control Working Group

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Session 3: Work Stream 1: Enhancing the Impact of Core Interventions Co-chairs: Hannah Koenker & Allan Were

Welcome and Introduction to Task Forces – *Hannah Koenker, Tropical Health*

Hannah Koenker opened the session by welcoming and thanking all for attending on behalf of herself and her co-chair Allan Were. This session will focus on work stream 1 which is now known as “enhancing the impact of core interventions”. These core interventions are LLINs and IRS.

One of the initiatives of the work stream and the VCWG as a whole has used in the past few years is to have some time limited task forces who can focus on a particular issue and take that forward as a small group where there is motivation and identified need to focus on a particular aspect.

In the restructuring of the work streams, the focus outputs for work stream 1 are:

1. To identify tool gaps or capacity needs & steer research priorities, by the targeting and stratification of LLINs and IRS products. This will be the focus of the first three talks today and may lend itself to the creation of a task force with this in mind.
2. Policy clarification & evaluation pathways. Here we have elements of policy and guidance in new nets, IRS & LLINs together, dissemination of policy and guidance and research updates feeding into development of policy. Under this focus output there is also the evaluation of partial IRS, refining and standardising the denominator for IRS and refining quantifications of LLINs.
3. Implementation/operational scale-up support/training and capacity building initiatives. Here, there are a number of work plan items which focus on the durability of LLINs, access and replacement, use issues, capacity building and technical assistance to government IRS programs, as well as the expansion of mobile data collection for IRS and LLINs.

In terms of task forces, some surveys have been released to gauge interest in participation. One of the aims of today's session is to keep track of discussion in the session and chat box, and try to identify key areas of interest and focus for task forces.

Hannah iterated the agenda for the session, and handed over to Allan to facilitate the first two blocks of the session.

The Entomological Surveillance Planning Tool (ESPT) Evaluating interventions based on functionality and gaps in protection - *Neil Lobo, University of Notre Dame*

We are not where we want to be. Goals are not currently being met, and over time the gaps between goals and actuality have increased. There has been a plateau in number of global malaria cases. The main issue is that there is a lack of data on what the problems or issues are. In order to be serious about changing the curve, we must do things differently. We usually know how well interventions work, but do not quantify where transmission is coming from when we are evaluating interventions.

There is need to quantify the spatial and temporal protective efficacy of an intervention within the context of overall transmission, and to identify and understand what the gaps are. Gaps in protection can be directly identified and quantified by understanding how interventions interact with local humans and vectors. Within the context of LLINs and IRS this can be vector bionomic traits, as well as sub-optimal usage or coverage.

The ESPT is a decision support tool for planning and guiding programmatic vector control decisions. An important part of this is that it is question based, and it has been observed that when you direct

entomological surveillance towards answering a specific question, that the data collected is usable for decision-making. A major barrier to decision-making currently is that data is not being used or used appropriately.

The ESPT is iterative. It begins by trying to identify what the programmes question is. It then goes over the minimal essential indicators to answer these questions, and looks at sampling methods that are appropriate, site selection, sample design and capacity and funding. So, within your funding envelope and capacity, what is possible. It is able to be adapted for additional and future use due to its iterative design.

When you look at minimal essential indicators, there is a lot of data which can be collected but all of this data does not necessarily need to be used to inform programmatic decisions. An example of this is with LLINs; biting behaviours, place and time, and insecticide resistance are key, but additional data such as vector occurrence and density, seasonality, resistance frequency and resistance status can also be collected with little difficulty that may enhance decision-making.

The key indicators for IRS are resting behaviours and insecticide resistance. When it comes to entomological surveillance we must consider that interventions intrinsically change transmission. The ESPT aims to monitor these changes, including species composition and behaviour, as well as the emergence and spread of insecticide resistance. The key point here is to outline what is not being protected by an intervention and how the system is adapting.

An example ESPT question was given from Panama; 'are LLINs an effective tool in this setting?' Entomological indicators were collected – species composition, behaviours and resistance profile as well as human behaviours indicative of sleeping patterns and how bed nets were used. Based on this data, it was possible to characterise how much protection these indicators gave to the community, as well as quantifying the exposure and gaps in protection. Gaps were identified where exposure happened outside, where people were indoors whilst awake, and asleep but not using bed nets. Using this information, it was possible to approach the Ministry and inform them of where these gaps were and which interventions should be implemented. Based on this, the Ministry proceeded to attempt to improve net coverage and usage. After LLINs were distributed and SBCC was conducted, uptake and usage significantly improved. This was a specific and targeted approach which was very successful.

There is need for a paradigm shift where we focus on where and when interventions work and do not work and how transmission adapts to interventions. We need to know where and when present transmission is coming from to identify the problems. The ESPT supports this shift for programmatic entomological surveillance activities.

Optimising the deployment of vector control tools against malaria – Tom Churcher, Imperial College

There is no longer a one size fits all for vector control. As pyrethroid resistance has emerged, there are now multiple classes of ITNs, with more in development as well as differences in IRS. In the future, we are hoping to have a full expansive range of tools in the toolbox. However, what to do in a particular setting is not always clear.

The gold standard is to use RCTs (and epidemiological evidence is a key part of this), but RCTs are both time consuming and restricted in both size and localities. Experimental hut trials are good tools for showing entomological impact and how this varies between sites, and can be done in more places. What is needed is to extrapolate results of RCTs to different locations with differences in entomology, epidemiology and history of malaria control. A mathematical model has been developed for this purpose (MINT) and parameterized with hut trial data to recreate RCT results.

Current RCTs pose the question of 'do interventions work', but it is important to move from this to 'how well do they work'. Because there is no 'silver bullet' for vector control, layering interventions together is essential to achieve malaria control goals. A framework must be developed to support evidence-based decision making. Cost is a high priority to consider, and cost effectiveness analysis could be an important tool for this.

It is important to parameterise with quality local data such as level of pyrethroid resistance (for example % mortality in discriminating dose assays). The current model considers only WHO recommended tools; pyrethroid only ITNs, pyrethroid-PBO ITNs and annual IRS (long-lasting).

Tom gave a brief demonstration of the website for this model, and all attendees are encouraged to visit the website for the demo. This begins with the landing page where you type your name and the area you are looking at. The scale of the region you wish to look at is key. This then brings you to a page to set-up the baseline using data on sites (population size, seasonality and malaria prevalence), mosquitoes (biting preference, pyrethroid resistance and PBO synergy evidence) and past vector control (ITN and IRS usage).

Following this, a current trajectory is presented whereby you can visualise projected malaria prevalence in the instance of no new interventions. On the left side, of the screen, you can add different interventions such as mass bed net distribution and projected usage. When you select these interventions, charts are generated to predict trends in prevalence, and clinical cases averted. Several interventions can be added for one locality, adding more to the charts.

The price of interventions can also be added into this model, and the website will generate cost effectiveness charts and projected costs over time vs cases averted. This framework is available now, and all are encouraged to play around with this site and provide feedback.

A slide of acknowledgements was presented to those who have helped make this possible.

Experience working directly with countries to support country-led national decision-making processes using their available data – Sarah Burnett, PMI VectorLink

Sarah Burnett leads the PMI VectorLink component called 'integrated data analytics and visualisation'. Through this, PMI help governments to make decisions around the targeting and stratification of interventions or product choice, using their available data.

In Zambia, the government were helped to determine what IRS products to use and where based on their entomological data, that data was integrated across 5 partners, and product history was considered to ensure good insecticide rotation. In Mali, the government were supported to target their new Interceptor G2 nets based on their malaria case burden and entomological data that was available.

In addition to developing visualisations to support national decision-making, PMI VectorLink also support national programmes in using their own data to evaluate the impact of their interventions. Currently, there is a portfolio of 15 evaluations of IRS and ITNs across 9 countries, which helps governments to use their own data so they have localised data that presents situations on the ground to them as opposed to an RCT which despite being the gold standard, might not reflect local conditions.

Given this experience, there are some lessons learned in the targeting and stratification of interventions and how better use can be made of data sources to support decision-making at the national level. Better, more granular data is required to guide decision-making by way of integrated data systems, enhanced population and structure data at lower levels, and maps to track where

interventions are carried out. A better understanding of new interventions and their impact is needed, as well as how best to combine IRS and ITN products.

In integrated data systems, movement has been seen in national programmes from Excel files to capture ITN and IRS data, to the use of databases. In Mali for example, the NMCP has ITN and SMC modules directly in their national DHIS 2, and in Zambia the national government were supported last year to create ITN and IRS modules within their national DHIS 2 database, which allowed the assessment of the total population protected across both programmes down to the health facility level. This is very positive, and with movement towards more integrated data systems we will see more reliable data not only on coverage but also on how to target interventions at the lower levels.

VectorLink Collect use a DHIS 2 system to track IRS and the WHO modules for IRS, ITNs and entomological data.

Geospatial data is being increasingly looked at, and how it can be used to support national governments. We know that oftentimes census data can be old, and that whilst there are headcounts, it would be good to have another data source to assess headcounts against. Currently in Zambia, geospatial data on population estimates is being validated against on the ground enumeration data to see if this can be used for the national programme moving forward. This data has been used in 2020 to evaluate where to place IRS given the density of the structures and places that were harder to reach and therefore more suitable candidates for ITN usage. This population data will be critical for targeting on the ground interventions.

In particular with new tools there is an opportunity to use the routine data sources that governments already have to help assess the impact of interventions in particular areas. There is a wealth of information available in terms of malaria case burden, and again an integrated data source combining case rate and intervention data would be ideal to inform decisions. Additionally, integrating entomological data with human behavioural data can help us to understand why an intervention works or does not work in any given area.

Two studies are ongoing using routine data sources in Sierra Leone (PBO ITNs alone vs. PBO ITNs + IRS), and Ethiopia (PBO ITNs vs. IRS plus standard ITNs). These types of evaluations will help to guide decisions at country level on how interventions can be combined.

Models are also very important to expand our knowledge beyond RCTs. It will also be useful to take modelling predictions and compare them to what we are seeing through routine data sources or other study designs to look at the relative effect sizes. What we see in one RCT may not reflect what we are actually seeing in country.

PMI VectorLink are also developing a draft data visualisation best practices guide that will include key indicators across IRS, ITN, malaria case burden and entomological data, and provides some use cases of how that data can be integrated to guide decision-making, and key tips on how to integrate data. This is designed for national programmes and governments who wish to use routine data sources to guide their vector control decisions. This will be released later this year.

