Malaria Decision Analysis Support Tool (MDAST): Evaluating Health, Social and Environmental Impacts and Policy Tradeoffs

PROGRESS REPORT FOR THE PERIOD:
JANUARY 1, 2012 – OCTOBER 31, 2012

Submitted to: WHO-AFRO, MDAST Executing Agency
Contact Person: Dr. Birkinesh Ameneshewa

Submitted by Duke University and University of Pretoria on behalf of the project partners shown below:

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<thead>
<tr>
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<th>Contact Researcher</th>
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INTRODUCTION TO THE PROGRESS REPORT FOR THE PERIOD OF JANUARY 1 – OCTOBER 31, 2012

PROJECT BACKGROUND:

The Malaria Decision Analysis Support Tool (MDAST) project is working to improve the protection of human health and the environment by promoting sustainable malaria control strategies that are consistent with the successful implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs). The project has been developed in a collaborative manner with various stakeholders involved in POPs implementation and malaria control policy making and implementation, and responds to a need for capacity building for improved policy formulation. The aim of the project is to promote evidence-based, multi-sectoral malaria control policy-making in Kenya, Tanzania, and Uganda, serving as a pilot for other malaria-prone countries. The project employs a comprehensive framework to assess the full range of health, social, and environmental risks and benefits associated with alternative malaria control strategies.

To accomplish this goal, the project is focusing on achieving four main outcomes:

(1) Development of a Malaria Decision Analysis Support Tool (MDAST) that jointly incorporates health, social and environmental priorities for malaria control in Kenya, Tanzania, and Uganda.

(2) Increased capacity for evidence-based malaria control policy making through the regular use of MDAST in Kenya, Tanzania, and Uganda.

(3) Creation of an agenda for policy-relevant malaria research through development of MDAST and identification of key knowledge gaps.

(4) Elucidation of requirements for replication of MDAST in other malaria-prone countries around the world.

These outcomes are being pursued through a range of activities including stakeholder and expert consultations, conceptual modeling, policy dialogue workshops, training and information sharing, partnership building, incentives analysis, and identification of knowledge gaps and research priorities. The project is establishing an inter-disciplinary network of practitioners and policymakers, and is building research, monitoring, and analytical capacity to make more informed decisions about alternative approaches to malaria prevention and treatment.
NARRATIVE OF WORK CARRIED OUT DURING THE PERIOD JANUARY 1 – OCTOBER 31, 2012:

The project partners continued to make excellent progress on project activities during the third year of the Malaria Decision Analysis Support Tool (MDAST) project. Activities were undertaken in this phase according to the Year Three Workplans, which were defined based on the schedule of activities laid out in the project proposal. Thus, during the third year of the MDAST project, the focus has been primarily on Activities 4, 5, 6, and 7. Activity 4 concerns engaging in country-specific training, testing, and refinement activities; Activity 5 is to use country-specific MDAST modeling in value of information (VOI) analyses; Activity 6 relates to disseminating project results and lessons learned; and Activity 7 pertains to developing guidelines for replication in other countries.

Specifically, in the period of January 1 – October 31, 2012, the project partners accomplished the following:

1) Co-organized, co-conducted, and reported on the 2012 Stakeholder Workshop & Training Series;

2) Participated in and reported on the Third Regional Steering Committee meeting;

3) Continued to refine the MDAST tool, including the incorporation of feedback elicited from key stakeholders and the Steering Committee during evaluative workshops, trainings, and meetings (Activity 4);

4) Further developed and presented on value of information analyses (Activity 5);

5) Worked to disseminate project results and lessons learned, including through the launch of the MDAST website, developing templates for partners to present on MDAST, further development of publications, and presentations at conferences (Activity 6);

6) Worked to establish the foundation for developing guidelines for replication through continuing to document the process of developing MDAST in the three project countries and identifying common challenges and methods for addressing these (Activity 7).

This Progress Report contains sections which detail the progress made on these activities and associated deliverables. The sections of this report are:

- Report on the 2012 Stakeholder Demonstration & Training Workshops
- Report on the Third Meeting of the MDAST Project Steering Committee
- Key Model Developments in Year 3 (2012)
- Status of Value of Information Analyses
- Update on MDAST Dissemination Activities
- Remaining Project Activities
# TABLE OF CONTENTS

- Introduction to the Progress Report .......................................................... Page 2
- Report on the 2012 Stakeholder Demonstration & Training Workshops ...... Page 5
- Report on the Third Meeting of the MDAST Project Steering Committee ... Page 38
- Key Model Developments in Year 3 (2012) ................................................. Page 51
- Status of Value of Information Analyses ................................................... Page 58
- Update on MDAST Dissemination Activities ........................................... Page 60
- Remaining Project Activities ................................................................. Page 64
REPORT ON THE 2012 STAKEHOLDER DEMONSTRATION & TRAINING WORKSHOPS

Submitted to: WHO-AFRO, MDAST Executing Agency
Contact Person: Dr. Birkinesh Ameneshewa

Submitted by: Duke University and University of Pretoria
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INTRODUCTION

This report summarizes the background, objectives, activities, and outcomes of the Malaria Decision Analysis Support Tool Demonstration and Training Series held in April 2012 in Kenya, Uganda, and Tanzania. The series had great success in further engaging a range of stakeholders in the review and initial use of the tool, raising enthusiasm for MDAST as well as eliciting further valuable feedback on the model from its targeted potential users.

The Malaria Decision Analysis Support Tool (MDAST) project involves a broad range of collaborators and stakeholders engaged in the development of a comprehensive, evidence-based framework to assess the full range of health, social, and environmental risks and benefits associated with alternative malaria control strategies. The 2012 MDAST Demonstration and Training Series was organized by collaborators based in each of the three project countries (at the Vector Control Division in Uganda, the Division of Malaria Control in Kenya, and the National Institute of Medical Research in Tanzania) as well as collaborators at Duke University, the University of Pretoria, and the WHO, and engaged a wide variety of stakeholders from a range of government sectors as well as other relevant private and non-profit organizations.

After providing a brief background on the project, this report details the methodology behind the 2012 Demonstration and Training Series, including objectives and format. The report then summarizes key points from the demonstration and training sessions, noting themes in common across the workshops as well as distinct insights gained from the activities in each of the countries. The report concludes by reviewing both the successes as well as the lessons learned from the series, including areas for continued development of MDAST. The appendices include participant lists, training materials, and results and preliminary analysis of the evaluation questionnaires administered at the close of each session.

The aim of the Malaria Decision Analysis Support Tool (MDAST) project is to promote evidence-based, multi-sectoral malaria control policymaking in Kenya, Tanzania, and Uganda, serving as pilot for other malaria-prone countries. The project employs a comprehensive framework to assess the full range of health, social, and environmental risks and benefits associated with alternative malaria control strategies. These project activities are carried out in partnership by collaborators based in each of the project countries (at the Ministry of Health in Uganda, the Ministry of Health in Kenya, and the National Institute of Medical Research in Tanzania) as well as collaborators at Duke University and the University of Pretoria. The project has been developed in a collaborative manner with multiple stakeholders involved in malaria control policy making and implementation. It responds to a need for capacity building for improved policy formulation in malaria control. The project has the following specific objectives:

1) To develop a Malaria Decision Analysis Support Tool (MDAST) that jointly incorporates health, social and environmental priorities for malaria control in Kenya, Tanzania, and Uganda;

2) To increase capacity for evidence-based malaria control policy making through the regular use of MDAST in Kenya, Tanzania, and Uganda;
To create an agenda for policy-relevant malaria research through development of MDAST and identification of key knowledge gaps;

4) To elucidate requirements for replication of MDAST in other malaria-prone countries around the world.

To accomplish these goals, it is important to engage a wide range of stakeholders in the project countries through interviews, surveys, workshops, and trainings.

**METHODOLOGY OF APRIL 2012 STAKEHOLDER DEMONSTRATION & TRAINING SERIES**

The aim of the 2012 MDAST Demonstration and Training Series was to demonstrate, train, and gain expert feedback on the current version of MDAST from key stakeholders in order to assess the model and strategies for its dissemination and implementation. The demonstration and training sessions were organized by collaborators based in each of the project countries (at the Vector Control Division in Uganda, the Division of Malaria Control in Kenya, and the National Institute of Medical Research in Tanzania) as well as collaborators at Duke University, the University of Pretoria, and the WHO. Relevant ministries within government including health, environment and agriculture, as well as representatives of district level governments, where appropriate, were invited to participate in the stakeholder workshops. In addition, participation was sought from other relevant organizations.

**DEMONSTRATION AND TRAINING SERIES SCHEDULE**

The workshops were held as follows:

<table>
<thead>
<tr>
<th>Country Workshop:</th>
<th>Workshop Venue:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>icipe Headquarters, Nairobi</td>
<td>April 23, 2012</td>
</tr>
<tr>
<td>Uganda</td>
<td>Imperial Resort Beach Hotel, Entebbe</td>
<td>April 25, 2012</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Centre for Enhancement of Effective Malaria Interventions (CEEMI), Dar es Salaam</td>
<td>April 27, 2012</td>
</tr>
</tbody>
</table>
• **Group photograph in Nairobi:** Monday, April 23, 2012

![Group photograph in Nairobi](image)

• **Group photograph in Entebbe:** Wednesday, April 25, 2012

![Group photograph in Entebbe](image)

• **Group photograph in Dar es Salaam:** Friday, April 27, 2012

![Group photograph in Dar es Salaam](image)

See *Appendix 1* for a list of participants in each of the workshops.
OBJECTIVES

The objectives for holding the workshop and training sessions were:

1. To demonstrate the use of MDAST to key stakeholders using different scenarios of malaria control interventions, disease epidemiology, and social factors;

2. To provide in-depth training on how to use MDAST to key persons in each participating country;

3. To elicit additional stakeholder feedback regarding the latest version of MDAST, and further inputs leading to refinements of the tool;

4. To engage stakeholders in discussion on strategies for implementation and dissemination of the tool.

These objectives were agreed upon by all collaborating institutions in advance of the series and were presented to stakeholder participants a few days prior to the workshop in each country. The clear definition of these objectives guided the appropriate design and scope of the sessions towards achieving the desired outcomes outlined below.

EXPECTED OUTCOMES

The expected outcomes of the Demonstration and Training Workshop Series were:

1. Use of MDAST demonstrated to key stakeholders;

2. Key persons in each participating country trained on how to use MDAST;

3. MDAST evaluated and requirements for refinement identified;

4. Refinement of tool dissemination and implementation strategies based on stakeholder input.

The first three of these outcomes were successfully addressed during the Series while establishing the framework for and value of potential further exposure, evaluation, and training opportunities in the future (e.g., reaching a broader audience of additional stakeholders, and increasing reach and depth of training for interested users). Progress on the fourth outcome was initiated during the Series and continues to be pursued by the team as the feedback is summarized, fully considered, and addressed. This report details feedback and results from the Series to be considered in attaining the third and fourth outcomes.
FORMAT

While each workshop was dynamic in responding to stakeholders’ interests, in general, each workshop followed a very similar format as according to the agenda schedule as follows:

DEMONSTRATION AND TRAINING AGENDA

<table>
<thead>
<tr>
<th>PART 1: Main Session</th>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30-9:00</td>
<td>Welcome, introductions, and opening remarks</td>
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<tr>
<td>9:00-9:15</td>
<td>Overview of the project and tool</td>
<td></td>
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<tr>
<td>9:15-9:30</td>
<td>Summary of updates based upon user input</td>
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<tr>
<td>9:30-10:00</td>
<td>Scenario demonstrations</td>
<td></td>
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<tr>
<td>10:00-10:30</td>
<td>Coffee break</td>
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<tr>
<td>10:30-11:00</td>
<td>Scenario demonstrations continued</td>
<td></td>
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<tr>
<td>11:00-12:00</td>
<td>User-driven exercise of the tool</td>
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<tr>
<td>12:00-13:00</td>
<td>Lunch</td>
<td></td>
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<tr>
<td>13:00-14:00</td>
<td>Strategies for implementation and dissemination</td>
<td></td>
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<tr>
<td>14:00-14:20</td>
<td>Feedback and evaluation</td>
<td></td>
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<tr>
<td>14:20-14:30</td>
<td>Closing remarks – Adjournment of main session</td>
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<tr>
<td>14:30-15:00</td>
<td>Tea Break</td>
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<table>
<thead>
<tr>
<th>PART 2: Training Session</th>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:00-15:15</td>
<td>Introduction to training session</td>
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<tr>
<td>15:15-17:00</td>
<td>Hands-on training session</td>
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<tr>
<td>17:00-17:15</td>
<td>Feedback and evaluation</td>
<td></td>
</tr>
<tr>
<td>17:15</td>
<td>Closing remarks – Adjournment of training</td>
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MAIN SESSION

WELCOME, INTRODUCTIONS, AND OPENING REMARKS

Each main session began with welcoming remarks from representatives of WHO, Duke University, and University of Pretoria as well as the hosting in-country partner institution. The welcome provided by the in-country partner representative also provided an opportunity for an informative and insightful overview of the status of malaria control strategies in the country, including current successes and challenges that the national malaria control
program was experiencing. Each in-country partner introduction was an engaging opening to the session, offering a valuable reminder for all participants of the importance of developing and effectively deploying alternative control strategies in the battle against malaria, as well as describing significant contextual factors to be taken into account. Following the conclusion of opening remarks, all participants were invited to introduce themselves and state their affiliations.

