



Evaluation Data Report

Investigative Workshop: *Malaria Modeling and Control*

June 15-17, 2011

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Malaria Modeling and Control Workshop

Evaluation Data Report

Background

Introduction

This report contains evaluation data for a NIMBioS Investigative Workshop entitled “*Malaria Modeling and Control*” (Malaria workshop), which took place at NIMBioS June 15-17, 2011. NIMBioS Investigative Workshops are relatively large (30-40 participants), focus on a broader topic or a set of related topics than Working Groups, attempt to summarize/synthesize the state of the art and identify future directions, and have potential for leading to one or more future Working Groups. Participants may include post-docs and graduate students with less experience in the particular topic than those participating in Working Groups.

The Malaria workshop comprised 34 participants, including co-organizers Miranda Teboh-Ewungkem (Dept. of Mathematics, Lafayette College, Easton, PA); Folashade Augusto (NIMBioS, Univ. Tennessee, Knoxville); Frederick Baliraine (Univ. California, San Francisco, Dept. of Medicine, Division of Infectious Diseases, San Francisco General Hospital).

Workshop Description

Malaria is a life-threatening parasitic disease, transmitted by mosquitoes. In 2008, 243 million malaria cases led to about 863000 deaths, a slight drop from 2006 statistics. This slight drop in mortality resulted from a number of improved policies: increased international funding for research and healthcare, provision of insecticide-treated bednets, and a revival of support for indoor residential insecticide spraying. Despite this slight drop, challenges like drug resistance, the global financial slow-down and changing climatic conditions pose a threat to malaria control efforts. Mathematical models continue to play a major role in studies of malaria transmission dynamics and control. Although existing models have advanced our understanding of malaria, new models are urgently needed to capture new challenges to malaria control. Of note, there are increasing reports of malaria even in places where it had been eradicated. A model that captures mosquito dynamics with respect to current climatic changes, incorporates the use of a potential vaccine, and reflects the economic burden of the malaria-afflicted nations can inform policy makers on the most effective combination of control tools. Such a model can therefore help to reduce the malaria burden significantly, as well as contribute to finding a means to eradicate malaria in the near future. This workshop brought together experts in the mathematics and biology of malaria dynamics to discuss cutting-edge approaches to modeling malaria transmission and control, with the goal of forming a global Working Group to develop a model that will incorporate pertinent workshop questions. The workshop addressed the following questions:

1. How effective are present malaria control measures? What can be done to eradicate malaria in the near future? Can we generate a timeline?

2. What is the current state of things with malaria modeling? How do we capture the dynamics of the mosquito population to reflect climatic changes and global warming issues in order to produce an accurate model that represents the dynamics of the vector population?
3. What are the most realistic combination of control schemes that take into account feasibility and the health and economy of endemic areas most affected by malaria?
4. Will control mechanisms be more effective if based on the make-up of the population at risk- for instance genetic makeup and other physical properties such as high attractants to mosquitoes? What factors are more pertinent to consider in this regard?
5. How can vaccines be effectively captured in a malaria model that addresses questions 3 and 4 and can advance and provide answers to question 1?

Evaluation Design

Evaluation Questions

The evaluation of the workshop was both formative and summative in nature, in that the data collected from respondents was intended to both gain feedback from respondents about the quality of the current workshop and also to inform future similar meetings. The evaluation framework was guided by Kirkpatrick's Four Levels of Evaluation model for training and learning programs (Kirkpatrick, 1994¹). Several questions constituted the foundation for the evaluation:

1. Were participants satisfied with the workshop overall?
2. Did the meeting meet participant expectations?
3. Do participants feel the workshop made adequate progress toward its stated goals?
4. Do participants feel they gained knowledge about the main issues related to the research problem?
5. Do participants feel they gained a better understanding of the research across disciplines related to the workshop's research problem?
6. What impact do participants feel the workshop will have on their future research?
7. What changes in accommodations, group format, and/or content would participants like to see at future similar meetings?