Discussion

- Tom was asked how do you account for interactions between IRS and LLINs and additionally SMC? Current results are quite uncertain as there are not many trials published which evaluate this. The model has been parameterised by experimental hut trial data where they evaluate IRS and LLINs and this is used to predict how the intervention will behave in combination. There is inherent uncertainty about the usage overlap, and it assumed that

these are independent of one another, but this model has been quite successful in predicting the results of a trial in Tanzania which used IRS and LLINs in combination. Unit of scale is important – do you evaluate a whole district at a time or do you evaluate small geographical areas? It is recommended to use the framework to compare between larger and smaller areas to optimise interventions. It would be good to include microstratification data in very small areas within the model.

- Neil was asked if studies overlay variation in human behaviour by hour with variation in vector species and biting intensity by hour? Yes, this is done. This can be as detailed as needed (i.e. hourly), but we look at how both mosquitoes and human behaviour varies over time, and how the interventions function within those spaces.
- Sarah was asked do you have a summary document of the country-level activities that you mentioned, as there were no slides to accompany your talk? Yes, there is a summary available which can be sent out.
- Sarah was asked could you say more about GRID3 population estimates and how they're constructed? Do they draw from e.g. existing census data spread over the given area, or do they use alternate estimation approaches? For those who are not familiar, GRID3 is a project that is using geospatial data to predict population and structure counts for vector control programmes. How these estimates are determined is to use geospatial data to get an account of the structures in combination with modelling, incorporating census and other data sources that are available. In Zambia they work closely with the government to get detailed information from other studies to help modify and parameterise the model predictions that are used in the development of final population estimates.
- Tom was asked if the demo incorporates bio-efficacy data i.e. mortality of mosquitoes over time? Yes, we currently use the bioassay (discriminatory dose) as the measure of resistance level. Clearly there are a lot of measurements surrounding this. In an ideal world we would use intensity bioassay or genetics, but not a lot of data is currently available for this.
- Tom was asked how is routine ANC/EPI and school-based distribution factored in? We currently do not do this in this version of the model framework, what we would like to do is to add continual top up campaigns and define net percentage distribution through that medium. That is next on the list of things that will be considered and implemented in future versions of this.
- Tom was asked do you have any comments on the observations that as coverage increases, the return on investment also goes down. How is this incorporated in decision making? This is a great question and there are so many important parts. As you get higher coverage your added benefits decrease so your cost effectiveness also decreases. Other interventions that might not be as cost effective at the start of a campaign may improve over time. To achieve high coverage, many more nets need to be distributed. Ultimately it is about improving impact, saving lives and increasing coverage but the question of investments is a wider conversation.
- It was asked that I realise there isn't complete overlap with what you can use the tools to do, but if you were able to define a question that both tools could be used to explore - would then come up with the same "answer"? Similarly, STPH groups working with several countries - do those models also 'match'? Neil responded that different answers may arise based on how we approach the questions/what assumptions are made. Data will be collected on the ground, entomological and human indicators that visualise what is happening at that site. Tom responded that this is a good thing, models are different due to unknown biology and systems

so it is good to have multiple mechanisms to address the uncertainties and reflecting the true unknowns and what is best to do.

- Sarah was asked what IRS insecticides are you testing in combination with PBO nets? SumiShield.
- Neil was asked if this tool has been operationalised and used anywhere currently? So far there have been pilot studies in four countries; Mozambique, Myanmar, Panama and Namibia, and in all of these it has changed what is happening and how malaria has been approached on the ground. It is being taken up by multiple countries in the near future. Bigger effects have been seen than were expected.
- Tom was asked as this is a work in progress, how much more time is needed before you can confidently tell us that the final version of the model is ready? This is as of yet unknown, but all are encouraged to use this now, if anything to help guide and inform future iterations which will continue to be worked on to optimise this model.
- It was asked to all that one of the key factors that a lot of us on the operational side have to consider is cost effectiveness. So, how is this factored in? Neil responded that with the ESPT we see that countries will direct what they want to do. Countries usually already conduct entomological surveillance but this is not directed at answering specific questions. Here, the ESPT allows a country to take charge and ask their own questions. The goal is to decolonize global health, to have countries take charge and the ESPT allows for this.
- It was asked to all what the response has been from the governments, have they received these well? A lot of governments have their own constraints, i.e. political issues and social factors that make it difficult to operationalise models. What has your experience been with governments? Are they welcoming? Sarah responded that while data plays a role in decision-making this is also governed by policies and politics and there are a lot of considerations. In Zambia, when PMI VectorLink supported the product choice insecticide rotation decision, data was pulled together to produce visualisations which became the technical advisory committee's recommendation. The government then took these recommendations and conducted their internal processes. Around 80% of the districts ended up receiving the same recommendation as that of the technical advisory committee. Whilst this is not a perfect situation you can definitely see that the data is informing the process. Similarly, in Mali when supporting the Interceptor G2 net programme, part of the decision-making process was guided by operationalization to distribute to the entire district as opposed to just one part. Realities must be factored into the decision-making process.
- Tom was asked do you see a use of MINT (or adaptation of it) for new product design? (e.g. value to add known sub-lethal effects to certain intervention types)? We haven't done so far, but this is certainly something that could be used to support the development of new products. We want to have a good idea of how they work. For example, if you had a new longer-lasting net or IRS, we could put them into the model and play around with scenarios whilst comparing to existing interventions and visualise what price they would become cost effective for example. This model currently is focused and grounded on products recommended by the WHO but in theory could be used for this.
- It was asked to all why it has taken this long for us to get here? IRS and LLINs have been with us for decades and malaria even longer, why is stratification and targeting being considered novel in 2021? Neil responded that this is not novel but has not been done. People tend to not try new things and just do what is comfortable, which is unfortunate and why it is time for us to do things differently. Tom agreed and added that this is precipitated by pyrethroid resistance, and now we have more proof that interventions perform differently in different

locations etc. It has taken a long time to collect the evidence base to feel confident in what we are doing. Sarah added that we have seen improvements in data sources that we did not have in the past for example health facility capture and coverage.

Comparative study of the protective efficacy of the distribution of isolated LLINs and LLIN+IRS in two regions with high malaria transmission in Madagascar – *Saraha Rabeherisoa, National Malaria Control Programme*

Malaria remains a major public health problem in Madagascar both in terms of morbidity and mortality. The general objective of the 2018-2022 NMCP is to reduce malaria morbidity by 30% by the end of 2022, and the strategic objective is to protect at least 90% of the eligible population by adequate malaria prevention measures (LLINs and IRS).

Key interventions include LLIN distribution through different channels; mass campaign, routine distribution, community level distribution, distribution through social marketing and emergency distribution in the case of an outbreak. A generalised IRS campaign is carried out throughout the year to avoid transmission and focused sprays are implemented when we face an epidemic.

With the framework of the study – Madagascar is an East African island separated by the Mozambique channel. Madagascar has over 26 million inhabitants, 22 health regions, 114 health districts and 2,974 primary health centres. There has been almost a 100% increase in malaria incidences but fatality remains the same.

In terms of the study setting, there are 5 epidemiological clusters defined by transmission duration and climate: East, Central Highlands, Margins, West and Sub-desertic. The study was targeted in two regions; Vatovavy (East) and Atsimo Andrefana (Sub-desertic), these regions account for 30% of total malaria.

This was a cross-sectional retrospective study based on LLIN and IRS data. This was referred to the 2019 RHIS programme. Two study arms were selected with 98 communes in each. The first arm had just LLINs and the other arm a combination of LLINs and IRS. Study variables included the malaria incidence in study areas, rapid diagnostic test positivity rate and the proportion of confirmed malaria cases in under 5s. 2 independent samples were used to compare two groups with a rate of reliability at 95%.

In terms of results, over 400,000 cases of fever were reported in the LLIN and IRS group, and over 300,000 in the LLIN only group. The government recommended to test all incidences of fever for malaria. There was a reduction of 23% positivity rate between the LLIN arm and LLIN+IRS arm, but the difference between two groups was statistically non-significant. The difference between arms in terms of malaria among under 5s was also not statistically significant.

A 26% reduction of malaria incidence was seen in the LLIN+IRS arm, which was statistically significant. However, this study was limited only in two high transmission regions out of 20, and a country level representative study is needed.

In spite of such favourable results of this implementation of interventions there are still some challenges. These include high cost of IRS implementation (which limits scalability), IRS constraints (biological and security), geographical inaccessibility, low uptake of LLINs by the population and the mis-use of LLINs.

In conclusion, the LLIN+IRS combined strategy contributed to reduce malaria incidence significantly when compared to single LLIN strategy. Combined strategies should be encouraged in high transmission areas to reduce malaria morbidity and break the transmission chain. Further experiments

should be undertaken to include more health regions, and finally advocacy among donors is required to consider funding these strategies.

Interim update from the New Nets Project pilot evaluations – Joseph Wagman & Julia Mwesigwa, PATH

The New Nets Project is a large project with many components and moving parts, and is funded by Unitaid and the Global Fund, as well as being primed by IVCC. The intent of the project is to increase market access for next generation ITNs, as well as to generate evidence on their efficacy and cost effectiveness. One of the key components of this project is the pilot distribution of next generation ITNs (Interceptor G2, Royal Guard & pyrethroid-PBO) which occurred during annual mass coverage campaigns in 2019 and 2020. These pilots are being led by NMCPs in Burkina Faso, Rwanda, Mozambique and Nigeria, and PATH support these and the generation of evidence from these roll-outs to estimate the incremental effects of new net types in real world implementation settings.

In all the countries involved in the New Nets Project, annual cross-sectional surveys are conducted. Two surveys have been conducted in Burkina Faso thus far, and net usage across the three districts surveyed saw a massive increase between 2019 (20.8-78.8%) and 2020 (44.2-90.4%). In Rwanda across two surveys, net usage percentage has remained similar between February and December 2020 (around 70%). In Western and Northern Mozambique, net utilization was very low (around 30% and 20% respectively). In Nigeria, one survey has been conducted and utilization remains low across all four districts (as low as 3% in one surveyed).