**OVERVIEW OF THE PROJECT AND TOOL**

Introductions were followed by an overview of the project and tool as well as acquainting the participants with the day’s agenda. Though many of the participants had been involved in previous stakeholder engagement activities, for the benefit of those unfamiliar with MDAST it was necessary to briefly provide project background information including on the general project objectives and key institutional partners involved. The specific objectives of the workshop activities were then presented to the group in order to frame and guide the approach of the sessions.

**SUMMARY OF UPDATES BASED UPON USER INPUT**

The next session topic focused on recognizing the many ways in which input from past in-country stakeholder engagement activities had been incorporated to revise and improve the tool. From the beginning, the project has emphasized the role of collaboration with and input by a broad range of key stakeholders involved in malaria control policy making and implementation. The project has actively engaged key stakeholders across a range of sectors and levels in all three project countries in the development of MDAST through a variety of mechanisms including interviews, surveys, workshops, and consultations. The rich feedback from key stakeholders to-date has presented many opportunities to further refine the tool according to an enhanced understanding of the situation on the ground as well as the needs of its anticipated users. The information gained through these varied forms of stakeholder involvement has been essential to the process of appropriately refining the MDAST model so that it can better address the full range of health, social, and environmental risks and benefits associated with alternative malaria control strategies. It is also important to note that the process of gaining and incorporating stakeholder feedback has not only been essential to strengthening the model itself, but has also been instrumental in building understanding and a sense of ownership of the tool among key in-country decision-makers – its targeted users.

The workshops provided a valuable opportunity to demonstrate the extensive model developments made to incorporate key stakeholder feedback from a variety of forums, including: the First Round of MDAST Stakeholder Workshops (August 2010), the MDAST Stakeholder Survey (August 2010), MDAST webinar consultations with key project partners (April – June, 2011), expert consultations with NMCP staff, in-country partners, and other experts (August, 2011), the External Mid-Term Evaluation Report and Review (August – September, 2011), inquiries to in-country partners and NMCP staff on proposed LLIN module developments (November 2011), and Regional Steering Committee Meetings. Conducted throughout the duration of the project, these activities allowed for the prioritization of revisions and further developments to the tool deemed necessary to meeting users’ expectations and needs. The presentation highlighted key results and priorities derived from the 2010
Stakeholder Workshops and 2011 In-Country Expert Consultations (including country-specific inputs), the further details of which can be found in the Year 2 MDAST Annual Progress Report.

**SCENARIO DEMONSTRATIONS & USER-DRIVEN EXERCISE OF THE TOOL**

The core of the main session was the demonstration of the tool. This occurred in two parts. In the first part, MDAST modelers introduced and presented on the tool’s interface, functions, and capabilities through demonstrating the use of the model under a number of scenarios (for example, different possible scenarios could include scaling up mass distribution of and voucher systems for LLINs alone and in combination, looking at the effect of IRS and LLIN strategies alone and in combination, scaling up RDTs with improved compliance for ACTs, and changing parameters such as effectiveness of an awareness campaign on net use). The interests of the audience played a significant role in driving the selections of the scenarios, and their expert feedback was elicited to provide input values. The scenario demonstrations allowed the stakeholders to become familiar with the model through a guided tour showcasing a range of its functionalities and applications. In each country, the scenario demonstrations led participants to seek clarifications and ask other questions about the tool as well as generated lively discussion. The outcome of the scenario demonstrations was to raise both interest in and understanding of the tool and its abilities among the participating stakeholders.

Following the scenario demonstrations, the session turned to a user-driven exercise of the tool. During this part of the workshop, the stakeholders were actively engaged in determining and executing a scenario of their own in the model. In each country, a volunteer from among the participants was chosen to lead the exercise through soliciting and inputting expert feedback from the audience in order to run the model for a given scenario. The volunteer worked with the MDAST modeler to enter the data, run the model, and interpret the output. In each country, this was a very engaging activity for the group. Many participants were willing to provide suggestions and explanations for various parameter inputs, at times resulting in insightful discussions highlighting areas of uncertainty or disagreement. This provided a valuable opportunity to talk about how the tool deals with the data issues surrounding use of the tool and decision-making more generally (e.g., availability/completeness, uncertainty, variability, reliability). Overall, the user-driven exercise was a valuable demonstration of the tool and the ability of a new user to learn and implement some of its basic functions in a short time. Demonstrating the user-friendliness and approachability of the tool in this hands-on way was important in particular for those participants who did not later attend the more in-depth training session.

Taken together, the scenario demonstration and user-driven exercise sessions directly and successfully addressed two of the key objectives of the workshop, namely 1) to demonstrate the use of MDAST to key stakeholders using different scenarios of malaria control interventions, disease epidemiology, and social factors; and 2) to elicit additional stakeholder feedback regarding the latest version of MDAST, and further inputs leading to refinements of the tool. The demonstration sessions were important to achieving the two outcomes related to these objectives, that is, 1) the use of MDAST demonstrated to key stakeholders, and 2) MDAST evaluated and requirements for refinement identified.
STRATEGIES FOR IMPLEMENTATION AND DISSEMINATION

Following a break for lunch, the group reconvened for a discussion on how to best approach introducing and employing the tool more broadly. This session addressed a key objective of the workshop, “to engage stakeholders in discussion on strategies for implementation and dissemination of the tool” towards the outcome of revising these strategies based on the expert input. To begin the conversation, participants were presented with recent survey feedback from the August 2011 Expert Consultations, during which respondents were asked, “Please indicate how critical each of the following barriers is to full implementation (or dissemination) of the tool for decision making?” Selecting among eight defined options, respondents to that survey question perceived that particularly critical barriers to address were applicability to real life, acceptance by superiors, limitations of relevant data, and donor preferences/agenda. The workshop audience was asked to consider and comment upon their own perceptions of the barriers and opportunities for implementation and dissemination of MDAST given the current model that had been demonstrated. A recurrent theme throughout all workshops was discussion on the appropriate level(s) (e.g., district, national) at which the tool should and could be applied. The conversation was then directed to a consideration of the mechanisms that could be used in dissemination of the tool. Participants were posed with the following question: “What forums can MDAST use to continue to engage NMCP and other key stakeholders in tool refinement and uptake?” Forums discussed included the project website (which was briefly introduced and presented upon), workshops, policy briefs, conferences, and peer-reviewed publications. Details on these conversations can be found in the next section of this report, “Key points from the workshop and Training Sessions”.

The main session concluded with the distribution and completion of an evaluation questionnaire and closing remarks (the results and preliminary analysis of the evaluation questionnaire are contained in Appendix 3). After a short tea break, those stakeholders continuing on to attend the training session reconvened.

TRAINING SESSION

OBJECTIVES

The primary aim of the training sessions was to address the workshop objective “to provide in-depth training on how to use MDAST to key persons in each participating country”. At the same time, the training session gave additional opportunities to further the other workshop objectives of demonstrating MDAST to key stakeholders and eliciting additional stakeholder feedback regarding the latest version of MDAST.

SET-UP AND INTRODUCTION

Before the training session officially began, MDAST team members distributed flash drives containing the model and other training files to training participants with personal laptops, and worked with them to install the free software on their machines. A formal introduction to the training session laid out its specific aims and agenda, and participants received a hand-out detailing the schedule and activities. Participants were asked to split into small groups of two or three people, making sure that each group had access to at least one laptop. Individuals
with their own laptops were welcome to run the model on their own so long as other teams had access to at least one machine. MDAST team members also made their own laptops available for use. Teams were encouraged to shift control over the laptop amongst members in the group. In this way, it was ensured that each pair or group of three was able to closely interact with the model in a hands-on fashion.

**HANDS-ON TRAINING SESSION**

In the hands-on training session, the small groups were guided through developing, implementing, and interpreting a number of scenarios using the model. Each person received a worksheet guide which they used to 1) follow along with the demonstration of an example scenario, and then 2) execute their own scenario in their group, selecting a decision parameter of interest from among a small list and recording their chosen inputs as their team progressed through the exercise. The worksheet can be seen in Appendix 2.

The MDAST modelers first worked through a simple example scenario with the groups so that they could explore the user interface and other aspects of the model together and familiarize the trainees with the basics of how to enter inputs and generate results. For this exercise, the example was to compare three policy alternatives, each with a progressively higher percent coverage by vouchers of retail LLIN price. The current situation (“status quo”) to which the policy alternatives were being compared was “no retail LLIN vouchers”. The groups were led through how to locate and enter the appropriate parameter values in each of the policy portfolios (i.e., 30%/50%/100% of retail LLIN price covered by vouchers). The groups were then instructed on how to generate results; after running through a few projections together, groups were encouraged to explore additional outputs of interest to them.

Following the example scenario, each group chose one of three decision parameters to explore (IRS coverage, larviciding coverage, or RDT coverage). On their worksheets, each group then filled out a percent coverage level for the current situation/status quo and each of three alternatives. After filling out the sheet, each group entered their selections as appropriate within the tool. Each group then ran the model to determine outputs suggested by the worksheet (e.g., monthly incidence, malaria deaths in children under five years, program cost per severe case averted). After completing the worksheet, participants were encouraged to explore additional scenarios and results options in their groups. Throughout the hands-on session, MDAST team members familiar with the model circulated to observe and offer any assistance requested from the groups.

**FEEDBACK AND EVALUATION**

Following the hands-on training, all trainees came back together to discuss their experiences and feedback. This was an immensely valuable discussion in each country, allowing for the MDAST team to get direct feedback on many aspects of the model including user-friendliness from those that were approaching the tool as users for the first time. The feedback gained in these discussions made clear priorities for revising the tool according to user preferences and requirements. The details and conclusions from these discussions can be found in the following section of this report, “Key Points from the Workshop and Training Sessions”. Finally, the training
session concluded by collecting written feedback from participants on the training activities and the model itself (the results and preliminary analysis of the evaluation questionnaire are contained in Appendix 3).

KEY POINTS FROM THE WORKSHOP AND TRAINING SESSIONS

POINTS IN COMMON ACROSS COUNTRIES

The workshops held in all three countries were well-attended by a range of key stakeholders from various organizations (see Appendix 1 for a list of participants in each session by country). Across countries, Dr. Ameneshewa commented that MDAST is important and unique as a project for its contribution to evidence-based policy development. The stakeholders engaged in lively discussions throughout each of the workshops, contributing valuable feedback drawn from their knowledge and expertise. While each workshop provided unique insights, there were also comments and suggestions which were held in common across countries.

In general, stakeholder participants in all countries exhibited interest and enthusiasm for learning more about using MDAST to improve evidence-based policymaking. Participants in Kenya and Uganda indicated that they were particularly attracted to the ability to use the tool to both combine and compare alternative malaria control strategies side-by-side and across time horizons; they saw this value-added functionality as responsive to both the real-world situations in their countries as well as to guidelines from international institutions involved in malaria control. Stakeholders were pleased to find in both the demonstration and training sessions that they could understand and explain the general mechanisms influencing model projections given specific scenarios that had been set out; participants felt that in general the tool “worked” in that it modelled the trends they would expect to see given the inputs, while adding value by providing high levels of detail in its outputs (e.g., malaria burden indicators, cost projections, etc.). The workshops in all countries also provided an opportunity to clarify and discuss the ultimate aim and appropriate application of MDAST as a user-driven tool to inform policy decisions; specifics of these conversations can be found in the country-specific summaries which follow.

A common theme across all workshops revolved around data required by the model. Stakeholders in all countries were interested to discuss the sources of data used in the tool, the type and amount of data that the user would need to provide, and in a more general sense the issues of availability and quality of data accessed by both the modellers and the users. The clarification and discussion of these issues built a stronger understanding of the model’s capacities and limitations among the stakeholders. These discussions provided an opportunity to underscore the transparency and robustness of the model with regards to its data sources and underlying structure. These conversations allowed for pointing out limitations of the model to reflect all contexts and maintain absolute currency as new data emerge, while in turn highlighting the strength of the model in allowing the user to draw on his own experience and local knowledge to define the input values for many of the parameters. The flexibility of the model to reflect users’ specific situations was seen as key. Nonetheless, others felt that the need to search out and enter data across many parameters could be a barrier to using the tool effectively; some of these users were appreciative that default parameters and assumptions based on the literature could be used but generally felt that default parameters specific to the country context
would be even more helpful. Finally, there was discussion about how to build user confidence in the quality of input data and the model calculations more generally, e.g., through model validation. Additional details on the outcomes of data-related discussions in each country are provided in the country-specific summaries that follow.