Evaluation Procedures

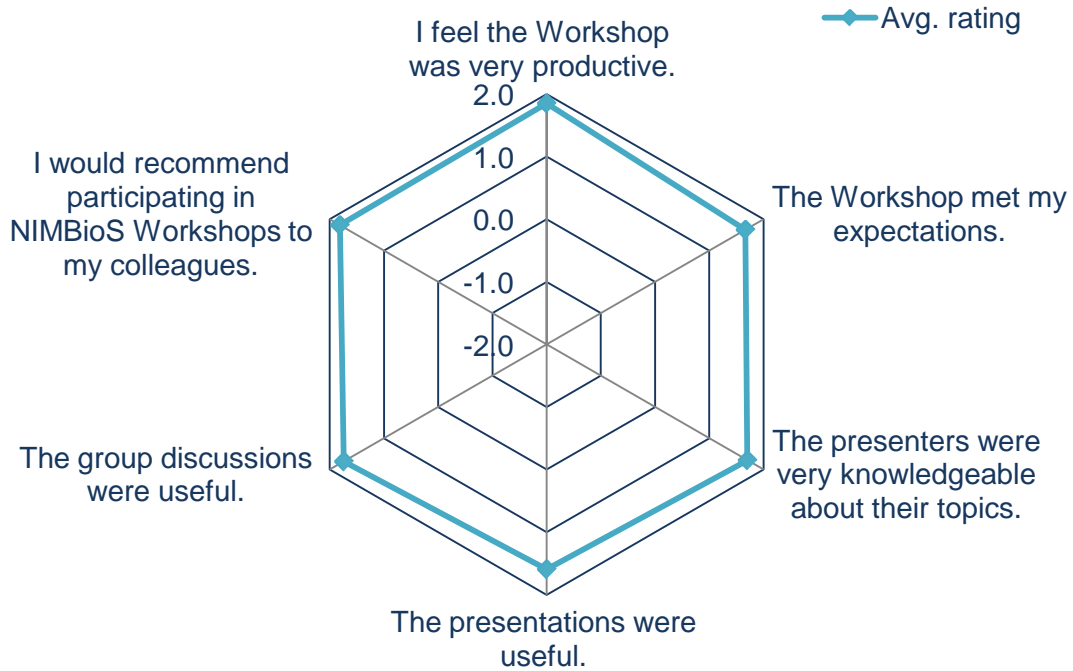
An electronic survey aligned to the evaluation questions was designed by the NIMBioS Evaluation Coordinator with input from the NIMBioS Director and Deputy Director. The final instrument was hosted online via the University of Tennessee's online survey host mrlInterview. Links to the survey were sent to 31 registered workshop participants on June 15, 2011 (co-organizers and NIMBioS affiliates were not included in the evaluation). Reminder emails were sent to non-responding participants on June 22 and 27, 2011. By July 3, 2011, 27 of the participants had given their feedback, for a response rate of 87%.

¹ From Kirkpatrick, D.L. (1994). *Evaluating Training Programs: The Four Levels*. San Francisco, CA: Berrett-Koehler.