Malaria prevalence estimates are also a part of these cross-sectional surveys. In Burkina Faso, there has been a variation in baseline prevalence. After the mass net campaign there was an overall decrease in malaria prevalence across the districts. The largest decrease was seen in the district which was given PBO nets; from 28% to just 4%. In Rwanda, prevalence of malaria was low at the baseline (overall around 2% across districts), and this remained similar in the first survey. It should be noted that malaria incidence did increase in the district using LLINs and IRS, but seasonality is important to consider and the overall number is still low. In Western Mozambique, the baseline prevalence varies from 44.3% to 5.7% in the district with PBO ITNs. In Northern Mozambique and Nigeria, baseline prevalence of malaria was moderate to high across all districts. Overall, we see large variation both between and within countries, as malaria is very heterogeneous. Full cross-sectional surveys will be conducted later in the year and results published.

In terms of baseline vector data, we also see large variation between and within countries. There is a lot of diversity in species composition of *Anopheles* vectors, their relative abundance and relative importance to transmission in each district and country is not consistent. There is a lot of variation in the *An. gambiae* complex sampled at each site, but what remains consistent is a low number of *An. arabiensis* collected.

Indoor and outdoor biting ratio data is collected. In most of these locations it has been observed that within *An. gambiae s.l.* and *An. funestus* that populations are just as happy to bite indoors as they are outdoors. In Nigeria this is different, a high ratio of indoor vs. outdoor biting is observed here. Pyrethroid resistance data is collected (based on WHO tube test mortality) which also varies by district. In Rwanda, it is a low to moderate level and here we see mitigation of resistance by pre-exposure to PBO whereas in Nigeria you only see partial mitigation from this. In Mozambique little data has been collected and abundance data will change as more data is acquired. To date, a moderate level of pyrethroid resistance is observed here.

In Burkina Faso, multiple surveys have been conducted. *An. gambiae s.s.* is the most prominent species observed all but one district. Levels of resistance are high. There are multiple resistance mechanisms

at play and only partial mitigation of PBO exposure. A future goal of PATH is to collect biting density data by hour and align this with human behaviour data. You can also see that mosquito biting rates in the peak season decrease after net campaigns and although this is not consistent across districts, it is consistent between indoors and outdoors. Parity is also a parameter being looked into but it is difficult to see effect of nets on mosquito longevity in this respect.

This is very much ongoing work and preliminary results are intriguing and it is hoped that at the end of the three years a great deal of useful data will be generated.

Patterns of net ownership, retention and use in sub-Saharan Africa – *Amelia Bertozzi-Villa, Institute for Disease Modelling*

As well as working with the Institute for Disease Modelling, Amelia also collaborates quite extensively with the Malaria Atlas Project. A link is provided to a preprint that will hopefully be published in the near future, which will provide a more detailed summary of the work discussed today.

The overall goal of the Malaria Atlas Project is to develop maps of various malaria metrics. The goal of this particular project was to generate these maps over time for several ITN related metrics. ITNs are extremely impactful but there are many barriers to coverage including distribution retention and use patterns over space and time. In order to estimate this within a modelling framework we first try to look at the national goals to understand what net crop looks like in countries over time. This is done by triangulating 3 different data sources; NMCP distribution data, information on net manufacturer deliveries to generate an estimate of reported net distribution counts. We also need to understand how that number of nets wanes over time so in order to do that we utilise survey data and fit a median net retention time to survey data counts.

Once this information is collected it can be plugged into a series of geospatial estimates. The first step is to translate net count into an ITN access metric which includes household size estimations, and then to align this with geospatial frameworks in an attempt to understand both access and use.

The first outcome of this analysis is that people tend to use the nets they have access to. The mean value of use rate where nets have access is positive, especially considering that access as a whole is a lot more heterogeneous and lower across the board in many localities. This raises a lot of questions. This analysis does not look specifically at what drives subnational variation but we can speculate a number of reasons for this. Risk varies between localities i.e. there will not be access to ITNs in uninhabited areas and areas of low inhabitancy such as highlands where risk of malaria is also considered to be low. There are a range of reasons you may expect to see lower access from an operational perspective and these include logistical/distribution issues, household size limitations, rural areas and conflict zones. It is also important to note that sometimes there are data collection artefacts in these maps for example in Tanzania it is unclear if access is indeed low or whether data were being collected at the same time as distribution campaigns.

As well as the country level, it is important to also look from a national level as to what the barriers are to access. Although it should be noted that a more holistic approach is being taken to interventions in addition to nets, you can see that access is low and therefore there is only a limited amount of which use can increase. This speaks to challenges both in the number of nets that countries are able to distribute, but also to challenges of allocation efficiency. Net retention is also a barrier to access. Within this model, the median net retention time must be much lower than the 3 years which is expected. It does seem that net durability is a big challenge in this.

In terms of policy implications, there is a need for longer net retention and potentially more durable nets. Efficient allocation is extremely important as coverage levels increase. Overall, net usage is good

but there is room for improvement in many localities. This modelling has not yet considered the relative impact of these mechanisms but could give a pathway to explore trade-offs. We need to consider all results in a holistic context, and future work may include extending the model to consider entomological efficacy.

Discussion

- Saraha was asked how big the problem of misuse of LLINs was, and could it be more cost-effective to improve LLIN use as compared to combining LLINs with IRS? We do not have data about the misuse of nets, but what we can conclude from field visits and field colleagues is that they use the nets for other things such as fishing or to protect crops in rural areas and it is true that the appropriation or ownership of the community is important. Cost-efficiency ratio has to do with integration of LLINs and IRS and people need to be aware of how to use this properly and efficiently. There is a need to be well informed.
- Joe was asked for his thoughts on a comment that there is a need to quote access figures as well? Without these, people tend to assume that the problem is about behaviour rather than access. We are calculating access and use given access so will be able to contextualise all of those factors as well. This is of high importance. Ultimately, you do not want to judge an intervention based on use given access, and how many people are able to use nets will drive the effective size estimates that we can.
- Amelia was asked do you explicitly chart net age? Also, are routine ANC and EPI inputs included? Net age is not currently explicitly input into the model, to some extent you can see this as an output from the mass net campaigns and work backwards to calculate net age based on retention times, but it is also true that from survey data we have net age data which is potential area to consider in future work. Routine ANC and EPI inputs are included.
- Amelia was asked if SBCC was considered to align with net retention? Not explicitly as this was done at the national level, but again it would be interesting to look into this.
- Saraha was asked which ITN and IRS products were used in the study areas? In the region where we had the LLINs and IRS in combination we used pyrethroid nets.
- Amelia provided two links in the chat box; the first is the preprint of the paper mentioned in the talk (<https://www.researchsquare.com/article/rs-199628/v1>), and the second to the Malaria Atlas Projects data explorer that allows for the download of the maps that were shown (<https://malariaatlas.org/explorer/>), as well as her email address. The chat is available on the Attendee Hub.
- Joe added that the areas which were presented on net types and distribution was determined by NMCPs so were not purposefully done to make areas as similar as possible, but PATH did try to select study areas that were as continuous as possible. Pilot evaluations are messy in nature but try to capture complexities in reality which may make for some very interesting analyses in context. All of these pilot evaluations are being done in combination with RCTs on the same net types in Benin and Tanzania so this is all just one component of the work being done.

Streamlined ITN durability monitoring – Stephen Poyer, PMI VectorLink

Streamlined ITN durability is new on the agenda. The PMI VectorLink team have been working with PMI colleagues to develop a streamlined approach to durability monitoring. Standard durability monitoring is already very effective and efficient but focuses of this new approach are ITN bio-efficacy, collecting data on physical integrity and allowing an indirect measure of attrition. It is hoped that this will provide another standardised tool we will have in our collective toolboxes to better understand an element of ITN durability which is a very important topic for modelling and decisions on the ground.

Currently, PMI VectorLink is supporting durability monitoring in 15 countries, and 13 standard durability assessments are ongoing. In late 2021 and into 2022, the streamlined approach to monitoring will be rolled out in Madagascar, Malawi and Nigeria.

To date, durability monitoring studies have been conducted in over 20 countries and covering a dozen ITN brands (the vast majority of these are pyrethroid-only). There is a need for a targeted approach to directly measure field performance of new AIs, particularly in countries that have conducted full standard durability monitoring. The objectives of the streamlined approach are to;

1. Assess and compare the insecticidal efficacy of one or more ITN brands in one or more locations, as measured by bioassays and chemical content testing.
2. Monitor the physical integrity of one or more ITN brands in one or more locations, as measured by a hole assessment and short questionnaire.
3. Provide an indirect estimate the level of attrition of the nets at each round.

Many of the aspects of the streamlined monitoring design are taken from the standard monitoring in order to maintain consistence with material that people are already familiar with. To give an overview of the process, there is a standard pre-distribution bioassay with chemical content testing for nets prior to mass campaign roll-outs but after landing in countries. These may identify concerns in net quality. The bulk of work is conducted following a mass campaign. It is important to note that the main difference is in sampling frame. Not all nets are followed and rather a random sample taken of 30 nets from a campaign at baseline, which rises to 45 at each subsequent monitoring phase. These random cross-sections aim to provide an indirect measure of attrition. Assessments will be conducted on physical integrity as well destructive bioassays such as cone tests, and chemical content analysis. 30 nets are taken at baseline as we will see optimal results here, but the increase to 45 in later sampling is to provide a higher level of precision. There is a trade-off between the new approach and old approach in terms of median 'useful life' data, and attrition measurability is less exact in the new strategy.

The PMI VectorLink team have developed materials which are now available online including a generic template, information and consent forms, sampling and questionnaire forms as well as a budget template. This is based on the standard durability monitoring template to facilitate comparisons between the approaches. It is estimated that streamlined durability monitoring will cost approximately 20% less than standard durability monitoring on the assumption that there is more remote support and much more country owned and led work, reducing costs from in person technical support.

Among this package of materials, there are net listing and sampling forms which can be adapted to country leads. There is a focus on a questionnaire which has been expanded from the original 12 questions on standard durability monitoring to 44 questions for respondents. This is intended to not be a time-consuming process and allows for rapid fieldwork on the assumption that there are adequately sized teams to complete this work in a short number of days.

There is some material available and a comprehensively written protocol and questionnaire which provides a lot of guidance and detail on the origins and objectives of the activity. Going forward as this approach is implemented in Malawi, Nigeria and Madagascar, PMI VectorLink look forward to building on materials, in particular finalising training materials and analysis approaches such as developing standard Excel data entry forms and templates for reporting.