At all workshops, a mini-session was held in which participants were asked to share and discuss their thoughts on developing and refining the implementation and dissemination strategies for MDAST. Among all countries, and especially in Tanzania and Uganda, there was considerable discussion about the level at which the tool could or should be implemented, i.e., at a district or national level. It was generally agreed that while district-level data could be valuable in reflecting and addressing varied situations across the country, ultimately the tool would have to be introduced and used in a way that was consistent with the established organizational structures for policymaking and implementation in the country. Generally, this meant that dissemination strategies should recognize and reflect an understanding that policy directives come from the central level of government in these countries. Conversations in Tanzania and Uganda in particular addressed in more detail the specific policy environments in each country and how these should inform contextual implementation and dissemination strategies for the tool.

Finally, the workshops provided insights on specific malaria control strategies as they were incorporated into the model. In particular, all workshops discussed IRS strategies at length. In all countries, stakeholders expressed a need for the model to expand the number of insecticide types for IRS made available as a choice to the user (in the version presented at the workshops, the user could choose among only 3 types of insecticides to be used in an IRS program defined in the model). The MDAST modellers have been working to respond to this universal advice by expanding the insecticide selections available to the user. Other conversations regarding IRS which are detailed in the country specific summaries which follow included the issues of insecticide resistance and insecticide rotation.

**UNIQUE INSIGHTS FROM EACH COUNTRY**

**KENYA**

**WORKSHOP SESSION**

The initial demonstration of the model engendered lively discussion and questions from the stakeholder participants. One participant commented on the value of the model’s ability to help assess the combined effect of interventions (e.g., IRS and LLINs) across different scenarios (such as varying prevalence rates) to achieve disease reduction in a cost-effective way.

One stakeholder participant conveyed that is important that the tool be flexible and customizable enough to reflect key details of actual policies being implemented or actively considered in policymaking circles. For example, she explained that there are many distribution mechanisms for LLINs and wanted to know whether the user would be able to modify the model across the relevant parameters to approximate the actual policies
under consideration. The demonstration of the LLIN module showed aspects related to distribution that could be modified, but MDAST modellers also pointed out that additional dialogue (such as that being generated through the workshop sessions) was essential to making sure the tool is able to be reflective of context as much as possible. Similarly, another participant underscored the importance of being able to change individual parameters within a particular intervention type because of its potential impact on cost. Using the example of the range of costs for different insecticides available for use, this participant pointed out that changing just one parameter can often make a significant difference in terms of cost effectiveness. From his perspective, the ability to customize interventions at a high level of detail was key. The MDAST team explained that while the model is designed to accept user inputs, one must keep in mind that due to both resource and modelling constraints MDAST does not account for every possible option. For example, in the version presented at the workshops, the user could only implement a few insecticide options, though modellers have been working to incorporate additional types into the model. The team used feedback on flexibility to make two key points about MDAST: 1) It is an evolving tool, and its development will continue to benefit from stakeholder feedback on how it can better approximate a range of users’ contextual requirements (e.g., additional changeable parameters to be included), and 2) In its current form, the modellers and users alike can consider how to implement or modify currently available options to fit or approximate the alternatives being discussed.

Apart from the flexibility offered by available inputs, another main consideration brought up throughout the workshop discussions related to the availability and quality of data. Participants were interested to know details regarding the default parameters and data used in the underlying structure of the model. It was explained that a rather unique aspect of the model is its transparency; the peer-reviewed source(s) from which data on a particular parameter have been drawn are specified, and the underlying structure is accessible to the user. This design allows others to review the data used in the model. One participant asked if the model reflected current situations, pointing out that incidence has changed dramatically in only the past 10 years, and varies across regions. Another participant felt that the rapid transition that many malaria endemic countries in Africa are currently going through (including reduced malaria prevalence) makes this the perfect time to be deploying models like MDAST to evaluate the situation on the ground; he stressed the importance of being able to consider cost effectiveness across a variable time horizon such as MDAST allows. He suggested that it was important to work with field researchers and findings from field projects to be able to incorporate new data both as inputs and into the underlying structure (e.g., how interventions interact and potentially synergize). These comments allowed for pointing out limitations of the model to reflect all contexts and maintain absolute currency as new data emerge, and in turn highlighting the strength of the model in allowing the user to draw on his own experience and local knowledge to define the input values for many of the parameters. One participant pointed out that for LLIN use in particular, decision-makers rely on data from national indicator surveys, commenting that the indicator surveys would be a good source of data for certain LLIN parameters in the model. The participant was glad to see that country-specific data she already relied on could be incorporated into the modelling. However, one participant noted that a big recurring challenge for malaria control policymakers is how to get complete and good quality data, particularly for some of the parameters which are more obscure or harder to measure. This participant suggested that in Kenya, the DOMC may be able to assist in providing some of the values. Another participant pointed out that completeness of national data is often a challenge, but that
data from the community based information system could be used. Another participant commented that investment in diagnostics will help improve surveillance – for example, district health information software can be used for reporting incidence in more or less real time. Nonetheless, others felt that the need to search out and enter data across many parameters could be a barrier to using the tool effectively; some of these users were appreciative that default parameters and assumptions based on the literature could be used but generally felt that default parameters specific to the country context would be even more helpful.

Finally, Dr. Ameneshewa led an insightful conversation on the issue of responding to mounting resistance to insecticides. She commented that this is an issue facing nearly every national malaria program in Africa. The question was raised, how can MDAST reflect the reality of the challenge posed by resistance as the tool continues to be developed? It was noted by the modellers that MDAST is unique in incorporating resistance at all; other holistic models have not attempted to do so. Nonetheless, the challenge or resistance suggests the limitations of the model to guide policymakers particularly in emerging scenarios and approaches to insecticide resistance management such as rotation and other strategies for combating resistance (and reducing long-term costs). It is a reminder that the model results must be considered in the context of and balanced with national and international policy directives in place (e.g. with regards to insecticide resistance policy and strategy). The team is working to further address the issue of resistance management, but it must also be remembered that while the model is meant to assist users in making more evidence-based decisions, the user must also always consider the broader context in which the results are generated.

This discussion was followed by a discussion on DOMC plans for the use of IRS and resistance management in the future, providing valuable contextual information (including that the plan in Kenya is to increase spraying to twice per year in high transmission areas, meanwhile implementing a rotational spraying schedule).

In addition to requests to add additional insecticide options, a number of participants conveyed it would be useful to incorporate additional larvicide options into the model, as a number of larvicide types not included in the model are being discussed within the ministry. While some pointed out that larval source management is currently not used extensively and only in specific situations, Dr. Ameneshewa and others conveyed that while larviciding cannot be considered a stand-alone intervention, there are contexts in which it would be useful to consider it as a complementary method for vector control.

Rebecca Kiptui volunteered to lead the user-driven exercise of the tool. The stakeholder participants were very engaged in reviewing and revising the default values in the scenarios (Alternative 1: A pure vector control policy; Alternative 2: LLIN mass distribution), drawing upon the specialized expertise of many in the room. Many found that the user-driven exercise was very helpful in clarifying the theoretical and operational aspects of the tool that had been under discussion earlier. Ultimately, workshop participants felt it was promising to see that the most cost-effective alternative identified by the model was as the group of expert participants would expect.
TRAINING SESSION

Stakeholder participants in the hands-on training session held in Kenya gave valuable feedback on the user experience with the model, allowing the MDAST team to perceive initial reactions of target users implementing the full model for the first time. Comments included:

- Some participants expressed preference for a “re-set” button for parameter values within the model rather than having to re-open the main file to initiate each new scenario;
- Whether it would be possible for a user to “hide” or de-activate interventions that they were not interested in assessing (e.g., larviciding) in order to simplify the options being presented to them;
- Inquiries into the ability to specify additional parameters (e.g. to be able to edit the cost of RDTs).

Overall, training participants were pleased to see that the model generated outcomes along the trends that they would expect. For example, one user reflected that the impact of insecticide resistance within the model when assessing IRS alternatives was clear. Another small group sharing their experience using the model explained that as they increased the subsidy of retail vouchers for LLINs, the cases decreased relative to the baseline, as they would anticipate. The participants appreciated that the model reflected the general trends they would expect while providing the added value of additional levels of detail (e.g. cost projections) and allowing the user to consider multiple scenarios side by side.

UGANDA

MAIN SESSION

The workshop session began with an overview from key decision makers on current approaches to specific strategies as well as policymaking in general with regards to malaria control. Specific strategies mentioned included home based management, IVM, LLIN mass distribution, IRS, and studies to assess resistance and drug efficacy. It was commented that in Uganda, malaria control strategies are generally aligned with the guidelines issued by key international organizations involved in the fight against malaria, in particular RBM and WHO. Examples of this that were given included general alignment in Uganda with these organizations’ policies on home-based management and combination strategies. In particular, multiple participants stressed the importance of combining complimentary intervention types for malaria control, as recommended by the WHO. In this sense, stakeholder participants found the tool particularly valuable for its ability to combine and compare multiple intervention strategies side by side.

Stakeholder participants were actively engaged in discussions during the user-driven exercise demonstrating the tool. In particular, participants were interested in gaining a greater understanding of the data and structure underlying the tool as well as the quality and sources of default data. One participant inquired on the extent to which the tool takes into account cultural values. Regarding data parameters, a participant wanted to know how the values related to NMCP data, as concordance could be seen as important. It was explained that the data in the model are not currently country specific, but that many of the default values can be tailored by the user to their desired context and datasets. Regarding available data, another stakeholder stated that it would not be
possible to use the tool unless surveillance was in place and the data quality from the surveillance was good. The modellers explained that while the default values may not be country-specific, they were based on the literature and could be used as reasonable values for making a general assessment of alternative intervention scenarios when it was not feasible to determine all data locally.

Other conversations during the user-driven exercise centered around comments on specific parameters as well as how to estimate their value (e.g., ACT coverage for which there is little surveillance data, and the range of IRS coverage levels by district compared to an average national level). At the same time, some participants were quite interested in the ability of the tool to incorporate projections, for example, to assess effects of the anticipated ramp up in RDT coverage for improved diagnosis, which is currently very low. In terms of projections, stakeholders found it useful to be able to determine and assess output over a time horizon, so that one could have guidance in predicting outcomes based on specified intervention scenarios and gain a better sense of for how long one might consider continuing with an intervention. In addition, participants put forward for consideration a few aspects not currently included in the model, namely distinguishing between treated and untreated nets, incorporating resistance to ACTs, and rotation of insecticides.

Finally, during the conclusion of the main session, there was considerable discussion among the stakeholders about the level at which the tool could or should be implemented (i.e., district or national level). Previous examples discussed during the user-driven exercise had highlighted the issue that parameter values could vary significantly across districts or locations (e.g. malaria prevalence, baseline IRS coverage rate). Thus, some saw that the tool could be useful at the district level in giving tailored guidance based on localized (district-level) data and situations. Others, however, pointed out that the district level data could be aggregated to determine national averages, so implementing at the national level was certainly feasible. Ultimately, it was felt by most that the tool would have to be implemented at the national level according to the established policymaking and implementation structure of operations in the country. According to this strategy, it was commented that it would be important for the success of MDAST that program managers and national level policy-makers be engaged and provide their support for the tool. The group discussed a variety of approaches for introducing and gaining national level support for the tool.

**TRAINING SESSION**

The training session in Uganda was attended by a smaller group of about 10 people that was very enthusiastic to gain hands-on experience with the tool. In general, clusters of two to three people performed the exercises together on a laptop, while MDAST team members led the session and circulated throughout the room to observe progress and answer any questions. The training provided a good opportunity for the MDAST team members to gain a better understanding of how first time users perceived and undertook the process of learning the tool, as well as highlighted areas where clarification in training and implementation may be necessary. For example, one lesson learned is that the tool should be more explicit about the unit of currency being used (USD), as the model will not work properly if the user inputs values in local currency as one group did. In addition, having so many users exploring the tool led to the identification of an issue regarding altering the time horizon which was addressed before the following workshop.
At the end of the training session, the group had a more in-depth discussion about the interpretation of model results. Some users wanted to know how they could use the model to determine the “best” policy scenario; it was explained that the aim of the tool was to provide the information for making more informed, evidence-based decisions, but that the model did not prescribe a single “best answer”. The group discussed, for example, how users’ varying objectives and valuations under the same scenario could understandably lead them to reach different policy conclusions.

Finally, the group raised the issue of how to continue training on the tool. It was suggested that a program could be set up at an institution and/or that the MDAST team return for further training sessions, including sessions targeting additional audiences (e.g., high-level politicians, staff at the district level, etc.). The MDAST team agreed that it would be important to consider how to offer additional training opportunities in the future. It was noted that the MDAST website and forums should be seen as a valuable resource currently available to workshop participants to train, troubleshoot, interact with other users, and give additional feedback on the model.