Evaluation Findings

Overall Satisfaction

Figure 1. Satisfaction with various aspects of the workshop



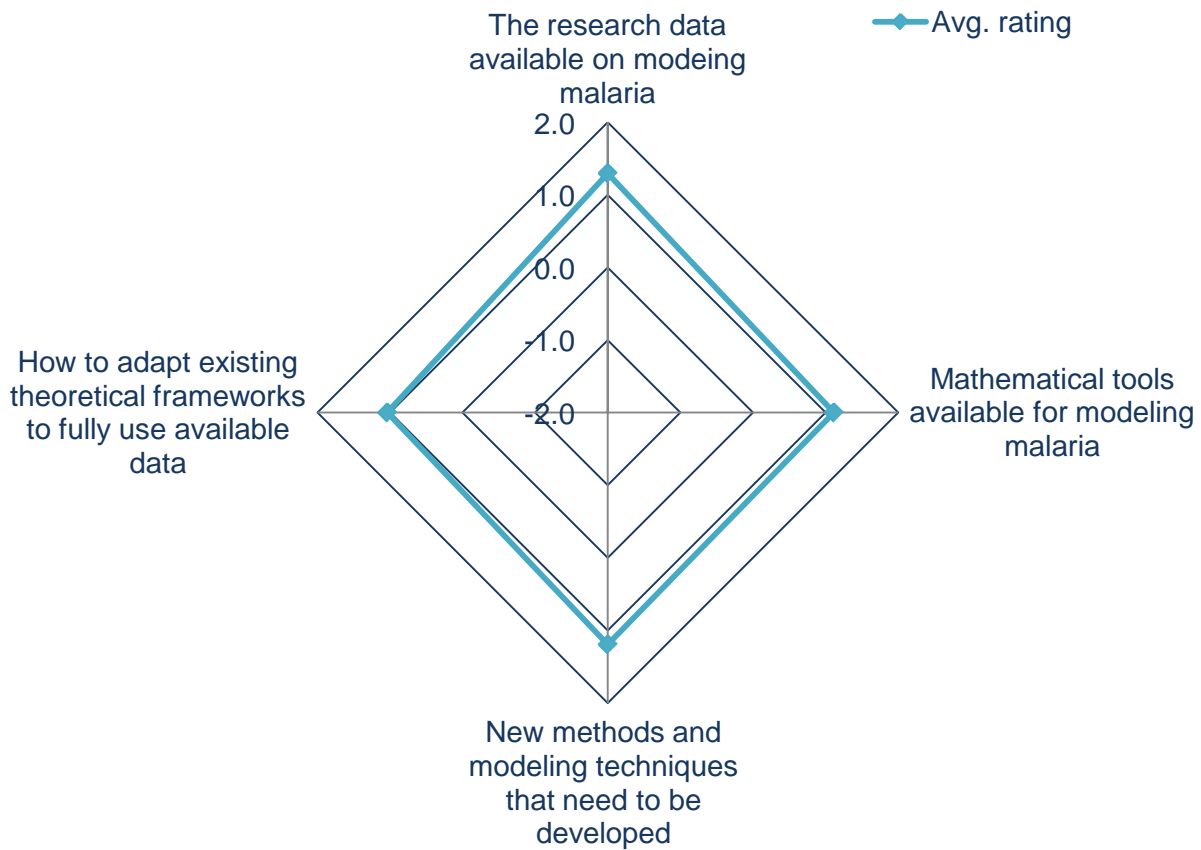
Scored on a 5-point Likert scale from -2 to 2 for “strongly disagree” to “strongly agree”

Workshop Content and Format

Participant Learning

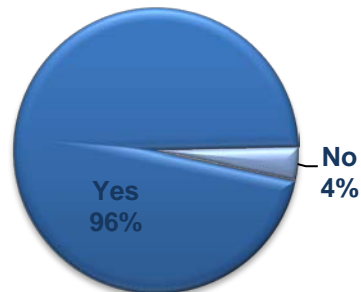
Figure 2. Participant learning

As a result of attending this workshop, I have a better understanding of:



Scored on a 5-point Likert scale from -2 to 2 for “strongly disagree” to “strongly agree”

Figure 3. Do you feel that participating in the workshop helped you better understand the research going on in disciplines other than your own regarding malaria modeling and control?



Comments

As a mathematician, listening to biologists talk about mosquitoes and public health professionals talk about the real issues in malaria control was invaluable.

Global malaria control and elimination of the disease is not an easy task. However, malaria elimination becomes a reality through a scientific data based and strategic approach. For this modeling of malaria vector dynamics, control measures, drug resistance, socio economic conditions ect. are of utmost importance. Either biologist or mathematician separately cannot do effective modeling for malaria/ malaria control. This type of forum, combining biologists and mathematician for malaria modeling with the objective of malaria control/ elimination globally, is very important. The initiated activities at the workshop needs to be continued and develop proposals to continue the work, raise funds for multi country projects (as different countries have different eco-geographical conditions) for developing models to guide disease control programs and policy makers for implementing effective malaria control measures for malaria control/ elimination globally. So this workshop is of immense importance.

I have a better understanding of the biological aspects.

I have really appreciated the possibility for biologists and mathematicians to work in a cooperative manner. The participation of biologists from different disciplines than my own was also a very interesting point.

I, as a person's health area, working in epidemiology, found it very important to interact with mathematical models. Was important to discuss with the group in the light of biological knowledge in order to help improve their mathematical models based on reality. On the other hand, allowed me to understand how mathematical modeling can represent reality and contribute to the prediction of events, as well as for the evaluation of intervention. Such joint activities have the potential to contribute to better understanding of malaria and its control.

It will definitely help me direct my research to address burning issues in malaria control rather than working on general models. One very important lesson I got from the workshop is: How could mathematical techniques help answering questions about malaria controls by using possible means available to the third world? Which one of these means is the most effective? What does it take to eradicate malaria from the third world?

The available information on the influence of temperature and rainfall on the dynamics of malaria and the malaria vector are two cases in point.