Making the case for method validation – Angus Spiers, Innovation to Impact

We need consistent and reliable data to properly evaluate and monitor vector control tools, particularly new tools which have different modes of action and entomological effects to previous tools. Comparability of data and consistency of input into data is an important consideration, and it should be noted that we do have flexibility in terms of PQ and how to evaluate new tools.

With the emergence of dual AI nets, it is increasingly important that validated methods are available to evaluate these and to ensure consistency and clarity of monitoring. There has been a lot of discussion surrounding QA of nets and having consistent reliable data is crucial to this to indicate performance, understand data and perhaps most importantly to compare between different studies, countries and settings. In terms of flexibility for new methods, this underpins innovation by embracing different entomological effective, classes and tools that we are seeing on top of what is already known. It is vital to have the ability to indicate performance when bringing new tools to market.

Another aspect of this is surrounding the characterization of materials that are going into these studies, and particularly the variability in the way data inputs are presented. This makes it difficult to compare between products. More clarity is needed on batch numbers for example, as well as characterization of the mosquitoes used for these studies and their resistance profiles. Where unexpected or unclear results are seen, this would provide a way to trace back and address these problems and discrepancies. Another example is in IRS studies which claim that sprays are tested on 'mud' walls. The composition of mud may vary between localities so it is important to provide clarity.

The basic principle is that we need to have validated methods to indicate the performance of a product, but need to be specific to the product and its properties. Without validated methods, evaluation of new tools is not possible and will result in delays to access.

The product should drive choice of method, not vice versa. Many questions are posed. Do we have defined end points for new tools? Do we have consistent data to back these up and a method to describe them? When we talk about washing, do we have a way to wash which preserves the insecticide correctly (or are we continuing to use old wash methods)? Are tunnel and cone tests relevant for different modes of action?

In terms of reporting consistency, a literature review was conducted by Giorgio Praulins at LITE of 61 papers regarding WHO tube tests. 4 guideline references were identified, and numerous inconsistencies were seen in both methodology and reporting. This shows that even well-known methods are being applied inconsistently. In almost 80% of these papers, a negative control was not reported at all, and variations were seen in mosquito numbers. This review will be published.

A four-stage method validation is presented;

1. Preliminary development – defining desired outcomes, design and refining of methodologies.
2. Feasibility experiments – quantify inherent error in the method.
3. Internal validation – evaluate the ability of the method to accurately characterise VC products.
4. External validation – affirmation of results by two external laboratories.

This is a labour-intensive process but costs and benefits must be weighed in terms of conducting this work prior to or following market release.

Innovation to Impact are meeting with a number of stakeholders to identify issues for current products, to agree SOPs/methods for validation of dual AI ITNs, characterise inputs and materials, determine whether we can accurately capture necessary data points and to landscape and prioritise methodological issues. It is also necessary to engage with next gen products under development to

determine validation methods, and to identify where assistance and resources are required. Finally, and more broadly, work must be done to identify underlying methodological issues and update these with new advances, for example can we apply new technologies such as video tracking to answer otherwise unanswered questions?

Developing consensus SOPs for evaluating next-generation ITNs – *Rosemary Lees, Liverpool School of Tropical Medicine*

Despite the availability, roll out and monitoring of next-gen ITNs which are PQ listed there is still currently no recommended, standardised durability monitoring methods. Currently existing methods are largely centred around pyrethroid-only nets, and these methods are likely to differentiate against the next-gen ITNs which often contain multiple AIs and novel modes of action. SOPs are under development and the example of PBO nets will be given here to explain the methodology behind the production of a 'consensus SOP' for new tools.

There are four stages to method validation. Present focus is guided towards the first stage which is method development. A collaborative approach is being taken to this, to identify key stakeholders, to collate available methods and compare experimental parameters, and to use this information to propose a consensus SOP which will be refined through stakeholder decision. The goal of this is to make the SOP and method development publicly available which will facilitate a consistent methodology across projects and sites, and allow for easier comparisons to be made.

Through literature review and stakeholder discussions, a total of 9 trials have been identified with potential methods for durability monitoring. Of these, 6 available SOPs were identified. For the remaining 3 trials, SOPs were unable to be obtained. It is unclear where durability monitoring was carried out at all in one of these, one which did not carry out durability monitoring and one where methods were still under consideration. The 6 SOPs identified were reviewed alongside traditional WHO cone test guidance for monitoring of pyrethroid-only nets.

A table of key experimental parameters was developed for bioassays and filled in using data from available SOPs. These parameters were then compared. Some were obvious and largely agreed upon, but others differed. From that, questions were developed and issues to be raised by the stakeholder group. This is an iterative process of feedback, refining and integrating into a consensus SOP. A draft SOP is currently under review by stakeholders, with the view to create a final document.

A lot of valuable suggestions have been made on strengthening SOPs, and it is now important to balance this within what is ideal and what is feasible to be carried out, particularly in field sites. The aim is to have a prioritised order of testing for areas where resources are limited.

When the final SOP is available, it will need to be validated. This will consider looking for data that already exists using this or similar SOPs, and then where there are gaps to conduct experiments to fill these in. This will be a multi-centre validation.

In terms of considerations, it is clear that the cone test is suitable to expose mosquitoes to an ITN but it is not that simple with a PBO net. Not all of the six currently PQ listed nets are the same. They have different concentrations of PBO, different combinations of pyrethroids and PBO on different panels, and there was a lot of discussion about the fact that some nets have PBO only on the roof panel. We know from behavioural studies in Liverpool, that most of the interaction of a mosquito with a net is on the roof. Discussions have been had about prioritising testing of roof panels over additional replicates of side panels. Again, a pragmatic approach is needed to identify appropriate testing for panel types to make a future-proof member for new PBO nets. There is also need for guidance of

interpretation of results particularly when it comes to synergism as well as the use of susceptible vs. resistant strains of mosquitoes tested.

Although work is still ongoing we are close to having a comprehensive method to testing PBO nets and it should be noted that similar efforts are being conducted for other new net classes.

Discussion

- A number of questions were asked regarding attrition and the measurement of this within the new streamlined approach. Steven was asked to comment on this. The measure of attrition and streamlined durability is direct. It is based on a known number of nets that were present at a certain time. The level of robustness of that data, the precision of that attrition data, unless there's very high levels of attrition which one would expect to see towards the end of the study, but in the earlier years you'd need very high levels of attrition in order to identify a broad mix of reasons for attrition. So, it is direct, but the precision is lower. Ultimately there is a lot of attrition data from durability monitoring. And the papers that have come out from PMI VectorWorks in Malaria Journal have very nice standard charts that show these different levels of attrition. It is interesting to consider how in the estimation of survivorship of nets and median useful life, some of these attrition categories don't feature in that. It might be worthwhile taking a step back and looking at attrition and median useful life side by side, but in particular, looking at these attrition results, and then digging into again, or going back to the literature and seeing what what we've worked on before, to understand a bit more about household reallocation, why it's occurring, and if there's a need to follow up those nets, because they're not an inconsequential proportion of nets that that are brought into the cohort, but then immediately lost from the cohort because they've been given out to some other member of the community or another family member. A question for the group really, if that's something that's worth looking into again, and understanding.
- It was commented that tunnel tests have not always been used to confirm some of the poor results seen in the cone bioassays. Are tunnel tests being looked at moving forward, or have they been a part of the discussions on the on the new SOPs? Rosemary responded that tunnels are part of the discussion. There is a growing consensus around the use of tunnel tests for Interceptor G2 nets, and what we would want to do is review the data that is available on this to understand the things like the level of noise, reproducibility of the tunnel test, and using Interceptor G2 to parameterize how robust the method is for that. It's fair to say it's probably the closest we have to an available kind of lab scale method.
- It was commented that bioassays are difficult to standardise across different labs and countries and even between years, resulting sometimes in higher bio-efficacy estimates in older nets than in newer nets. Stephen was asked if they are the most efficient indicator to retain in streamlined monitoring? He agreed with the spirit of the question. Rosemary's presentation described a set of options that one would eventually come up with an approach to this. In terms of the streamlined durability monitoring, the good storage of those net samples, from one survey round through to the end of the project is paramount. Wherever possible, one standard lab should be used to minimise the variability.
- Rosemary added that there has been a lot of discussion around standardisation, and contrasting it with characterization. Where possible, you would conduct everything side by side in standard conditions, and standardise every parameter that you could. But where that's not possible, at least we would want to characterise the inputs. So like Angus was talking about characterising the mud, that mud is not just mud, but every sample of mud is different. And so, if you're doing an IRS study on a sample of mud, you would want to understand the

characteristics of that mud, so that you can then use that to interpret the results from your bioassay. In the same way, you would want to understand and characterise the mosquito strain that you were using for a set of bioassays, so that you can then interpret the results. If we do spread one mosquito strain across every testing lab, it won't be the same for very long, there'll be divergence. And so at least if we can characterise the mosquitoes trying to understand as much as we can the genotype or phenotype of the strain that you're using, you can then interpret the results. And if you see a difference between two sites, you then have the information to try and understand why you're getting different results. Is it because the strain is different? Is it because your temperature in the testing lab was different? etc. It's characterising and then reporting those characteristics alongside your results.