TANZANIA

MAIN SESSION

The introduction to the main session given by local leaders provided an opportunity to hear about current and foreseen malaria trends in Tanzania. For example, it was commented that the NMCP expects to see clinical incidence decline as better diagnosis strategies are implemented across the country. The introduction also touched upon the potential value of MDAST in informing policy as the NMCP prepares the next 10-year strategic plan in the near future. It was commented that a challenge facing the NMCP is how to incorporate the current evidence base. In addition to lack of data in many areas, the NMCP is also seeking to establish a comprehensive framework for considering the current evidence on malaria control strategies and to demonstrate how this framework is applied in forming the next strategic plan.

Thus, there was considerable interest in the structure, capabilities, and validity of MDAST as a tool for making more informed policy decisions. One aspect of this was the emphasis that uncertainty within the model be made explicit. Others were interested in data issues including level of confidence that could be had in the default parameter sources and values. Another main point of discussion was model validation, or “proving” the tool. Participants noted that the tool needs to be proven in order for them to adopt it, e.g., by demonstrating the ability of the tool in other countries. Without adequate proof, policy makers in Tanzania would understandably question the reliability of the predictions, impacting effective dissemination and implementation of the tool. They suggested that the most useful way to demonstrate this would be by testing a real situation, for e.g. comparing one city in Tanzania to Dar es Salaam, where it is historically known that a certain parameter was effective. By comparing this historical knowledge with the outcomes projected by the model, it would convince policy makers that the tool is able to reflect reality. The team commented that model validation is a part of future plans for MDAST, but to date, the focus of the project has been developing and refining the model.
disclaimer was also made that proper data and expertise with the tool would be required for the tool to be used successfully in decision analysis.

The choice of insecticides in the model was another point of interest for the workshop participants. The team clarified the reasoning behind the insecticide choices that were currently incorporated into the model, explaining that it was partly influenced by the history of the project (i.e., for comparisons with DDT), the fact that pyrethroids are commonly used, and finally, that bendiocarb was taken into account with concern to addressing resistance. Participants commented on the factors to be noted in the evolving insecticide situation, including resistance and that DDT is almost abandoned as a consideration in the policymaking context in Tanzania.

The conversation regarding implementation and dissemination centered around the appropriate scale and scope for use of the tool. Participants were posed the question of whether it is more suited to central, district, or the health facility level. Some commented that it would be difficult to use at the national level given heterogeneity across the country, instead proposing that it would be better to use the tool considering the regional level. Still others took this point further in opining that a district level approach would be ideal, though a regional approach would be a prerequisite. However, these opinions generally related to the level at which data should come from and be employed and not necessarily the level of implementation; ultimately it was emphasized that dissemination and implementation decisions must be made at the central level according to the current system of operations. For this reason, it is important to understand government structures in the approach of the tool. They also noted that it is important for the model to incorporate an estimation of costs and an understanding of which local infrastructure may require more funding.

Participants appreciated that the tool was dynamic and could be modified to reflect actual situations. Participants were interested to see how the tool would work in real life situations, since they have encountered problems such as multiple rounds of IRS failing to reduce malaria transmission. One participant noted that he could see the value of the model in looking at various factors and identifying strategies and areas where policymakers should seek out more information and/or put more emphasis. In this sense, MDAST was seen as a useful way to frame policymakers' thinking and approach.

**TRAINING SESSION**

Discussion at the training session in Tanzania also resulted in useful feedback for the MDAST team. One participant commented that it would be good to have a reminder to restart the program when doing a new calculation, or have a refresh button option. Another participant remarked that the projected costs require a socioeconomic understanding of the outcomes. It was hoped by participants that these aspects would be covered in the manual so that they would be fully aware of the measures they would be reporting. In response to one participant’s question of whether it is possible for the software to show the calculations being used, the team noted that the tool had been developed in a transparent way such that the background calculations could be viewed (the team then demonstrated how to dig deeper into the model to see the calculations). A participant made a suggestion about achieving acceptance of the tool at the central level, stating that it would be important to have a forum with the top management at MOH in order for them to see that the tool is helpful and to
accelerate its application. Generally, participants remarked that the training session allowed them to appreciate the tool more and improved their ability to reflect on the discussions in the main session.

CONCLUSIONS

The MDAST project aims to promote evidence-based, multi-sectoral malaria control policymaking in Kenya, Tanzania, and Uganda, serving as a pilot for other malaria-prone countries. The project involves a broad range of collaborators and stakeholders engaged in the development of a comprehensive framework to assess the full range of health, social, and environmental risks and benefits associated with alternative malaria control strategies.

This report has summarized the background, objectives, activities, and outcomes of the Malaria Decision Analysis Support Tool Demonstration and Training Series held in April 2012 in Kenya, Uganda, and Tanzania. The aim of the 2012 MDAST Demonstration and Training Series was to demonstrate, train, and gain expert feedback on the current version of MDAST from key stakeholders in order to assess the model and strategies for its dissemination and implementation.

Specifically, the objectives for the April 2012 MDAST Demonstration and Training Workshop Series were:

1. To demonstrate the use of MDAST to key stakeholders using different scenarios of malaria control interventions, disease epidemiology, and social factors;

2. To provide in-depth training on how to use MDAST to key persons in each participating country;

3. To elicit additional stakeholder feedback regarding the latest version of MDAST, and further inputs leading to refinements of the tool;

4. To engage stakeholders in discussion on strategies for implementation and dissemination of the tool.

These objectives were applied towards achieving the expected outcomes of the Series:

1. Use of MDAST demonstrated to key stakeholders;

2. Key persons in each participating country trained on how to use MDAST;

3. MDAST evaluated and requirements for refinement identified;

4. Refinement of tool dissemination and implementation strategies based on stakeholder input.

As the content within this report attests, the Series successfully addressed the first two of these outcomes, while establishing the framework for and value of potential further exposure and training opportunities for MDAST in the future (e.g., reaching a broader audience of additional stakeholders, and increasing reach and depth of
training for interested users). Oral and written feedback from the Series documented in this report also cast light on aspects of the presentation and training activities that stakeholders thought were successful, as well as ways to improve upon demonstration of and training on MDAST.

Progress on the third and fourth outcomes was initiated during the Series and continues to be pursued by the team as the feedback is summarized, fully considered, and addressed. During the workshops, representatives from relevant government ministries and other organizations gave advice on refining both the model itself and strategies for its implementation and dissemination according to their contextual knowledge and experience with both approaches to malaria control and the national policy environment. This report details feedback and results from the Series to be considered in attaining the third and fourth outcomes; the series had great success in further engaging a range of stakeholders in the review and initial use of the tool, raising enthusiasm for as well as further valuable feedback on the model from its targeted potential users.

Themes in common across all of the workshops included data availability and quality, ability of the tool to reflect real situations, a desire for the model to refine aspects of the IRS module including incorporation of additional insecticides, and the importance of considering the policy environment and structure in implementation and dissemination strategies. Each workshop also yielded unique insights on the further development, dissemination, training, and implementation of MDAST, including contextual information on the malaria control agenda and policy environment in the country. The information gained from the April 2012 Demonstration and Training Workshop Series will be essential to the process of further refining the MDAST model and dissemination and implementation strategies for the tool according to an enhanced understanding of the situation on the ground as well as the needs of its anticipated users.
APPENDICES

APPENDIX 1: WORKSHOP PARTICIPANTS

Note that in addition to the lists below, the following MDAST team members were present at each demonstration and training workshop:

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Birkinesh Ameneshewa</td>
<td>WHO</td>
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<tr>
<td>Clifford Mutero</td>
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<td>Randall Kramer</td>
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<td>Zack Brown</td>
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<td>Duke Team- North Carolina Central University</td>
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<tr>
<td>Adriane Lesser</td>
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KENYA PARTICIPANTS

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<td>4</td>
<td>Damaris Matoke</td>
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<td>Ephraim Githinji</td>
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<td>6</td>
<td>Anthony Miru</td>
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<td>7</td>
<td>Fredrick Nyambane</td>
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<td>Jacob Kimani</td>
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<td>10</td>
<td>Paul Kiptoo</td>
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<td>11</td>
<td>Andrew Wamari</td>
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<td>12</td>
<td>Dr Rebecca Kiptui</td>
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<td>Jacinta Opondo</td>
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<td>14</td>
<td>Dr Dunstan Mukoko</td>
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<td>15</td>
<td>Athuman Chiguzo</td>
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<td>16</td>
<td>Beatrice Machini</td>
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<td>17</td>
<td>Jacinta K Omariba</td>
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## UGANDA PARTICIPANTS

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<td>Dr. John Bahana</td>
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<td>Mr. Arthur Tazula</td>
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<td>20</td>
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# Tanzania Participants

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<td>Charles Paul</td>
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<td>17</td>
<td>William Kisinza</td>
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<td>18</td>
<td>Denis Swai</td>
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## Training Worksheet for Scenario Implementation

### Example Scenario

**Purpose:** To examine the impact of support for retail LLINs

- **Status quo:** No retail LLIN vouchers
- **Policy Alternative 1:** 30% of retail LLIN price covered by vouchers
- **Policy Alternative 2:** 50% of retail LLIN price covered by vouchers
- **Policy Alternative 3:** 100% of retail LLIN price covered by vouchers

### Instructions

1. Similar to the example, create your own scenario using the “DECISION PARAMETERS” section in the table.
2. Change the MDAST parameters based on your scenario and run the tool.
3. Complete the “RESULTS” section with the results from the MDAST.

### DECISION PARAMETERS

Note: Please choose ONLY ONE parameter in the list and fill out the row with desired values for your purpose.

<table>
<thead>
<tr>
<th>DECISION PARAMETERS</th>
<th>Status Quo</th>
<th>Policy Alternative 1</th>
<th>Policy Alternative 2</th>
<th>Policy Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail LLIN vouchers (fraction of price)</td>
<td>0</td>
<td>0.3</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>IRS coverage (between 0 and 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Choose Bendiocarb</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larviciding coverage (between 0 and 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Choose Bti</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDT coverage for children under 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### RESULTS

Note: Please fill out the table with the output values from the MDAST.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly incidence in total population</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria deaths, children under 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program cost relative to status quo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program cost per severe case averted</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>
APPENDIX 3: WORKSHOP AND TRAINING SESSION FEEDBACK: PRELIMINARY ANALYSIS

MDAST MAIN SESSION FEEDBACK QUESTIONNAIRE

The survey administered to the workshop participants included sections for: 1) Evaluating their interest and opinion on the value of MDAST, 2) what features of MDAST they find most useful, 3) how critical various barriers are to the implementation and dissemination of the tool for decision making, and 4) what aspects of the MDAST project website are most important. Participants were asked to rate the series of questions on a scale of 1-5, with responses closer to 5 being increasingly positive.

The total number of responses to the main session evaluation questionnaire across all countries was 48. The results of this survey are presented here in aggregate (i.e., across all countries). Participants’ interest and opinion on the value of MDAST following the workshop was overwhelmingly positive (Figure 1), with 74-93% of responses responding with a 4 or 5 on all the questions. Participants reported that the workshop improved their understanding, interest, and opinion on the usefulness of MDAST positively. Responses were also positive about how likely participants were to use MDAST, and how confident they were in the results suggested by MDAST (80.9% and 74% of total responses being 4 or 5 respectively).
Figure 2 shows participants’ ratings of the importance of four model outputs. Incidence, mortality, and program cost were all ranked approximately equally important, with 84.4%, 84.8% and 85.1% of responses being 4 or 5 respectively. The importance of the measurement of health-adjusted life years, e.g., DALYs, was rated slightly lower, with 74.4% of responses being 4 or 5, and 25.6% of responses ranging from 1 to 3.
Participants were asked to rate how critical eight barriers are to the implementation and dissemination of MDAST for decision making. Applicability to real life and limitation of relevant scientific research were rated most critical, with 80% of the total ratings being 4 or 5 for both barriers. Next, donor preferences, acceptance by superiors, and costs of implementing alternative strategies were also rated critical, with 75-77% of ratings being 4 or 5 for all three barriers. Computer access for policy makers and uncertainty of outputs were rated less critical, and popular opinion was rated the least critical barrier. These results are shown in Figure 3.
Workshop participants were also asked to rate what aspects of the MDAST project website are most important. The importance of interactive training materials and the availability of an online version of the tool were rated most highly, as seen in figures 4 and 5 (97% of responses being 4 or 5 for both barriers). Communication barriers were next in importance, namely, a forum for discussion with other policy makers, and communication with the development team (95.3% and 93.1% of responses being 4 or 5 respectively). The documentation of references, and links to other web resources were also rated as critical, but less so than the other four barriers.
A second feedback questionnaire was given to participants of the training session. The questionnaire surveyed participants' opinion on MDAST following the training session, as well as their satisfaction with the current version of the tool. The total number of respondents from all countries combined was 32.