- Rosemary was asked have you found a way of comparing bio-efficacy and chemical content data? Do we always have to measure both? That is something that we're discussing, trying to correlate the results that we get from bio-efficacy and the chemical content. The kind of current method that's used is HPLC, which is a measure of total chemical content in that sample. But as an entomologist, it's more complicated than that, because the mosquito is only interacting with the insecticide that's available on the surface of the net. In an ideal world, we would have a way of quantifying the effect the insecticide has on the mosquito, the content of insecticide that still on the surface and available for the mosquito, but also the chemistry of that. So is that still active, but still in a biologically active form. It may still be there, but it might not be effective against the mosquitoes. We're not there yet, but it is certainly something that we're investigating. It would be ideal to find a translatable, easily accessible method for measuring surface content for insecticide that wasn't expensive or laborious or, or long winded.
- Rosemary was asked to clarify whether or not net manufacturers were included as stakeholders in the SOP discussions. Manufacturers were not included in specific SOP discussion, but there are ongoing relationships and discussions with the manufacturers and therefore do have input. However, specific SOP discussions have been led by those who are using these SOPs and conducting the testing. Angus added that in the initial discussions around these SOPs, the relevant manufacturers for those products that were being looked at were included. These discussions were then carried on with other partners.
- It was asked that in terms of increasing use of ITNs, is there room to consider strategies to convert popular but untreated nets in the markets, which are common in many countries? Hannah responded that there's a lot of untreated nets in certain countries, really in Southeast Asia, but also to a certain extent within Tanzania and some other East African countries. It could certainly cause a lot of confusion to start retreating them again.
- Angus commented that it is very encouraging to see such interest in methods in the chat, and posed a number of questions to attendees with regards to collation of methodological issues. What's front and centre right now is declaring priorities of products actually in the field that need to be defined and indicated with up to date methods and then looking at those products on the horizon. Do we have different endpoints? Are they different products? How are we looking at validating those methods, and trying to do that before we get through the PQ or country regulators wherever you might be going? Please reach out to discuss this with myself, Rosemary or Natalie. We will be reaching out to various stakeholders in the coming weeks as well. We're interested to hear what everybody on this group is talking about. We look forward to reporting back.
- Hannah noted that the chat will be published on the Attendee Hub, and may be an interesting resource given the level of discussion.

- It was asked how the costs of new SOPs compare to standard cone bioassays, is anybody looking at the potential cost ramifications of having to do these new tests on a lot of a lot of the newer nets as they come out? Rosemary responded that one of the advantages of having so many people involved in the discussion is that we can get a good feeling for what is or is not realistic. Whilst detailed costing has not been conducted yet, we're trying to come up with a compromise that could be borne by those funding durability monitoring, and that still gets the answer that we need. Inevitably there will be more replicates, more controls, and more complicated than the test methods for pyrethroid only nets. It does need to be thought of how to be as streamlined and as manageable as possible to give us the data that we need.
- Stephen added that obviously there is some placeholder values in the streamlined durability monitoring template, the life of project package cost is less than standard durability monitoring because of the large field work costs. The lab component on its own, necessarily, is more expensive, just from the larger sample size, but also the additional tests with the resistant mosquitoes and characterizing those resistant mosquitoes. We can continue to compile, anonymize, have that data and review it so that we're looking at the implications for funders, but importantly, implications for future, domestic funding lines. When activities like this are supported, through domestic funding, so there's good clarity on what the precise cost is to countries, but I think as many people on the call recognise, a lot of those costs a lot are human resource costs, and those vary hugely between countries based on different costs of business in countries. But certainly, we have that information.

Discussion on Task Forces and Next Steps – *Hannah Koenker, Tropical Health*

Hannah noted that there were no other suggestions for specific task forces. Certainly, we can look at the interest that was generated in the online survey. The goal for this if we had sort of generated any task forces was to match that up across the interest expressed there. But for now, it may make the most sense to kind of keep those survey responses on hand. And as the work stream moves forward over the year, and we are maybe able to do additional, sharing of information as new aspects come out, or potentially organise around other large-scale meetings as they occur. The task forces could still develop, it's not that we're setting them aside completely, but there does need to be a clear and burning need to start one up.

Wrap up and close – *Hannah Koenker, Tropical Health*

Hannah brought the session to a close. It was iterated that the slides, chat and recordings will be available on the Attendee Hub. We must keep conversations and research moving forward, and continue to share insights and findings so we can make our core interventions as enhanced as possible. There will be lots of upcoming opportunities for us to interact and discuss further. Hannah thanked all speakers, attendees (particularly those who engaged in the chat, driving great inputs forward), interpreters and the secretariat.

List of acronyms

AI	Active Ingredient
ANC	Antenatal care
DHIS	District Health Information Software
EPI	Expanded Programme on Immunizations
ESPT	Entomological Surveillance Planning Tool
HPLC	High Performance Liquid Chromatography
IRS	Indoor residual spraying
ITN	Insecticide-treated net
IVCC	Innovative Vector Control Consortium
LITE	Liverpool Insect Testing Establishment
LLIN	Long-lasting insecticidal net
NMCP	National Malaria Control Programme
PATH	Program for Appropriate Technology in Health
PBO	Piperonyl butoxide
PMI	President's Malaria Initiative
PQ	Prequalification Programme
QA	Quality Assurance
RBM	Roll Back Malaria
RCT	Randomised Controlled Trial
RFID	Radio-frequency Identification
SBCC	Social and Behaviour Change Communication
SOP	Standard Operating Protocol
STPH	Swiss Tropical and Publish Health Institute
VCWG	Vector Control Working Group
WHO	World Health Organization

Disclaimer

The views and opinions expressed in the Chat are those of the individual presenter and do not necessarily reflect the official policy or position of the Vector Control Working Group of the RBM Partnership to End Malaria or any of its co-chairs, co-leads, coordinator.

Chat from VCWG session 3

Work stream 1: Enhancing the impact of core interventions

20 April 2021, 3:00 PM – 6:00 PM CET

15:01:11 Von Mohan Rao Arasada an Alle : Good morning Hannah
15:01:46 Von Jessica Rockwood an Alle : Good morning all - Jessica Rockwood IPHA
15:01:57 Von Birkinesh Ameneshewa an Alle : Good afternoon all.
15:02:09 Von Andre Laas an Alle : Good Afternoon - Andre Laas, AVIMA, South Africa
15:02:24 Von April Monroe an Alle : Good morning/afternoon, everyone - April Monroe, Johns Hopkins Center for Communication Programs
15:03:09 Von jacobwilliams an Alle : Good morning/afternoon/evening!
15:03:12 Von Gagik Karapetyan an Alle : Hi all. I am Gagik Karapetyan, STA ID, World Vision US, Washington DC
15:03:23 Von Birkinesh Ameneshewa an Alle : Good to be part of this session again. Birkinesh
15:05:37 Von Sian Clarke, LSHTM an Alle : Good afternoon, everyone - Sian Clarke, LSHTM. Greetings from sunny London!
15:06:48 Von Heverton L Carneiro Dutra an Alle : Greetings from Penn State University
15:08:44 Von JMiller an Alle : Hello everyone- Janee Miller, PMI VectorLink
15:13:27 Von Ole Skovmand an Alle : i dont think it is very complicated; Nets were supposed to last 3 years, so campaigns are 3-4 years interval, b ut they only last 2, so after 2 years, half the nets are gone or not effective, so malaria resurge
15:16:43 Von Lina Heltsche an Alle : Kindly ask your questions via the chatbox, adding the word QUESTION in front of them!
15:18:40 Von jacques charlwood an Alle : In Panama I presume most people have electricity - and so they may be awake indoors but in the light (which reduces mosquito biting activity)
15:23:00 Von Neil Lobo an Alle : Thanks Jacques, you are right... exposure was spatially and temporally very different in communities based on the presence of electricity - we measured this as well.
15:24:51 Von Hannah Koenker an Alle : Link to the demo site: <https://mint.dide.ic.ac.uk/>
15:27:32 Von Neil Lobo an Alle : Link to the ESPT:
<http://www.shrinkingthemalariamap.org/entomological-surveillance-planning-tool-espt>
15:28:23 Von Sian Clarke, LSHTM an Alle : QUESTION (Neil Lobo) - Some gaps might be more critical than others. DO your studies overlay variation in human behaviour by hour with variation in vector species and biting intensity by hour?
15:28:24 Von Kate Kolaczinski an Alle : QUESTION to TOM: Can users plug in how long a net lasts in their setting?
15:29:40 Von Olivier Briet an Alle : QUESTION to TOM: (How) do you account for interaction between IRS and LLINs in combinations?
15:30:29 Von Julia Mwesigwa an Alle : Question: Tom does the model have SMC?
15:30:47 Von Ole Skovmand an Alle : Question to Tom: what do you mean by 60 % resistance ?
15:32:00 Von Neil Lobo an Alle : Thank you Sian, you are right. We do exactly what you describe. The data that can be collected is dictated by the funding and capacity at present but always looks at the essential data with the option to include “nice to have” endpoints.

15:32:17 Von Immo.Kleinschmidt@lshtm.ac.uk an Alle : Question to Tom: Will you consider in future upgrades the effect and cost effectiveness of adding reactive focal IRS rather than routine blanket vector control. There is trial evidence of effectiveness of focal reactive approaches

15:32:26 Von Ellie Sherrard-Smith an Alle : hi @kate at the moment we are assuming distributions every 3 years, there is decay in the insecticide efficacy which changes depending on resistance, and there is waning in people using nets. In this first version these are fixed but this is something we could explore

15:33:23 Von Kate Kolaczinski an Alle : @Ellie - ok merci, let's chat!

15:33:31 Von tom churcher an Alle : ANSWER (hopefully) - Kate/Julia - Not yet but hopefully soon as both will be important.

15:34:34 Von Sheila Barasa an Alle : Question to Tom: does the demo incorporate bioefficacy data i.e. mortality of mosquitoes over time

15:36:04 Von tom churcher an Alle : ANSWER - Oliver- Currently parameterised using experimental hut trials. This is mostly independent of one another so needs further validation from studies but our model currently matches the LLIN-IRS RCT from Kagera relatively well.

15:36:22 Von Ellie Sherrard-Smith an Alle : Hi @oli at the moment the interaction is assumed to be multiplicative and works as per Jamie Griffin's original assumptions for the transmission model (these are in this paper: (The US President's Malaria Initiative, Plasmodium falciparum transmission and mortality: A modelling study - PubMed (nih.gov)). For the RCTs we have looked at so far (our validation so far is to see how well we recreate the RCTs), this seems reasonable but happy to chat more on this

15:37:04 Von Ellie Sherrard-Smith an Alle : @julia (SMC would be great to add but not yet)

15:38:08 Von David Gittelman an Alle : For Sarah, do you have a summary document of the country-level activities that you mentioned, as there were no slides to accompany your talk? That would be very helpful, thanks.

15:38:20 Von Hannah Koenker an Alle : Question for Sarah B - could you say more about GRID3 population estimates and how they're constructed? Do they draw from e.g. existing census data spread over the given area, or do they use alternate estimation approaches?

15:38:56 Von JMiller an Alle : @Tom and Ellie- how is routine ANC/EPI and school-based distribution factored in?