Participants reported an overwhelmingly positive increase in their interest and motivation to use MDAST, as seen in figure 6. When questioned about how much the training session improved their knowledge and familiarity...
was MDAST, the response was majorly positive, but slightly less so than the previous question (figure 7). With regard to their comfort using MDAST to compare multiple policy alternatives, on a scale of 1-5, from not comfortable at all to very comfortable, 28.1% of responses were 3, 62.5% were 4, and 9.4% of responses were 5 (figure 8).
Participants of the training session were queried on their satisfaction with the features of the current version of MDAST (figure 9). Participants rated the user interface, i.e. the visual appearance and to a slightly lesser extent, visual navigation, as most satisfying among the six listed features. The specification of output uncertainty, convenience of use, and sufficiency of included parameters ranked next in terms of satisfaction, with each feature having 79%, 73.3%, and 75.9% of responses being 4 or 5 respectively. The speed of computation received the lowest satisfaction rating among all 6 features.
The results of the evaluation questionnaires from the main demonstration sessions and training sessions will be fully considered and employed by the MDAST team in assessing priorities for the refinement of the model as well as implementation and dissemination strategies.
The Malaria Decision Analysis Support Tool (MDAST) project is working to improve the protection of human health and the environment by promoting sustainable malaria control strategies that are consistent with the successful implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs). The project has been implemented in the last 2.5 years with the collaboration of WHO-AFRO, UNEP, Duke University in the USA, University of Pretoria in South Africa and three national institutes in Kenya, Tanzania and Uganda. The project promotes evidence-based, multi-sectoral malaria control policymaking in Kenya, Tanzania, and Uganda, serving as pilot for other malaria-prone countries, through the use of a comprehensive framework for assessing the full range of health, social, and environmental risks and benefits associated with alternative malaria control strategies. As the project approaches its final stage of implementation, the executing agency, WHO-IST-ESA organized the Project Steering Committee (PSC) meeting to evaluate what has been accomplished and plan for the next steps, including those beyond the project period, which ends February 2013. The 1st and the 2nd years’ PSC meetings were organized in Kenya and Tanzania, respectively. The 3rd and last PSC meeting took place in Entebbe, Uganda on 6 – 7 August 2012.

The main objectives of the Steering Committee meeting included:

1. To review project progress to date and agree on timeline for the completion of the remaining activities;
2. To review and discuss on the MDAST in view of the comments and inputs provided;
3. To discuss and agree on the next steps including finalization and field trial of the tool.

The expected outcomes of the Steering Committee meeting were:

1. Project progress to date reviewed and timeline for the completion of the remaining activities agreed upon;
2. MDAST reviewed and discussed; consensus reached on the extent to which it will be further modified;
3. Discuss on next steps (finalization of the MDAST, field trial and development of guidelines for replication of MDAST in other countries and dissemination of project results and lessons learned)

### PARTICIPATION

The following individuals attended the Third Meeting of the MDAST Project Steering Committee:

- Birkinesh Ameneshewa, WHO-AFRO
- Irene Kanyi, UNEP
- Leonard Mboera, National Institute of Medical Research – Tanzania
- Rebecca Kiptui, Ministry of Health – Kenya
- Edridah Muheki Tukahebwa, Ministry of Health – Uganda
- Randall Kramer, Duke University
- Clifford Mutero, University of Pretoria and ICIPE
- Ritha Njau, WHO *(Chairperson of the 3rd Meeting of the PSC)*
- Charles Katureebe, WHO
- Denis Rubahika, National Malaria Control Programme – Uganda
- Adriane Lesser, Duke University *(Rapporteur of the 3rd Meeting of the PSC)*

### AGENDA

The agenda was organized into sessions falling under each of the three objectives of the Steering Committee meeting. Sessions addressing Objective 1 occurred during Day 1; sessions addressing Objective 2 took place on both Day 1 and Day 2, and sessions directed primarily at Objective 3 were held on Day 2. The full agenda can be found in the Appendix of this report.

### OBJECTIVE 1: ASSESS PROJECT PROGRESS & REMAINING ACTIVITIES

The PSC was reminded that this was the final Steering Committee Meeting of the project and so it was essential to comprehensively assess project progress and discuss how to ensure its ultimate success, including the identification of remaining activities and agreement on a timeline for accomplishing them. In addition, future activities beyond the scope of the current project were proposed and discussed.

### COUNTRY PRESENTATIONS: REVIEW OF PROGRESS & DISCUSSION

#### BACKGROUND

Approximately an hour and a half was allocated for the country presentations. Project progress in Kenya was presented on first by Steering Committee member Rebecca Kiptui, followed by presentations on progress in
Uganda (Steering Committee member Edridah Muheki Tukahebwa) and Tanzania (Steering Committee member Leonard Mboera). Each project country lead presented slides on project progress and challenges, which have been compiled and distributed to all who attended the meeting.

**ACTIVITIES & CHALLENGES**

Each country presented on key MDAST project activities undertaken in their country. There was an emphasis in the presentations on the April 2012 (Round II) Stakeholder Workshops as a culminating event of the project. The country leads provided background on the workshop activities (including the hands-on demonstration and training sessions), and highlighted key feedback and discussion points raised by stakeholders. For example, in Kenya, it was noted that there were considerable discussions among stakeholders to improve the tool, especially where it did not reflect country policy. Nonetheless, the presentation from Kenya concluded that the tool was a great opportunity to help in making policy decisions based on evidence and could be used effectively for advocacy of effective strategies. The presentation on Uganda’s progress encapsulated the entire course of activities undertaken throughout the project, providing a valuable perspective on the breadth and depth of stakeholder engagement in the development and refinement of MDAST. In Uganda, it was noted that while the prototype of the tool presented during the Round I Workshop in August 2010 appeared complicated and was not well understood by all stakeholders, during the Round II Workshop in April 2012 the tool was perceived as very clear and promising, drawing enthusiasm from stakeholders. The presentation regarding progress in Tanzania also captured the range of stakeholder activities accomplished throughout the project.

The project leads also noted some challenges they had faced in implementing the project activities. For example, a couple of the leads mentioned that the delay in the receipt of funds affected activities in Year 2. It was also noted that high-level policy makers’ availability is limited, which could prove a challenge to overcome in the advocacy and dissemination of MDAST.

**DISCUSSION**

The chairwoman took a number of questions before they were addressed by the group.

It was asked whether any activities had been undertaken to consider what would be required to make the tool country-specific and/or adapted to the national context. The general issue of how to tailor MDAST to country-specific contexts is addressed in depth later in this report.

It was mentioned that the model could benefit from country-specific financial information, including for the costs of interventions (e.g., country-specific cost of procuring a particular insecticide). Regarding potential sources of such data, it was explained that the availability of country-specific pricing information depended on the intervention or product under consideration, as well as partnerships. For example, information on procurement of RDTs is readily available because they are procured by the government of Kenya or international
donors who will readily share the information. It may not be as easy to obtain the information from other international donor groups.

The Duke and Pretoria team were asked about the reactions to the demonstration of the tool at the Round II Workshops – specifically, whether the feedback differed across the three countries. It was commented by the Duke and Pretoria team that while there was a surprising degree of uniformity in feedback across countries, there was some difference in emphasis. For an in-depth description of the feedback to the Round II Stakeholder Workshops held in each country, including points in common, the members of the Steering Committee were encouraged to refer to the recently circulated draft report on these workshops and to follow up with any comments or revisions prior to the finalization of the report. It was agreed that the country leads would endeavor to provide their comments on the draft report within two weeks’ time.

Finally, the group considered how the country partners could proceed with disseminating and raising the profile of MDAST among high-level policy makers.

In Kenya, it was noted that certain members of the DOMC technical working groups which give suggestions to an inter-agency committee on a particular policy have been engaging further with the tool. This informal pre-testing has heightened interest in the tool within DOMC. Policy briefs would be another mechanism for greater dissemination of MDAST. These come out when addressing issues based on what is happening in the operational research field, as is the case with MDAST. In addition, according to current policy the report from this meeting will be made available to the Director, so hopefully that can be an additional mechanism to engage the other offices of the Ministry of Health. Another mechanism in Kenya is that there is an upcoming DOMC program review assessing the effectiveness and efficiency of current national programming, so this could also present an opportunity to introduce and evaluate MDAST in that context.

In Tanzania, the country lead noted that the procedure would be to ask for a management meeting chaired by the permanent secretary and, if successful, to then follow other procedures adopted by the respective programs. However, it was noted that the question of where to get the resources and cost allocations for adoption would need to be addressed.

In response, it was posited that the resources required for the next stage of dissemination of MDAST should not be prohibitive, since the current issue at hand is raising interest in and introducing MDAST to high-level policy makers as a tool for addressing evidence-based policy. The resources required for this may include funds for a workshop, for example, and should be manageable with minimal resources. It was commented that in Uganda, the cost will be to come up with the evidence that the tool is applicable in the country. However, it was felt that further training of a core team of MOH staff in Uganda on how to use the tool would be needed before they would feel prepared to present MDAST to high-level policy makers. In addition, many felt that additional validation of the model would be a requisite for being able to comfortably and successfully champion MDAST to high-level policy makers. These concerns were further addressed in other sessions summarized in this report.
IMPLEMENTATION STATUS OF ACTIVITIES 4, 5, 6, & 7: REVIEW OF PROGRESS & DISCUSSION

REVIEW OF PROGRESS

The Duke and Pretoria partners took the lead in presenting on the implementation status of Activities 4, 5, 6, & 7, including through the presentation of a detailed set of slides that was distributed to all who attended the meeting.

Activities 4, 5, 6, and 7 were set forth as follows:

- **4:** Engage in country-specific training, testing, and refinement activities
- **5:** Use MDAST in value of information (VOI) analyses to identify key knowledge gaps and create policy-relevant research agenda
- **6:** Disseminate project results & lessons learned
- **7:** Develop guidelines for replication in other countries

Regarding Activity 4 (engage in training, testing and refinement), Steering Committee members were reminded of the many stakeholder engagement activities throughout the three years of the project, including the 3-Country Stakeholder Survey, August 2010 Round I Stakeholder Workshops, the August 2011 Expert Consultations, the mid-term review, and the April 2012 Round II Workshops held in that country. The presentation noted the many ways in which stakeholder feedback from these activities influenced the development and priorities for modifications to the tool, including specific recommendations from each country. Emphasis was placed on results from the Round II Stakeholder Workshops, including points in common across the three countries and results from written feedback questionnaires administered to stakeholders during the demonstration and training sessions at the workshops.

The presentation on Activity 5 briefly covered ongoing work to conduct value of information (VOI) analyses to identify key knowledge gaps and create a policy-relevant research agenda, including conducting sensitivity analyses to determine which parameters are most influential in determining model results and identifying areas where influential parameters are missing or involve high levels of uncertainty. It was explained that this activity was significant because the literature contains relatively few examples of VOI applied in evaluating uncertainty in health related decision modeling. This presents an opportunity for the use of the MDAST tool to contribute to the wider health decision making field and to contribute to a policy-relevant research agenda on malaria.

Activity 6 (disseminate results and lessons learned) was not discussed in depth as an entire session was devoted to it later in the meetings. The plan for Activity 7 (develop guidelines for replication) was presented, with the goal being to document the process and common challenges of developing MDAST in three project countries, as well as to generate guidelines for adapting MDAST to other malaria-prone countries.

DISCUSSION

The discussion for this session began with recognition that MDAST is a unique project in that it represented the first time that an integrated tool has been developed for malaria control policymakers as an aid for making
improved, evidence-based decision making. While MDAST is addressing a critical issue and gap, being a new endeavor it is faced with challenges. It is important to make clear which activities will be completed before the project period ends in February 2013, and which are beyond the scope of the currently-funded project but should be considered for future developments pending additional resources. The requirements and sources of potential additional resources were touched upon.

It was agreed that the project had progressed to a solid state but that additional trial testing/validation and training would be required before showcasing the tool to high-level policy makers in the three countries. The general feeling was that the focus should remain on the three project countries, rather than attempting to implement the tool in other malaria endemic countries before a strong foundation for its use had been established in the three project countries. The additional benefit of this approach is that dissemination to additional countries would be facilitated by successful implementation and legitimization of the tool in the project countries first. When the tool is ready for broader dissemination, it was posited that MDAST only be made available after a country has expressed an interest and commitment to working with the team to take on MDAST, including meeting training requirements, to ensure that the tool is used in an informed and proper manner. It was suggested that a generalized standard document to inform implementation could be developed. This would include the importance of additional training, testing, and engaging directly with the NMCP through building ownership of the tool.

**ACTIVITIES TO BE COMPLETED AND TIMELINE**

The Duke and Pretoria team presented their working timeline for completion of remaining deliverables associated with Activities 4, 5, 6, & 7, followed by discussion.

**PRESENTATION OF TIMELINE**

The schedule for completion of key deliverables was as follows:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Deliverable</th>
<th>Planned Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Finalize Report on the 2012 MDAST Demonstration and Training Series with input from in-country partners</td>
<td>August 2012</td>
</tr>
<tr>
<td></td>
<td>Complete revisions to MDAST based on stakeholder feedback</td>
<td>September 2012</td>
</tr>
<tr>
<td></td>
<td>Update User Manual to reflect model revisions</td>
<td>December 2012</td>
</tr>
<tr>
<td>5</td>
<td>Identify areas where influential parameters are missing or involve high levels of uncertainty due to lack of knowledge and literature</td>
<td>September 2012</td>
</tr>
<tr>
<td></td>
<td>Use VOI to identify malaria research gaps</td>
<td>December 2012</td>
</tr>
<tr>
<td>6</td>
<td>Monitor and update website with revised versions of the model, User Manual, publications etc.</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Continue to develop publications reflecting project results and lessons learned</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
DISCUSSION

Regarding Activity 6, it was asked who the target audience was for the listed deliverables (website and publications). It was noted that the website and publications might not be forums that would reach high-level policy makers on malaria control in the project countries and that the methods for reaching these people might need to be broadened. The target audience of the website is existing and potential users of the tool. The website nonetheless also provides more general background for those that may not actively use the tool hands-on but are nonetheless interested in MDAST — this group would include stakeholders such as policy makers, though it was suggested that they might not access the site. It was suggested that it might be necessary to have another round of workshops in each country after the tool is ready to be fully implemented in order to target the high-level policy makers. The process of engaging these high-level policy makers could occur while pretesting is ongoing.

OBJECTIVE 2: REVIEW & DISCUSS MDAST IN VIEW OF COMMENTS & INPUTS

SUMMARY & DISCUSSION OF INPUT & COMMENTS ON MDAST

Dr Ameneshewa presented on a range of questions and comments (in italic text below) that had been made about MDAST both at the Round II Stakeholder Workshops and during a viewing of the tool in Brazzaville to her major department including the program leader, Lucien Manga. The points were discussed in-depth during Day 1, and revisited for further reflection towards the end of the meeting on Day 2. The comments and the conclusions for each point are summarized below.

COMMENTS FROM ROUND II WORKSHOPS

- **Applicability of the tool to formulate policy that addresses different malaria epidemiological settings (high and low burden) in a single country**
  - It was discussed that it is possible to consider different epidemiological settings and associated outputs in the current version of the model by examining the different situations individually in turn, e.g. at the district level. While this raised the possibility of a future project to modify the tool for use in aiding the development of operational strategies at lower levels of government, it was nonetheless agreed by the Committee that ultimately policy must be applied at the national level (as has been the intent and purpose of the current MDAST project).
- **The tool mainly compares different approaches and factors for individual intervention, particularly with regards to vector control, how can it be applied to compare use of combinations (e.g. IRS & LLINs or IRS & Larviciding)**
  - It was explained that the tool actually is capable of being applied to combination strategies including any of the interventions available in the model. This functionality existed in the version
demonstrated at the Round II Workshops, but it was recognized that this capability may not have been widely appreciated by all participants. It was recommended that the ability of the tool to allow for the consideration of combination strategies be made more explicit, and that future more in-depth trainings address this capability more fully.

- **Larviciding in the tool appears as a stand-alone major intervention while in practice it mainly (except in few cases) is complementary to IRS and/or LLINs**
  - This point was addressed in the context of the above comment noting that the model does allow for the consideration of combination strategies. Larviciding can be considered as a stand-alone intervention or in tandem with one or more other interventions.

- **Only larviciding is considered in the tool, instead of the broader larval source management**
  - While there are broader larval source management techniques beyond larviciding, it was explained that incorporating them into the model at this point would require resources beyond the scope of the current project period.

- **Only BTi and BS are to be compared for larviciding. Inclusion of others recommended larvicides required**
  - There are plans to incorporate additional larvicide types by the end of the project period.

- **Application of insecticides for IRS and larviciding should consider resistance management strategies as this has significant implications on cost, effectiveness and sustainability of a policy.**
  - While the case for incorporating additional resistance management strategies (including insecticide rotation) into the model is strong and convincing, the PSC acknowledged it is unfortunately not a possibility under the current resources and capabilities of the project. One of the MDAST modellers will be at the upcoming Malaria Journal conference in Basel and will communicate with other modellers to see how they are considering these and other modelling issues.

- **Inclusion of insecticides other than DDT, lambda cyhalothrin and bendiocarb (e.g. organophosphates other pyrethoids) in view of the difference in price, residual life etc.**
  - Based on stakeholder demand, additional insecticides have been added to MDAST since the Round II Workshops. These additions were discussed further during the Day 2 session.

- **How robust is the tool as malaria burden declines and cases become rare? The tool should be sensitive enough and responsive to these dynamics.**
  - The consensus was that MDAST should not be overly concerned at this point with addressing the needs of countries in the elimination phase or similar, as the approach of these countries will be significantly different.

- **In both the disease management and vector control options, program cost per severe case & death averted increases as number of cases goes down. Logically, the overall cost should decrease as number of severe cases and deaths goes down.**
  - There is not an inherent contradiction here; while the overall program cost may decrease as the number of severe cases and deaths due to malaria go down, it is not unreasonable that the program cost per case would rise as the burden decreases.

- **The tool presents only the mass and voucher continuous distribution of LNts but not the health system (antenatal and EPI) distribution alternatives that are happening in many countries.**
  - It was agreed that the tool will look at the potential to address this issue before the end of the project period.

- **Mass and continuous (voucher or HC) distribution are compared separately, whereas at program level mass distribution (catch up) and continuous distribution (keep up) are complementing each other to sustain high coverage.**
It was agreed that the tool will look at the potential to address this issue before the end of the project period.

Requirement of quality, reliable, complete and timely data for the tool to be fully useful
- The Committee concurred on the truth of this statement, while recognizing that the tool maintains functionality and value even when the user may not always be able to access perfect and complete data.

Level of application of the tool: National
- It was generally agreed during the Round II Stakeholder Workshops and reaffirmed during the Steering Committee Meeting that the tool should be applied for improved policymaking at the national level.

COMMENTS FROM WHO-AFRO

User-friendliness: the tool is not yet as user friendly as it has to be for ease application at the country (program) level. E.g., a lot of manipulation is required for data input.
- It was agreed that the tool did not have a maximal level of user-friendliness. Specific planned and implemented changes addressing user-friendliness were addressed on Day 2. It was also noted that a tool featuring as many capabilities as MDAST can only be user-friendly up to a point; any user should also expect to devote time and effort to training on the proper use of the tool.

Heaviness: the volume of inputs required to obtain the desired outputs is too high.
- Development of the tool has sought to balance user-friendliness with allowing the user to highly tailor the tool to his or her specific context, including the alteration of a range of inputs for which context-specific data may be available. Default values can be employed when the user cannot or does not wish to use context-specific values (e.g., due to lack of quality data). As a result of this feedback, the number of user inputs required has been reduced in the model.

Customization: the tool needs to be customized with already available population and geographical data of malaria endemic countries in Africa so that when it is applied for a given county and in a given location, some of the calculations are automatically made without requiring inputting data such as population, etc.
- The Steering Committee members reached a consensus that there was no need for the modeling team to undertake customization as the in-country leads expressed a preference to do so themselves according to their own contexts and available data.

Usefulness: currently, the tool does more of a simulation than the actual assessment of intervention options that are available for decision (rather than policy) making.
- It was determined that no action was required with regards to this point. The intent of MDAST is to serve as a guide for policy-makers to make improved, evidence-based decisions, but ultimately the policy maker must make the decisions.

We are also missing important elements of the vector control tools (e.g., insecticides, methods, and vector control approaches) that are critical for policy making.
- It was agreed that progress was being made with regards to this point. However, it was also reiterated that some elements may be beyond the capacity of the current project.

Relevance: Above all, interpretation of outputs is far from being obvious. It requires another level of scientific analysis. (To addressed before Feb)
- This concern also relates to the need to improve user-friendliness which the project is endeavoring to address. The number of results and outputs available to the user could be reduced to increase user-friendliness but that would also reduce the capabilities of the tool.
Ultimately, MDAST is a tool meant for those with a background in malaria control, and it does require that the user have the appropriate background for proper interpretation of output. Approaches to improving ease of interpretation will be considered before the end of the project period, including additional and/or improved training materials.

PRESENTATION OF MDAST & DISCUSSION ON FURTHER IMPROVEMENT & REFINEMENT

The second day of the Project Steering Committee Meeting began with a presentation of refinements that had been made to the tool based on feedback from the Round II Stakeholder Workshops, followed by discussion on further improvements. Afterwards, a brief, simple demonstration of the tool was conducted informally for those who had not attended one of the workshops.

The recent revisions made to the model were summarized into three types, with details provided on specific modifications within each type:

1) Model additions:
   - Addition of five additional pyrethroid insecticides currently approved by WHOPES for use in IRS.
   - Addition of input nodes for additional parameters for these insecticides (e.g., duration of effects, cost per household per round).
   - Addition of a user option to control the historical window for the baseline interventions (i.e., How long have they been in place?)

2) Interface modifications:
   - Reorganization of parameters into two groups: one group requiring user input, and another group based on parameters from the peer-reviewed literature.
   - Visual separation of baseline / “current” interventions from the three policy alternatives, to emphasize the distinct role of the baseline.

3) Technical modifications and small bug fixes (not discussed in depth).

The presentation also noted additional modifications scheduled for completion within the project period:

1) Conversion of more tables to pull-down/drop-down menus for user-selected inputs
2) Addition of organophosphate(s) as an insecticide option for IRS

Finally, the presentation noted that other modifications had been requested which were beyond the current scope of the project period but might be feasible to incorporate in the long term, including:

1) Building in additional resistance management strategies, e.g., insecticide rotation
2) Adding additional interventions as appropriate (e.g., a vaccine should it become a viable option in the future).

The presentation was followed by questions and discussion, including the following points:

- It was asked whether a feature automatically resetting to default values had been incorporated (so that the application would not need to be restarted for every new scenario). Software constraints make this
infeasible, but a reminder to restart the session for each new scenario will be incorporated into the user interface.

- It was reiterated that the issue of resistance management would be a key future development as it would allow for consideration of mechanism(s) to avoid and/or delay resistance in the first place.
- A query was raised inquiring into the flexibility of the model to reflect how interventions are being implemented on the ground and in specific contexts, e.g. mass LLIN distribution. It was explained that while the model has attempted to capture key parameters defining implementation of interventions (e.g. ability to choose mass distribution and/or LLIN vouchers, ability to alter cost and coverage, the effect of a community education campaign, etc.), the team remained interested in feedback on how the model might address any reasonable aspects of an intervention not currently featured in MDAST.
- This opened up into a broader question on how the model could continue to be updated to reflect changes in the future (e.g., should a vaccine become viable). It was explained that while the modelling team would like to remain involved in addressing emerging issues in the future, it is important to discuss Duke’s role moving forward as well as consider future resources for continued revisions to the tool.

Finally, a brief and basic demonstration of the tool for a single scenario was conducted for the benefit of those that had not attended at least one of the Round II Workshops. The time allotted did not allow for an in-depth demonstration such as in the workshops, where such sessions took a number of hours.

**OBJECTIVE 3: DISCUSS & AGREE ON NEXT STEPS**

**FINALIZATION OF MDAST**

A number of requirements and suggestions for finalization of MDAST are noted in the above sections, both with regards to those that can be achieved during the remaining project period and those which are outside the scope of the current project. These include both model refinements as well as additional project deliverables as noted in the timeline table within this report. In addition, throughout the meeting all PSC members acknowledged that more in-depth training would be necessary in order to better understand the operations of the tool, its full range of capabilities, as well as interpretation of results. Without additional training, in-country partners noted that they would find it difficult to fully explain and promote the tool to high-level policy makers. While the time and resources remaining in the current project are limited and preclude conducting more in-depth, in-person training beyond the Round II Stakeholder Workshops before the end of the project, the PSC discussed possible avenues for conducting additional training activities, which all agreed would be essential. The option of international teleconferencing was not widely supported due to the logistical and technical challenges. The WHO, Duke and Pretoria team have been considering alternative ways to accomplish additional training within the current project period and resources, including training videos and interactive exercises to be made available on the project website. In the longer term it was agreed that additional resources would be required to do more in-depth training on site.

**FIELD TRIAL OF MDAST**
Dr. Ameneshewa was requested to open and lead the discussion on the field trial of the tool. She proposed that the tool be disseminated to the three countries as a “draft for trial” of the real program in order to get feedback for further refinement. The field trial was conceived as a way to relate the tool to existing policies, by engaging policy makers in assessing the application of the tool at the national operational level to assess how the model outcomes relate to the reality on the ground. That is, the purpose of the field trial would be to assess the extent to which the tool can reflect the actual decision making processes leading to existing policies (but not to assess policies themselves). In addition, the field trial would provide a source of further feedback by assessing the functionality of the tool from additional perspectives at the national policy-making level. The exercise would benefit from a standardized approach used in each country.