15:39:40 Von Ellie Sherrard-Smith an Alle : @Sheila - yes we have used a systematic review of experimental hut data - <https://medrxiv.org/cgi/content/short/2021.04.07.21254306v1> - but this is one of the things we are more uncertain on. But there is waning insecticide over time and this is different depending on the level of resistance we see.

15:40:28 Von Neil Lobo an Alle : Note that the interaction (independent, additive or exponential) between IRS and LLINs can be measured using the ESPT by comparing and measuring the impacts the interventions have on susceptible populations of vectors (along with the exposure to bites)

15:41:23 Von Fredros Okumu an Alle : Question to Tom: Thanks for the great talk. Do you have any comments on the observations that as coverage increases, the return on investment also goes down. How is this incorporated in decision making ? Is it always a good idea to aim for universal coverage?

15:41:42 Von Sheila Barasa an Alle : Thank you Ellie.

15:42:15 Von tom churcher an Alle : ANSWER - Sheila/Ole We use resistance as the % surviving the discriminating dose bioassay. We assume this is constant over the 3 years which is obviously an over-simplification.

15:42:34 Von Corine Ngufor an Alle : To Sarah. You mentioned trials of combinations of PBO nets and IRS. What IRS insecticides are you testing in combination with PBO nets?

15:43:05 Von tom churcher an Alle : ANSWER - Fedros - Great question. Very much agree, cost effectiveness goes down. But at the same time impact goes up.

15:44:00 Von Ellie Sherrard-Smith an Alle : @JMiller at the moment this is not there but we are intending to include mass campaign (each 3 years) and then about 9% or 17% top up for intermittent years to capture ANC/EPI. We would like to include school-based too but not yet included - would be great to talk more!

15:44:19 Von Kate Kolaczinski an Alle : QUESTION Neil/Tom/Ellie/anyone from other modelling groups on here. I realise there isn't complete overlap with what you can use the tools to do, but if you were able to define a question that both tools could be used to explore - would then come up with the same "answer"? Similarly, STPH groups working with several countries - do those models also 'match' ?

15:44:38 Von jacques charlwood an Alle : Presumably house type also affects the utility of IRS. For example mosquitoes do not tend to rest so long in houses with tin roofs and so perhaps IRS should be concentrated in areas where more traditional houses are in the majority

15:44:52 Von Immo.Kleinschmidt@lshtm.ac.uk an Alle : @Fedros and Tom: This is were data driven targeting may give a better return, i.e. low overall coverage, but targeted at the right places

15:46:56 Von Hannah Koenker an Alle : Ellie and Janee, just clarifying that the 9% (of the population) is the number of nets NetCALC Lite recommends for between-campaign distribution for school or community channels. 17% x population is the # of nets recommended annually when mass campaigns are discontinued and school or community channels are the primary distribution channel. It will be great to test this in the model (or multiple models!).

15:48:56 Von tom churcher an Alle : Good ideal Neil, i'll copy it. - <https://mint.dide.ic.ac.uk/>

15:48:59 Von Fredros Okumu an Alle : Neil, you suggest starting from the key question to optimize data use. Do you think ESPT-based activities can also reveal new insights without NMCPs having any prior questions? Are there some of these indicators that you would consider applicable everywhere?

15:49:26 Von Nakul Chitnis an Alle : Kate - this is Nakul from Swiss TPH. When making model comparisons, we've usually found that we get qualitatively similar results, but the quantitative results are different. How different they are, depends on the exact assumptions we put in.

15:49:27 Von Tara Seethaler an Alle : Adding to Neil's response, we've found the ESPT very easy to operationalize in a number of different countries. Enormously helpful!

15:49:45 Von Ellie Sherrard-Smith an Alle : @hannah - thank you. Before we simulate this will double check! :)

15:49:58 Von Neil Lobo an Alle : Thank you Tara!!

15:50:12 Von JMiller an Alle : @Ellie- yes- t2hanks-happy to talk more! Jmiller@psi.org

15:50:25 Von Kate Kolaczinski an Alle : Thanks Nakul!

15:52:05 Von tom churcher an Alle : Very much agree with Nakul. Models might differ but it is only really important if it changes your decision. Most of the time they don't, if they do then it is a good time to explore how it does.

15:52:15 Von Justin (Video) an Alle : Question to Tom: do you see a use of MINT (or adaptation of it) for new product design? (eg. value to add known sub-lethal effects to certain intervention types)?

15:53:22 Von Neil Lobo an Alle : Thanks Fred, you are right. Since the ESPT relies of the program to take charge and figure out what needs to be done. And yes... the NMCP ALWAYS have questions/suggestions and thought that I never think about. They know what is happening. and, yes, based on the question, some indicators are applicable everywhere

15:53:23 Von Birkinesh Ameneshewa an Alle : To Fedros: What does cost effectiveness include or which factors are included to quantify?

15:54:38 Von Neil Lobo an Alle : retying this.... fat fingers!!! Thanks Fred, you are right. The ESPT relies on the program to take charge and figure out what needs to be done. And yes... the NMCPs ALWAYS have questions/suggestions and thoughts that I never think about. They know what is

happening far more than me. And yes, based on the question, some indicators are applicable everywhere

15:54:46 Von tom churcher an Alle : Answer - Justin - We haven't but we think we could for products we have a good idea of how they work. For example new IRS or LLINs could be trialled in these using hut trial data to make decisions on whether to progress. They could be used to see what price would make them cost-effective com

15:55:51 Von Justin (Video) an Alle : Thanks Tom - lets talk.

15:57:53 Von Anne Wilson an Alle : IVM recommended stratification a long time ago

15:58:05 Von Michael Macdonald an Alle : Has not been done before because DDT eradicated all the entomologists

15:59:09 Von jo lines an Alle : We are at a different stage: 15 years ago we were just worrying about doing SOMETHING effective everywhere. Great we are now ready to acknowledge diversity of settings.

15:59:41 Von Lina Heltsche an Alle : Click on the interpretation button to change between French and English!

16:01:11 Von jacobwilliams an Alle : there are two English interpretations. our cup running over? :)

16:01:40 Von JMiller an Alle : :)

16:09:10 Von Maurice an Alle : MID=LLINs and CAID=IRS

16:14:15 Von Ole Skovmand an Alle : question to Sahara: how big was the problem of alternative use of LLIN and what was this use ?

16:16:19 Von Olivier Briet an Alle : Question vers Saraha: pourrait-il etre plus cout-efficace d'ameliorer l'usage des MIDs par rapport a la combinaison MID-CAID? (Translation: Could it be more cost-effective to improve LLIN use compared to the LLIN-IRS combination?)

16:19:18 Von NMCD an Alle : Qn to Sarah, What was net coverage and use in both arms? Your conclusion of using both IRS and LLINs, Do think this will be cost effective? If you have done cost effective study of this please share your findings

16:20:02 Von jo lines an Alle : Could you PLEASE quote ACCESS figures here as well? Without these, people tend to assume that the problem is about behaviour. But historically, the data consistently show that lack of access is much more important than people not-using-accessible-nets

16:21:14 Von Ole Skovmand an Alle : qestin to Julia: whatever the Reason, use of std LLIN was low compared to the two new nets, so how do you compare effects of nets when use rate is so different ?

16:21:32 Von Ole Skovmand an Alle : *for Burkin a, sorry

16:21:51 Von jo lines an Alle : Thats why I think we need the differential access figures!

16:23:01 Von Mohan Rao Arasada an Alle : Agreed Joe. Good presentation like in earlier session

16:23:13 Von Sian Clarke an Alle : QUESTION 1: why is net utilisation so low in Burkina Faso, Nigeria and esp Rwanda (<5%!!)? Few nets distributed or nets available but not used? QUESTION 2: Any difference in user preference between the three types of nets?

16:23:14 Von Corine Ngufor an Alle : Julia, What did you do in Burkina Faso to increase net use in such a dramatic way.

16:23:37 Von Sola Oresanya an Alle : Nice presentation.

16:23:58 Von Basilianna an Alle : Great presentation

16:24:07 Von Kate Kolaczinski an Alle : Important to note for the Burkina and Rwanda data for '19 - '20: the 'areas of different net types' are areas where families received these different net types in the most recent campaign - but not necessarily where families are fully using these different net types yet (i.e. families of course move gradually from using previously own/stored nets - to newly received nets in some staggered fashion).

16:24:20 Von Mary Kante an Alle : Merci Saraha pour une présentation très intéressante. Pour le défi noté de l'utilisation des MII, les résultats MIS et MICS montrent les taux de possessions vers 80% en 2016 et 78% en 2018 et le taux d'utilisation parmi ceux qui possèdent au delà de 92% qui est noté le plus élevé de tous les pays. Pour le taux noté bas dans l'étude, quel est le taux et pourquoi il été bas par rapport aux taux national. <https://breakthroughactionandresearch.org/resources/itn-use-and-access-report/madagascar/> [Translation: National ITN ownership is 80% and 78% in MIS and MICS and the Use:Access ratio is above 92% and noted as the highest in the world. So would be helpful to understand why it is noted as low in the study area, and to know what the % is in the study zone.]

16:24:34 Von jo lines an Alle : It will be interesting to see these tables again when there are sporozoite data for the separate species.

16:26:21 Von Sola Oresanya an Alle : I agree we need the data on net access. What were the criteria for selecting the districts and assigning the type of nets to be studied in them? How similar/different are these districts in terms of geographic locations?

16:26:26 Von michael.coleman an Alle : It would be interesting to compare these tables to the original base line data where available such as Northern Mozambique. What has the impact been etc.

16:27:15 Von Monique MURINDAHABI an Alle : To Kate: especially that in Rwanda, the country distributed the first time rectangular nets as previous distributions it was conical nets

16:27:40 Von Kate Kolaczinski an Alle : Yes - Hi Monique!

16:28:14 Von Amelia Bertozzi-Villa an Alle : <https://www.researchsquare.com/article/rs-199628/v1>

16:28:48 Von Sian Clarke an Alle : QUESTION: There seems to be a difference in species composition at baseline between districts where different types of nets deployed (for several of the countries presented). Was this deliberate? If not deliberate, how will you account for this in future comparisons between net types?

16:29:29 Von Monique MURINDAHABI an Alle : To Sahara: thank you for the presentation: just to try to understand the prevalence of malaria in 2020 in Karongi district where they distributed nets and did IRS which showed its impact in reducing malaria incidence

16:30:00 Von Monique MURINDAHABI an Alle : Hi Kate-. Nice to connect again!