However, it was noted that it would be difficult to perform a full field trial before key users receive additional training, which is contingent on funding. Dr. Ameneshewa proposed and elicited from others potential opportunities, including further trainings of core staff. She commented that the WHO would see if there would be any resources that could be used for conducting field trial activities. It was agreed that raising awareness of the MDAST project generally through a basic orientation to its purpose and objectives would set the foundation for further dissemination and implementation and might open up additional avenues for funding training and field trial testing. The Duke and Pretoria team suggested that they could produce a template for such a presentation that the in-country leads could then tailor.

**DISSEMINATION OF PROJECT RESULTS & LESSONS LEARNED**

During the final official session, the meeting participants discussed forums and strategies for dissemination and implementation of MDAST. Key forums identified included conferences, peer-reviewed publications, policy briefs, and the project website. There was also discussion about the extent to which the model should be distributed. It was considered that there was a risk that the tool could be used improperly by those that had not received adequate training. Similarly the scientific integrity of the tool could be compromised if persons or groups attempted to make unauthorized modifications to the tool; for that reason it was suggested that the technical structure of the tool not be made readily available for modification and that those familiar with the mathematical structure of the tool (i.e., the modellers associated with Duke) remain involved.

Finally, the revised MDAST project website was presented as a key means of maintaining stakeholder engagement and training on the tool. The MDAST website can be found at [http://sites.duke.edu/mdast/](http://sites.duke.edu/mdast/). The website is designed to serve as a platform for the dissemination and implementation of MDAST by providing the newest version of the tool for download, as well as training tools including a User Manual and a forum where users can engage in discussion about the tool. The website also provides additional background information about the MDAST project and tool, such as scientific references, relevant publications, and photo galleries of MDAST events. The 2012 Stakeholder Workshop and Training Series provided an opportunity to gain feedback about the website.

**CONCLUSION**
The Third Meeting of the MDAST Project Steering Committee was a valuable forum of key project partners to assess project progress and discuss future activities and approaches related to MDAST. Through a range of presentations, the PSC was able to appreciate the contributions of all partner institutions as well as key stakeholders in the inception, development, refinement, and dissemination and implementation activities of MDAST. The PSC agreed on a timeline for accomplishing remaining activities within the project period, as well as discussed long-term goals as well as potential strategies for achieving them. Key to the future sustainability of MDAST in the future is conducting more in-depth training activities as well as in-country field trials in order to achieve full dissemination and implementation of the tool. This will require a coordinated effort to seek additional sources of support.

APPENDIX 1: AGENDA OF THE THIRD MEETING OF THE MDAST PROJECT STEERING COMMITTEE

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:30-8:45</td>
<td>Welcome, Introductions and opening remarks</td>
<td>Uganda</td>
</tr>
<tr>
<td>8:45-9:00</td>
<td>Objectives</td>
<td>Birkinesh</td>
</tr>
<tr>
<td>Objective 1.</td>
<td>To assess project progress to date and agree on timeline for the completion of the remaining activities</td>
<td></td>
</tr>
<tr>
<td>9:00-10:30</td>
<td>Review of progress and discussion</td>
<td>Kenya, Tanzania, Uganda</td>
</tr>
<tr>
<td></td>
<td>• Country presentations on 2nd year workshops and development of country specific MDAST</td>
<td>(presentations)</td>
</tr>
<tr>
<td>10:30-11:00</td>
<td>Tea Break</td>
<td></td>
</tr>
<tr>
<td>11:00-12:30</td>
<td>Review of progress and discussion</td>
<td>Cliff &amp; Randy (presentations)</td>
</tr>
<tr>
<td></td>
<td>• Implementation status of activities 4, 5, 6 &amp; 7</td>
<td></td>
</tr>
<tr>
<td>12:30-14:00</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>14:00-15:30</td>
<td>Activities to be completed and timeline</td>
<td>Cliff &amp; Randy (presentations)</td>
</tr>
<tr>
<td>15:30-16:00</td>
<td>Tea break</td>
<td></td>
</tr>
<tr>
<td>Objective 2.</td>
<td>To review and discuss on the MDAST in view of the comments and inputs provided by countries and EHP-AFRO</td>
<td></td>
</tr>
<tr>
<td>16:00-17:00</td>
<td>Summary of inputs and comments on the MDAST and discussion</td>
<td>Birkinesh (presentation) &amp; all</td>
</tr>
<tr>
<td>Day 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08:30-10:00</td>
<td>Presentation of the MDAST and discussion on further improvement and refinement</td>
<td>(Duke); All</td>
</tr>
<tr>
<td>Objective 3.</td>
<td>To discuss and agree on the next steps</td>
<td></td>
</tr>
<tr>
<td>10:00-10:30</td>
<td>Finalization of the MDAST</td>
<td>All</td>
</tr>
<tr>
<td>10:30-11:00</td>
<td>Tea break</td>
<td></td>
</tr>
<tr>
<td>11:00-12:00</td>
<td>Field trial of the MDAST</td>
<td>Cliff, Randy &amp; Birkinesh</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td>Dissemination of project results and lessons learned</td>
<td>Cliff, Randy &amp; Birkinesh</td>
</tr>
<tr>
<td>13:00</td>
<td>Closing</td>
<td>Birkinesh</td>
</tr>
</tbody>
</table>
KEY MODEL DEVELOPMENTS IN YEAR 3 (2012)

The MDAST model underwent further development and refinement in 2012 in response to feedback from stakeholders, Steering Committee members, and other project partners. These developments are summarized below in three phases.

PHASE I: DEVELOPMENTS BETWEEN JANUARY AND MARCH 2012

During this period, the calculations for morbidity and mortality projections associated with malaria were modified so that the measures used better reflected the real burden of disease. In particular, a measure of the incidence of severe malaria cases was added, to capture the fact that the impact of better access to treatment lies primarily in reduction of severe disease. The model for severe disease is modeled roughly as follows: The longer a non-immune person remains infected with malaria the more likely it is to become severe. Similarly, the longer a severe case lasts, the more likely death becomes. Moreover, treatment shortens the duration of disease. The incidence of severe, as opposed to regular cases, responds intuitively to interventions, and deaths respond similarly. “Hazard rates” of progressing to severe disease, and subsequently death, were based off of peer-reviewed literature.

Another development during this period was the inclusion of Bendiocarb as an additional insecticide option for IRS (figure 1). This addition captures the alleged trade-off between a programmatically “cheap” way to deal with resistance – i.e., DDT, versus a financially more costly but more sustainable insecticide for dealing with resistance – i.e., Bendiocarb. The impacts of Bendiocarb were based on peer-reviewed literature. The Insecticide Resistance module also underwent expansion, with insecticides selecting for genetic mutation in vectors, i.e., DDT and pyrethroids selecting for KDR genetic mutation, pyrethroids selecting for additional P450 genetic mutation, and Bendiocarb selecting for G119S genetic mutation. Genetic resistance parameters were based on peer-reviewed literature wherever possible, but large gaps in information exist (e.g. on the speed of evolution). After a discussion of limitations with project partners, it was also agreed during this period that modeling rotational insecticide use was beyond the scope and resources of the project.

The LLIN module also underwent substantial development and revision. The new module needed to realistically reflect the decisions available to policymakers. Thus, interventions now consist of mass distribution campaigns and voucher programs for LLINs sold at private retailers. Policy decisions regarding mass distribution are the frequency/duration of campaigns, number of LLINs to stock per campaign round relative to number of uncovered people, and amount of subsidy for campaign LLINs (usually 100%). The policy decision regarding vouchers is the % of sticker price covered by the voucher (figure 1).
PHASE II: IMPROVEMENT AND REFINEMENT BETWEEN APRIL AND AUGUST 2012

Modifications to the MDAST model in this period were primarily based on responding to feedback and lessons learned from the MDAST 2012 Workshops. Key model additions include the addition of 5 more pyrethroid insecticides currently approved by WHOPES for use in IRS (figure 1), additional input nodes for additional parameters for these insecticides (e.g. duration of effects, cost per household per round) (figure 2), and the addition of a user option to control the historical window for the baseline interventions, i.e. how long they have been in place (figure 3). The model interface was also modified, with the reorganization of parameters into 2 groups – one group requiring user input, and another based on parameters from peer reviewed literature (figure 4), and the visual separation of Baseline/“Status quo” interventions from the three policy alternatives, to emphasize the distinct role of the baseline (figure 5). Some technical modifications and bug fixes were also made.

PHASE III: DEVELOPMENTS SINCE SEPTEMBER 2012

Updates to insecticides include the addition of remaining organophosphates and carbamates as insecticide options (figure 1), modification of costs to be insecticide specific, and the addition of the amount of product used per house. MDAST users may now select from the full range of current WHOPES insecticides. Updates to larvicides include the addition of all WHOPES-listed larvicides. The MDAST interface also underwent changes, with the conversion of the interface to drop-down menus wherever possible, modification to the input screen for diagnostics and treatment, and the inclusion of a “No Campaign Option” to the mass distribution frequency menu. This feature was requested so that it was clear to users how to “turn off” all LLIN interventions if, for example, there is no government-supported LLIN program.

In response to stakeholder queries regarding the need to re-start the program to re-set its default values, a note was added on the front screen to remind the user of this (figure 4). Stakeholders also inquired about alternative LLIN distribution mechanisms (i.e. Antenatal and EPI). While this is beyond the scope of the current round of revisions, it may already be possible in an ad-hoc fashion (e.g. different distribution rates/methods for different age groups). Modification of the LLIN module to reflect these additional types of programs will be prioritized for future incorporation, contingent on resource availability.
FIGURE 1: ADDITIONAL LLIN POLICY DECISIONS AND INSECTICIDE OPTIONS
Malaria Decision Analysis Support Tool (MDAST): Evaluating Health, Social And Environmental Impacts And Policy Tradeoffs

Progress Report: January 1 – October 31, 2012

FIGURE 2: PARAMETER INPUTS FOR NEW INSECTICIDES

Intervention Impact Parameters

- Treatment
  - Mean duration of malaria episode, ACT-treated (days): 3
  - Mean duration of malaria episode, SP-treated (days): 5

- Diagnostics
  - Yearly incidence of malaria-like symptoms which are not malaria (per 1K): Edit Table

- Indoor residual spraying (IRS)
  - Half-life of IRS effects (days): Edit Table
  - Surface area in average household’s dwelling (square m): 250

- Larvaciding (default values have no scientific basis, currently)
  - Initial percent reduction in vector recruitment from larvaciding
  - Half-life of larvaciding effects (days): Edit Table

- Long-lasting insecticide-treated nets (LLINs)

[See “Technical Parameters” module for biological/ecological parameters on ITN impacts.]

IRS Costs

- Organochlorines
  - DDT: USD per round per HH = 1.60

- Carbamates
  - Bendiocarb: USD per round per HH = 13.8
  - Propoxur: USD per round per HH = 13.8

- Pyrethroids
  - Lambda cyhalothrin: USD per round per HH = 8.6
  - Alpha-cypermethrin: USD per round per HH = 8.6
  - Bifenthrin: USD per round per HH = 8.6
  - Cyfluthrin: USD per round per HH = 8.6
  - Deltamethrin: USD per round per HH = 8.6
  - Etofenprox: USD per round per HH = 8.6

- Organophosphates
  - Malathion: USD per round per HH = 13.8
  - Fenitrothion: USD per round per HH = 13.8
  - Pirimiphos-methyl: USD per round per HH = 13.8
FIGURE 3: SEPARATION OF "STATUS QUO" FROM POLICY ALTERNATIVES AND OPTION TO CONTROL HISTORICAL WINDOW FOR BASELINE INTERVENTIONS
FIGURE 4: REORGANIZATION OF PARAMETERS INTO 2 GROUPS AND REMINDER TO RE-OPEN THE TOOL TO RE-SET DEFAULTS

Parameters for user to enter

Parameters from literature
FIGURE 5: VISUAL SEPARATION OF BASELINE AND THREE POLICY ALTERNATIVES

Before April workshops

After April workshops
STATUS OF
VALUE OF INFORMATION ANALYSES

In developing MDAST, information gaps were identified in a range of areas, including regarding insecticide resistance, environmental and health damages from insecticides, and the effectiveness of larvicide alternatives. Project partners recognized the importance of considering the impact and significance of such gaps. As set out in the project proposal, the purpose of Activity 5 is to use MDAST in value of information (VOI) analyses to identify key knowledge gaps and create a policy-relevant research agenda.

The fulfillment of Activity 5 has been led largely by Dr. Dohyeong Kim at North Carolina Central University (a sub-contracted institution on the project), who has reviewed the literature on VOI and developed a framework for VOI analysis. The VOI in the MDAST context has been defined as a “decision-improving value of additional information provided by MDAST for informed decision making for malaria control (i.e. social value of being able to know the predicted outcomes of multiple malaria control options for policy decisions, with some uncertainty due to lack of knowledge and research findings).” Using the findings from the VOI analyses, the involved project partners hope to offer guidance on comparing the benefits of acquiring additional information from MDAST with the direct and indirect costs of acquiring such information, and investing optimally in the acquisition of new information through MDAST that would in turn support better choices among control options.