16:30:43 Von Joe Wagman an Alle : @ Jo lines - absolutely, access and use-given-access estimates will provide important context for the formal analyses and guide how to interpret them. Also

16:31:15 Von Julia Mwesigwa an Alle : @Sian we present utilization from Mozambique and Nigeria from baseline survey before the mass net distributions.

16:31:18 Von jo lines an Alle : This is lovely stuff, Amelia!!

16:34:38 Von tom churcher an Alle : Great talks Saraha, Julia/Jo and Amelia!

16:36:06 Von tom churcher an Alle : QUESTION - Amerlia - Really nice. Do you explicitly chart net age? Also is routine ANC EPI inputs included?

16:37:27 Von Immo.Kleinschmidt@lshtm.ac.uk an Alle : Are we surprised that progress in reducing malaria cases and deaths has stalled if access to the primary prevention remains so low? (Sorry a rather non-specific comment)

16:37:58 Von Valentina Buj an Alle : Were you able to include any SBCC interventions aligned to the net retention issue?

16:39:22 Von Amelia Bertozzi-Villa an Alle : @tom— we don't do modeling on differential net age as an input at the moment, but we'd like to. ANC and EPI distributions are captured in the inputs, however

16:40:11 Von Amelia Bertozzi-Villa an Alle : @Kate absolutely, abertozzivila@idmod.org

16:40:56 Von Olivier Briet an Alle : Question to Amelia, would your model / data sources allow investigating whether / how net supply influences net retention? I imagine net retention times being

lower when new distributions are there to push out the old nets, and higher when there is an expectation that it will be a while until the next distribution. Would be really nice to quantify this!

16:41:03 Von jo lines an Alle : Question for Amelia: Do you have this over time? I have been wanting someone to look at the association between the scaling up of coverage 2007-2015, which happened quickly in some places slowly in others, and the appearance and spread of resistance (incl the foci where resistance was first reported). I suspect we will see evidence that it is this scaling-up that really accelerated resistance evolution. In other words: (a) resistance happens at large scale, and (b) universal coverage' really means 'zero refugia' and as we close coverage gaps, we will see that evolution accelerate even more.

16:43:07 Von Amelia Bertozzi-Villa an Alle : @jo— yes! Net use by year is already available on the MAP site (link incoming), and the other metrics will be published with the paper. Reach out if you need them sooner!

16:43:28 Von Hannah Koenker an Alle : I can confirm that for Mozambique, ITN access was low and that use-given-access was largely good - the baseline occurred just before the mass campaign, thus reflecting net access and use 3 years after the previous campaign...we can see that these indicators fall super low before nets are replaced, in the absence of other distribution channels apart from ANC.

16:43:33 Von Joe Wagman an Alle : Another question for Dr. Saraha - which ITNs and which IRS products were used in the study areas?

16:45:04 Von Mary Kante an Alle : Merci Saraha pour la clarification par rapport au zone de l'étude

16:45:40 Von jacques charlwood an Alle : Rather like the colour of the Model T ford (as Henry Ford said 'You can have any colour as long as it is black') people are not given any choice of their favorite colour for a net (I realize done to reduce costs but in a small study in Mozambique we offered people different colored nets and there was a clear preference for pink, followed by blue and then green). Increasing the possibility of choice might increae sage.

16:45:50 Von Amelia Bertozzi-Villa an Alle : <https://malariaatlas.org/explorer/>, select malaria risk/intervention/Insecticide treated bednet (ITN) use version 2020

16:47:15 Von Joe Wagman an Alle : @ Sian, and others - No, the diversity in vector composition and malaria burden was not intentional. The distribution of net types was determined in-country by NMCPs, and study districts were selected afterwards with a goal of selecting districts that were as contiguous as possible and as similar as possible

16:47:55 Von NKUNI an Alle : Thanks Amelia for the link.

16:48:39 Von Anthony Nuwa an Alle : Great Presentations, Saraha, Joe and Amelia

16:51:18 Von Saraha (NMCP Madagascar) an Alle : Thanks to all for your interest!

16:57:11 Von Ole Skovmand an Alle : how does the Stream lined durability handle attrition rate when evaluating net parameters of those still present ?

16:59:21 Von jo lines an Alle : So you start with the record of nets given out in the first place, and you observe how many of those you have to try to locate, in order to find 45 that are still present. Correct? If so then isn't it still a direct observation of attrition? It's just that you are fixing the numerator not the denominator?

17:00:13 Von John Lucas an Alle : Will bioassay tests include tunnel tests to allow permethrin based LNs to be evaluated as it is well known that permethrin LNS have a significant f bite inhibition component that is more accurately determined in tunnel tests while cyano pyrethroids have a stronger killing effect that is generally better evaluated in cones

17:00:22 Von Olivier Briet an Alle : Question to Stephen: Bioassays are difficult to standardize across different labs (countries) and even between years, resulting sometimes in higher bioefficacy estimates in older nets than in newer nets. Are they the most efficient indicator to retain in streamlined monitoring?

17:00:57 Von Tara Seethaler an Alle : HI Stephen, thanks for your presentation! Could you share how much of the monitoring proposed is in addition to the minimum recommended by WHO, as well as estimated costs to follow this approach?

17:01:13 Von Bolanle Olapeju an Alle : For those interested in accessing national and subnational ITN use/access trends, the PMI funded www.itnuse.org might be useful. Click/select your country of interest for more ITN insights.

17:01:53 Von Konstantina Boutsika an Alle : All presentations are uploaded on the Attendees Hub. Check them out!

17:02:00 Von jo lines an Alle : I strongly agree that we need streamlined methods. But doesn't the evidence say that attrition is the most important cause of loss of protection?? I thought so. So I'd rather see a method that give more precision on attrition and less on the other factors.

17:02:08 Von Fredros Okumu an Alle : In addition to @Olivier Briet's question, should these bioassays be done using susceptible or pyrethroid-resistant mosquitoes?

17:02:52 Von Aurélie Delbaere an Alle : thank you for the nice presentation. how the results from durability monitoring could inform procurement decision-making ?

17:03:29 Von jo lines an Alle : Always susceptible, Fredros. We are measuring the ageing of nets. Whether nets still kill the resistant ones is a key question but needs to be measured separately, to avoid confusion.

17:04:52 Von Kate Kolaczinski an Alle : @ Jo / Fredros: for PBO nets or other nets designed to kill resistant mosquitoes, I would suggest the bio-efficacy testing would ideally include resistant strains (once standard methodologies are available) in order to measure chemical durability of all net components not just the pyrethroid part.

17:05:24 Von Kate Kolaczinski an Alle : (as well as, though, not instead of susceptible)

17:07:06 Von Stephen Poyer an Alle : Thanks for all the questions. A couple of cross-cutting responses and I'll ask Allan to raise the others during the Discussion.

On bioassay methods: Stay tuned for the presentation from Rosemary and Natalie on consensus SOPs... but yet, susceptible and resistant mosquitos are used, with defined characterisation methods; I believe tunnel tests will be recommended for 'failed' cone tests in the consensus SOPs.

17:07:12 Von jo lines an Alle : @Aurélie: please direct your question to the Global Fund. I have been trying for 16 years to get them to justify why they fail to take durability data into account in procurement.

17:07:30 Von Jackline an Alle : @Fredros: For pyrethroid LLIN we can use susceptible strain but If the net has two A.I. I think better to use both resistance and susceptible strain

17:07:31 Von Rosemary Lees an Alle : @Jo / Fredros and Kate: With I2I I am working on some guidelines for characterising a resistant strain to be used for monitoring efficacy of the second insecticide. I would agree with Kate and suggest using a susceptible strain to test the pyrethroids and a resistant strain to test the second insecticide.

17:08:06 Von Rosemary Lees an Alle : @Stephen: snap!

17:09:20 Von Sheila Barasa an Alle : Question to Stephen: have you found a way of comparing bio-efficacy and chemical content data? do we always have to measure both?

17:09:25 Von Stephen Poyer an Alle : @Jo: Attrition is very important. The standard DM approach does a good job of capturing robust attrition data, I believe.

@Rosemary - Indeed!

17:10:03 Von jo lines an Alle : @sheila: excellent Q.

17:12:18 Von Stephen Poyer an Alle : @Sheila - As I'm not one of the DDT-threatened entomologists (or a chemist) I will ask colleagues to share their thoughts on that question as my crude "Not yet" is probably not sufficient!

- 17:14:58 Von Garth Drury an Alle : Standard setting should be set by the buyers/users - not (exclusively) the manufacturers. There is always the tendency to try to set standards which permit own products to pass, but block competitors to reduce or eliminate competition. The upshot is higher end-user prices, not more effective nets on the ground.
- 17:15:26 Von Sheila Barasa an Alle : Thanks Stephene :)
- 17:18:13 Von jo lines an Alle : @Garth and @Aurelie: the problem is that our market is
- 17:20:55 Von Ole Skovmand an Alle : question to Rose mary: to name a net a dual AI net, what is the criteria for the presence and bioavailability of the two insecticides over time to call it a dual ai net or a at-least-at-start-dual-ai-net ?
- 17:23:56 Von Angus Spiers an Alle : @garth I agree that standard setting shouldn't be on the manufacturers, but in terms of suggesting methods to best define their new products, I think the onus should be on them and their research partners to present suggested methods to evaluators to help with robust assessment.
- 17:24:39 Von jo lines an Alle : Our market is oligopsony, and the dominant buyer (>60% of all nets I think) boasts of being "financial not technical". Hence our "fire and forget" habit. GF sees no obligation to track the performance of the products it buys. When manufacturers think of how to win a bigger market share, they do not think "I know, I'll build a better net". One of them tried to do so once (2009-ish) and got badly burned. Current GF procurement practice creates an incentive to make non-durable nets.
- 17:25:21 Von Johnson Ouma an Alle : @Rosemary Rees: did you include net manufacturers as stakeholders?
- 17:26:50 Von Garth Drury an Alle : @Angus - agreed on method proposition with the originator, and this does not prevent objective (or user-led) standard setting based on outcomes (e.g. malaria suppression in a given region).
- 17:27:38 Von Steve Harvey an Alle : Jo Lines: Yes, lowest common denominator. Though I understand recently GF is saying they will fund more than the bare basics net if NMCPs present data to show recipients are more likely to use the better net. They specify that the data must measure actual use, not just preference.
- 17:30:05 Von Mark Hoppé an Alle : We need to be careful that consensus S.O.P.s don't set de facto product specifications, and so inhibit innovation
- 17:30:17 Von jo lines an Alle : Yes, Steve. This is rather bizarre.
- 17:31:32 Von Angus Spiers an Alle : @Mark Hoppe I agree. SOPs should follow the data requirements for the product. I think what you are describing is the situation we are in now for nets
- 17:31:38 Von Jacques Charwood an Alle : It would be interesting to know if attrition rates of nets differed between people who had purchased their net compared to people to whom nets were donated! Not likely to be available though.
- 17:32:12 Von Jacob Williams an Alle : Mark; great point there
- 17:32:36 Von Garth Drury an Alle : @Jo: Good point: "Our market is oligopsony, and the dominant buyer...boasts being "financial not technical"."
- 17:33:00 Von jo lines an Alle : Yes, but Aurelie's question stands: will all these SOPs alter procurement preferences of products that "have a WHO recommendation"? Or are they to be part of the requirements to get that recommendation? I missed this point.
- 17:33:17 Von Mark Hoppé an Alle : For how long has the requirement for significant 60 minute knock down delayed innovation?
- 17:34:25 Von Steve Harvey an Alle : Jacques - could be done if it hasn't been. Would need to identify settings where there are active private markets for nets.
- 17:34:39 Von Ole Skovmand an Alle : will the net durability group take up the predictive index of durability published a few months ago and try to validate it?

17:34:43 Von jacques charlwood an Alle : Be good to have a net that killed Culex quinquefasciatus - that would get people using them

17:36:21 Von jacques charlwood an Alle : More power to you!!

17:36:37 Von Michael Macdonald an Alle : Question to group: In terms of increasing use of ITNs, is there room to consider strategies to convert popular but untreated nets in the market (common in many countries) to ITNs?

17:39:13 Von jo lines an Alle : Thank you Mark: WHO standards CAN inhibit innovation. That's why we are still using products that are almost exactly the same as in 2004. Technology is frozen in time. This not about barriers to new paradigms, its about the small-incremental-improvements that you would expect in a new technology. Think of ball-point pens!

17:39:55 Von Philip Okoko an Alle : When we have 6 different types of pyrethroid/PBO nets of varying concentrations, what do we use as a standard in such circumstances? are we supposed to rely more on bioefficacy results rather than insecticide concentration or both?

17:40:33 Von Philip Okoko an Alle : Also a challenge here is that they are all WHO PQ

17:41:04 Von Ole Skovmand an Alle : you can actually measure what is bioavailable at the surface, which is more relevant than what is inside the coat, inside the yarn, or inactivated at the surface

17:41:43 Von JMiller an Alle : @Michael- would that be the net retreatment kit? the d-I-y kit?

17:42:34 Von Ole Skovmand an Alle : hi Michal, there are almost polymerized coatings that do not need heat or UV curing to provide wash resistance; still, they are not as good as those cured

17:43:23 Von Steve Harvey an Alle : Has anyone looked at why people buy untreated nets? I think we all assume that it's because they're cheaper, but has anyone explored this systematically?

17:44:09 Von Michael Macdonald an Alle : Not necessarily a DIY - are there technologies to treat at the wholesale level, eg the old DawaPlus technology

17:45:00 Von Ole Skovmand an Alle : but what i suggested was the Bayer method for making not a LLIN but a longer lasting net

17:45:34 Von Ole Skovmand an Alle : or was it Syngenta

17:46:15 Von Ole Skovmand an Alle : so a dipping kit, just better than the old ones by having a binder

17:46:23 Von jo lines an Alle : It was Bayer.

17:46:45 Von JMiller an Alle : And syngenta

17:47:14 Von Mohan Rao Arasada an Alle : Thanks to All.

17:47:21 Von Melinda Hadi an Alle : @Stephen in streamlining monitoring what is VectorLink plan to publicly report/communicate data? e.g., public database / repository?

17:47:30 Von jo lines an Alle : We are working on how to choose which LLIN to buy given the local resistance situation: an advance on Tom & Ellie's system of generalisation from expel hut studies.

17:48:31 Von jacobwilliams an Alle : Steve. Most who buy untreated nets, are looking to have a good night sleep without bites (Barrier effect of net). so for them it is a no brainer buying a cheaper untreated nets. they are okay with just swatting the mosquito when moving about the room during the night. in short, the risk perception of getting malaria and or its impact is very low (" we've been living with malaria all our lives" kind of attitude)

17:48:43 Von jacques charlwood an Alle : Thank you for an interesting meeting and especially to Konstantina!

17:48:52 Von Ole Skovmand an Alle : i think the method we use to determine surface concentrations is not more expensive than other chemical methods

17:49:25 Von jo lines an Alle : @Philip: exactly. The problem is that — unless I missed something, which is possible — WHO have already said that PBO nets will all be considered in the same category for procurement purposes, and this in turn means that GF will treat them as technically identical (it pretends that this is what WHO means when it puts them together in a category). And since these

very diverse nets are considered technically identical (despite evidence to the contrary), they will be bought according to the lowest unit price (GF will insist they are legally obliged to do this).

17:51:37 Von Kate Kolaczinski an Alle : @Jo @ Philip: we are funding two sets of studies to look at the non-inferiority of the PBO nets, in order to understand this a bit better. Imperial also supporting on overarching analysis. Those data will be shared with WHO for their consideration during the Summer.

17:51:44 Von Steve Harvey an Alle : Jacob: Thanks - yes, that is part of what we all assume - my question is whether anyone has asked buyers systematically to confirm (or not) our assumptions.

17:52:32 Von Kate Kolaczinski an Alle : @all who would like more detail on how TGF does procurement - happy to talk or direct to colleagues as appropriate:
kate.kolaczinski@theglobalfund.org

17:52:59 Von Garth Drury an Alle : It is funny how PBO has come back around, after banging around for potential use on ITNs nearly 20 years ago (and quite possible before then)!

17:53:11 Von Stephen Poyer an Alle : @Melinda PMI VectorLink will maintain the durabilitymonitoring.org website and continue to add study reports and datasets to this site for standard and streamlined DM studies.

17:53:12 Von jo lines an Alle : @Kate: you mean WHO will be asked to say “this is a 2.2 year net, that is is a 2.6 year net”?

17:53:33 Von jo lines an Alle : Yes that’s good Stephen thanks.

17:54:12 Von Angus Spiers an Alle : I'm not sure you can get that specificity Jo. But the recent papers from NIRI and Albert do give some good guidance on how to quantify durability

17:54:32 Von Steve Harvey an Alle : @kate: Where would we find GF written procurement specifications?

17:54:47 Von tom churcher an Alle : Thanks all, especially to Konstantina, Hannah and Allan. Great session!

17:54:51 Von Philip Okoko an Alle : @Kate thanks for this additional information. It will be interesting to see the outcome of this study as it will guide countries on best fit nets for their local situations as well as manufacturers to improve on [product quality

17:54:52 Von Steve Harvey an Alle : & where something other than lowest price can be considered.

17:55:11 Von Angus Spiers an Alle : Thanks all, great session

17:55:36 Von Konstantina Boutsika an Alle : Thanks a lot for attending session 3 :-)

17:55:42 Von Rosemary Lees an Alle : Thank you very much Hannah and Allan, and presenters, really interesting discussion!

17:55:44 Von Erin Foley an Alle : Thank you all for a great session and discussion

17:55:45 Von Molly Robertson an Alle : Thanks all. Thank you Hannah and Allan!

17:55:45 Von Garth Drury an Alle : Thank you to Hannah, the panel and the incredible Konstantina!

17:55:45 Von JMiller an Alle : Thanks so much Hannah, Allan and presenters et al!

17:55:46 Von jacobwilliams an Alle : Steve: systematically no. But direct discussions (albeit haphazard) with many households over many years across several countries in sub-Saharan Africa. I agree, a formal study may would be worthwhile

17:55:52 Von jo lines an Alle : Thanks Hannah

17:55:54 Von Amelia Bertozzi-Villa an Alle : Thank you Hannah and team!

17:55:54 Von Philip Okoko an Alle : Thanks to all presenters. Its been an enlightening session

17:55:59 Von Joe Wagman an Alle : Thanks everyone - been a great meeting so far!

17:56:00 Von Amelia Bertozzi-Villa an Alle : And Allan :)

17:56:06 Von Kate Kolaczinski an Alle : @steve:

https://www.theglobalfund.org/media/5873/psm_procurementsupplymanagement_guidelines_en.pdf?u=636651116780000000. However - the national malaria programme ultimately define the

specifications, this dog gives the parameters within which those should fall to be supported by TGF financing.

17:56:07 Von Cheikh Tidiane DIAGNE an Alle : Thanks ! Interesting !

17:56:08 Von Lilia Gerberg an Alle : Thanks to the chairs and presenters! And for the robust chats.

17:56:11 Von jacobwilliams an Alle : fantastic meeting. thanks all. and to Konstantina the super star!!

17:56:12 Von Natacha Protopopoff an Alle : thank you

17:56:13 Von Garth Drury an Alle : Bye all!

17:56:13 Von Larry Norton an Alle : Thank you all presenters and great discussions.

17:56:14 Von Stephen Poyer an Alle : @Steve - we (PSI) could see if we can look at this in SEA.

17:56:14 Von Kate Kolaczinski an Alle : @Jo - no

17:56:14 Von jo lines an Alle : Put chat online please

17:56:17 Von Sola Oresanya an Alle : Thank you

17:56:19 Von Gagik Karapetyan an Alle : Thanks all

17:56:29 Von Hervé Raoul TAZOKONG an Alle : Thanks

17:56:32 Von Willy Ngulube an Alle : Thank you all

17:57:01 Von Vasanthan Paul John an Alle : Thanks everyone

17:57:02 Von Steve Harvey an Alle : Thanks, Hannah, Wilson, and Konstantina - great session.

17:57:32 Von Kate Kolaczinski an Alle : @Philip - yes. One study finished , one still underway.

17:57:53 Von Steve Harvey an Alle : @Stephen - Also an important factor in E & Southern Africa.