A multi-step approach has been designed to perform VOI analyses using the latest version of MDAST: (1) to determine which parameters are most influential in determining model results and to examine how sensitive the key MDAST modeling output measures are to each parameter (Sensitivity Analysis), (2) to identify areas where influential parameters are missing or involve high levels of uncertainty due to lack of knowledge and literature (Importance Analysis), and (3) to estimate a return-on-investment (ROI) and promote collaboration between researchers and policymakers to prioritize policy-relevant malaria research agenda in the project countries.

The team has identified in the literature what aspects and parameters of malaria transmission are promising for VOI analysis and has evaluated a series of parameters in the recent version of MDAST which could be a potential source of uncertainty and substantially influential to the key outcome parameters of MDAST. Also, we reviewed the literature and communicated with a group of experts and stakeholders to identify a lack of knowledge and research findings which should feed into the MDAST framework. As the initial set of VOI parameters, we have chosen a number of parameters to assess how sensitive the key MDAST modeling output measures are to each of the parameters and to determine the level of uncertainty and existing information associated with each parameter. The parameters that have been chosen are:

- **Insecticide Resistance Parameters**
- **Larviciding Impact Parameters**
- **Baseline Vector Recruitment per Person**
Sensitivity and importance analyses are underway. The sensitivity analysis will determine which parameters are most influential in determining model results and will examine how sensitive the key MDAST modeling output measures are to the assumed distribution of each of the selected “uncertain” input parameters. The findings from this sensitivity analysis can inform policy-relevant discussions on how much the additional information provided by MDAST can reduce the level of uncertainty in the outcome measures, compared to decision making without MDAST. The goal of the Importance Analysis is to identify key sources of uncertainty by comparing the relative importance of the “uncertain” input parameters to the level of uncertainty in the output. Preliminary results imply that there would be substantial reduction of uncertainty for malaria control policy decisions when informed by a tool such as MDAST. This approach would enable users of the MDAST models to invest optimally in the acquisition of new information that will in turn support better choices among control options and improve collaborations between researchers and policymakers to improve the implementation of MDAST.

Preliminary results of the VOI analyses were presented at the EcoHealth Annual Conference in Kunming, China on October 16, 2012. The presentation was titled “Value of information in decision-analytic modelling for malaria control” and received positive feedback from the audience.

When completed, the VOI will address the following questions:
- How much does MDAST reduce the uncertainty level on the outcomes of malaria control policy, compared to those without MDAST?
- What is the expected return-on-investment (ROI) into the research areas?
- Does MDAST improve collaboration between researchers and policymakers?
UPDATE ON MDAST DISSEMINATION ACTIVITIES

MDAST project partners engaged in a variety of dissemination activities throughout 2012. These included the launch and on-going development of the MDAST website, the development of a slide set for in-country partners to present on MDAST to those unfamiliar with it, presentations on MDAST at conferences, and the publication of a meta-analysis paper on a key malaria control intervention (IRS) employed in the model.

MDAST WEBSITE

The MDAST website can be found at http://sites.duke.edu/mdast/

The website is designed to serve as a platform for the dissemination and implementation of MDAST by providing the newest version of the tool for download, as well as training tools including a User Manual and a forum where users can engage in discussion about the tool. The website also provides additional background information about the MDAST project and tool, such as scientific references, relevant publications, and photo galleries of MDAST events.

Website content can be accessed using the menu bar that is displayed at the top of every page. The homepage of the website is used to display announcements about upcoming and recently held events, and provides a brief introduction to the MDAST project.

The current version of the model and the free Analytica player that the model runs on can be found in the Model Download section (currently, a password is required to download the model). The User Manual section hosts the manual for the tool that can be browsed online, or downloaded as a PDF. The Discussion Forum Home allows users to engage in discussions about the MDAST project. The forum is divided into sub-sections for discussion about model parameters, the User Manual, MDAST Workshops, and Technical Help. Users can access a relevant section from the menu on the Discussion Forum Home page, and start discussions by leaving comments, or continue discussions by posting replies to comments.

Supporting information for the project can be found in the Calendar section, which provides information about upcoming MDAST events, the Publications section which provides links to project publications, and the References section which provides a bibliography of key academic papers that were used in the development of MDAST.

The website also contains a Photo Gallery of pictures from MDAST workshops and a section for The Team, which lists the Institutional Partners, MDAST steering committee members, Model Developers, and Project Staff.

Contact information for support, questions or comments can be found in the final Contact section.
Each page of the website displays helpful links in the bar on the right side of the page, including links to the sub-sections of the User Manual and the Discussion forum, and a Search Box that can be used to search all the content of the MDAST website using keywords.

The MDAST website was demonstrated to stakeholders during the 2012 Workshops. Both oral and written feedback on the website was elicited from workshop participants. The feedback indicated areas for expanding and improving the website to enhance its role in dissemination and implementation of MDAST. For example, Participants deemed interactive training materials to be a very important addition to the website, with an average response of 4.6 on a Likert scale ranging from 1 to 5 (5 indicating highest importance). Participants also valued the availability of the online version of the tool very highly, with an average response of 4.7 on the same scale.

The MDAST website continues to be updated to keep pace with MDAST developments and events.
DEVELOPMENT OF MDAST PRESENTATION TOOLS

As agreed during the Steering Committee Meeting, a slide set has been drafted for in-country partners to use in presenting on MDAST. The presentation aims to support in-country dissemination efforts by providing in-country partners with a template which gives a general introduction and background on MDAST, particularly for those who are not familiar with it. The draft slide set has been shared with the Steering Committee for feedback and will be revised accordingly.

PRESENTATIONS AND PUBLICATIONS RELATED TO MDAST

The profile of MDAST has been raised through presentations at two recent conferences. These opportunities generated discussions about MDAST among experts in a range of fields and served as a vehicle for raising awareness about the tool and its development process among a diverse group of conference participants.

The MDAST stakeholder development process was highlighted through a poster presentation at the BioMed Central Conference “Challenges in Malaria Research: Progress Towards Elimination” from 10-12 October 2012 in Basel, Switzerland. The title of the poster was “Stakeholder development of the Malaria Decision Analysis Support Tool (MDAST)”. The poster is included on the following page. The full abstract is accessible through the Malaria Journal site at http://www.malariajournal.com/content/11/S1/P15.

A presentation was also made at The 4th Biennial Conference of the International Association for Ecology & Health held 15-18 October 2012 in Kunming City, China. This presentation focused on the value of information analyses associated with MDAST (Activity 5); more information can be found in the section titled “Status of Value of Information Analyses” contained within this Progress Report.

The development of publications has also constituted an important mechanism for the dissemination of lessons learned and project results. Progress continues on a number of manuscripts that have been developed over the past project period. In addition, two articles were published in peer-reviewed journals during the 2012 project period. Those articles are:


Malaria Decision Analysis Support Tool (MDAST): Evaluating Health, Social And Environmental Impacts And Policy Tradeoffs

Progress Report: January 1 – October 31, 2012

Abstract
To sustain recent progress in malaria control in sub-Saharan Africa, decision analysis systems must be developed for use— and in collaboration with— local policymakers and program managers. The project described here implements an approach to evidence-based policy making for malaria control using a decision analysis framework proposed by Kramer et al. [1]. The project consists of the stakeholder-driven implementation of that framework through the development of a Malaria Decision Analysis Support Tool (MDAST) in Kenya, Tanzania, and Uganda. Results from the project to date point towards large anticipated value from stakeholder-driven implementation of a tool such as MDAST at the policy, programmatic, and technical levels.

Background
While technological innovations for eliminating and controlling malaria have achieved exceptional results, the sustainability of this progress has been challenged recently by the spread of drug and insecticide resistance. Unstable global funding streams can further threaten progress in reducing the malaria burden.

Achieving sustainability of malaria control programs will require systematic, evidence-based policy implementation. Tools developed in the decision sciences—including aspects of economics, risk analysis, and policy analysis—are well-suited to address this implementation challenge. Decision analysis is a systematic approach to making choices, which can address the multiple objectives of a diverse ensemble of stakeholders and can account for large, high-stakes uncertainty. Thus, decision analysis is particularly suitable for addressing the implementation challenges of national malaria control programs.

The project described here consists of the stakeholder-driven implementation of that framework through the development of a Malaria Decision Analysis Support Tool (MDAST) in Kenya, Tanzania, and Uganda. The overall purpose of this software tool is to form and strengthen dynamic linkages between the malaria research and policy-making communities towards improved evidence-based decision-making (Fig 1).

Funding Sources: GEF/UNEP, WHO

Results
MDAST permits the analysis of risks that (a) were identified by stakeholders as important in determining effectiveness of different policies, and (b) have not previously been combined in a practical, flexible tool. These features include the dynamic selection of insecticide resistance in the mosquito population (Fig 5), as well as implications of different long-lasting insecticidal net (LLIN) distribution mechanisms (mass distribution or voucher-subsidized).

Through anonymous written surveys during the workshops, participants indicated high levels of enthusiasm for using the tool (Fig 6), providing essential feedback on how it can be improved (e.g., additional IRS insecticides and the capacity to rotate them, and better representation of larviciding), and identified barriers to dissemination and implementation (e.g., context-specific data for calibrating MDAST to reflect local conditions).

Fig 5: Using MDAST to investigate effects of IRS on insecticide resistance.

Fig 6: Opinions about MDAST’s value and ease-of-use [N=40].

Conclusions
MDAST addresses the need for a platform to exchange experience between national-level research and policy communities. Continued engagement with stakeholders, and with scientists producing the primary research on which this tool relies, is necessary to complete implementation of MDAST and develop extensions of similar tools to additional locations and situations.

References
REMAINING PROJECT ACTIVITIES

The project activities remaining to be completed before the close of the project in 2012 were discussed and documented during the Third Meeting of the MDAST Project Steering Committee. As detailed within this Progress Report, project partners have been working towards completion of the identified deliverables according to the timeline specified in the Report on the Third Meeting of the MDAST Project Steering Committee and reproduced below.

TIMELINE FOR COMPLETION OF KEY DELIVERABLES

<table>
<thead>
<tr>
<th>Activity</th>
<th>Deliverable</th>
<th>Planned Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Finalize Report on the 2012 MDAST Demonstration and Training Workshops with input from in-country partners</td>
<td>August 2012</td>
</tr>
<tr>
<td></td>
<td>Complete revisions to MDAST based on stakeholder feedback</td>
<td>September 2012</td>
</tr>
<tr>
<td></td>
<td>Update User Manual to reflect model revisions</td>
<td>December 2012</td>
</tr>
<tr>
<td>5</td>
<td>Identify areas where influential parameters are missing or involve high levels of uncertainty due to lack of knowledge and literature</td>
<td>September 2012</td>
</tr>
<tr>
<td></td>
<td>Use VOI to identify malaria research gaps</td>
<td>December 2012</td>
</tr>
<tr>
<td>6</td>
<td>Monitor and update website with revised versions of the model, User Manual, publications etc.</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Continue to develop publications reflecting project results and lessons learned</td>
<td>Ongoing</td>
</tr>
<tr>
<td>7</td>
<td>Complete Final MDAST Progress Report</td>
<td>February 2013</td>
</tr>
<tr>
<td></td>
<td>Draft guidelines and share with Steering Committee</td>
<td>November 2012</td>
</tr>
<tr>
<td></td>
<td>Finalize guidelines based on feedback</td>
<td>December 2012</td>
</tr>
</tbody>
</table>

ACTIVITY 4

Activity 4 is to engage in country-specific training, testing, and refinement activities. Activity 4 deliverables have been completed or are track for completion according to the timeline. The Report on the 2012 MDAST Demonstration and Training Workshops was finalized in August 2012 after in-country partners were given the opportunity for review. Revisions to MDAST based on stakeholder and Steering Committee member feedback were completed in October 2012. Updates to the User Manual are ongoing and on track for completion by December 2012.
ACTIVITY 5

Activity 5 is to use country-specific MDAST in value of information (VOI) analyses to identify key knowledge gaps and create policy-relevant research agenda. Value of information analyses (VOI) have been ongoing and are detailed in the section titled “Status of Value of Information Analyses” contained within this Progress Report. Results from VOI were recently presented at the EcoHealth conference and publications are in development.

ACTIVITY 6

Activity 6 is to disseminate project results and lessons learned. Work on Activity 6 has been ongoing as indicated in the timeline. This has included maintaining and monitoring the MDAST project website and continuing to develop publications reflecting project results and lessons learned. The Final MDAST Progress Report will be submitted at the close of the project.

ACTIVITY 7

Activity 7 is to develop guidelines for replication in other countries. Work on Activity 7 is ongoing as provided for in the timeline. The project partners have identified a plan for drafting guidelines to be shared with the Steering Committee meeting and revised and finalized accordingly.