The new approach to modeling malaria dynamics was illuminating and can be applied to other diseases

The workshop exceeded my expectations and I learned a great deal. I've also made contacts with other researchers and look forward to rewarding collaborations as a result of this workshop.

The workshop invited policy makers to present and discuss the current task in controlling the disease and how the mathematical models can be used to address certain questions. I feel that the workshop is great in gathering people from the entire field. I would think that it will be more helpful if the policy makers can identify certain problems need to be addressed in more specific aspects. Then, the mathematicians or modelers can compromise certain things to analyze what the realities and what they can do. Overall, it is a great workshop.

The workshop was very useful, it was engaging and everyone was involved.

This was a successful event, very involving and provided a big opportunity to learn and grow. I would recommend more of such events.

This workshop provided an opportunity to put together the mathematician, biologist, and public health authority, helped participants understand research, campaign of malaria control, established networks and enhanced the relationship towards potential colorations. I believe all those will result into a very positive impact in the malaria modeling and control area.

Workshop Format

Figure 4. Effectiveness of workshop format



Most Useful Aspects of Workshop

Breaking out into small groups.

Communication, interacting with policy makers and biologists.

Communication, understanding, collaborating, and creating!

Getting to talk with extremely knowledgeable people with a multitude of different backgrounds.

Getting together biologists and mathematicians and allowing interaction between them and providing opportunities to work together in the workshop for developing project proposals for multi country studies leading to modeling of different aspects of malaria control

Group discussions.

Having the opportunity to work on real problems that people came up with following the talks was such a great experience. More workshops should incorporate this type of format.

Idea and from people who have first had experience about the malaria control in the third world. The success of malaria control cannot be separated from the socio-economic aspects of human beings. Posting relevant papers about malaria control on Wiggio was helpful.

Interaction between biologists and mathematical modelers.

interdisciplinary work with other members of the workshop.

Most of members in my group were mathematicians, but it was very useful to

interact with people who have different background.

New direction of research.

Sharing biological data with the mathematicians.

Sharing of information and the time that was allowed to exchange knowledge (group time).

The group discussion where participant were allowed to brainstorm on different approaches to address the problem (malaria disease modeling).

The group projects were the most useful for me, though the presentations did a good job of laying the groundwork for focusing in on interesting questions.

The group sessions.

The interactive and open nature of the activities. The presence of Biologists was a real asset to us mathematicians because most "misconceptions" were clarified.

The lectures and breakout groups.

The most useful aspects of the workshop are: 1) interactions between biologists and mathematicians. 2) Presentations and discussions of the experts (eg. WHO expert and other). 3) Discussion groups 4) NIMBioS environment is also very interesting.

The most useful part of the workshop was the discussions between people of different fields.

The presentations and the discussion group.

The small group discussion& working were the most useful aspect of this workshop.

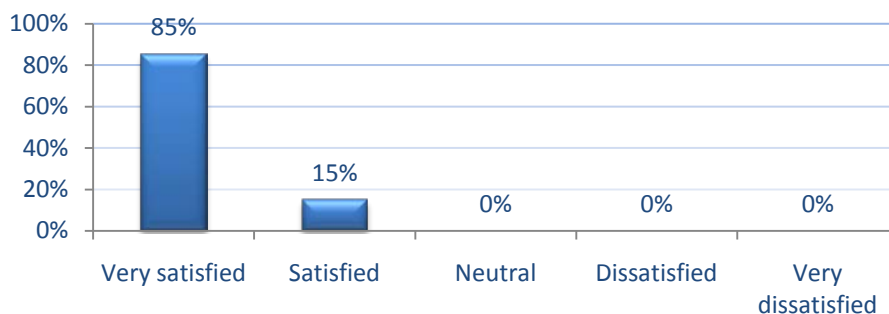
The small working groups, including the small presentations, were the most useful.

The successful reunion of biologists and mathematicians in order to discuss questions in general and then the work in small groups on a specific chosen topic.

The talk and expertise of the WHO expert.

Communication

Figure 5. How satisfied were you with the opportunities provided during workshop presentations and discussions to ask questions and/or make comments?



Comments

Give some time (on agenda) for the people in different work group to interact and know each other.

I thought the workshop did a very good job facilitating communication, and I don't see anything they should have done differently.

If opportunity arises, for problems such as malaria, please visit local sites to better improve current models. Also, share ideas with local experts in the field.

People leave everybody to talk and all of the foreign and interdisciplinary experiences are considered. I am satisfied!

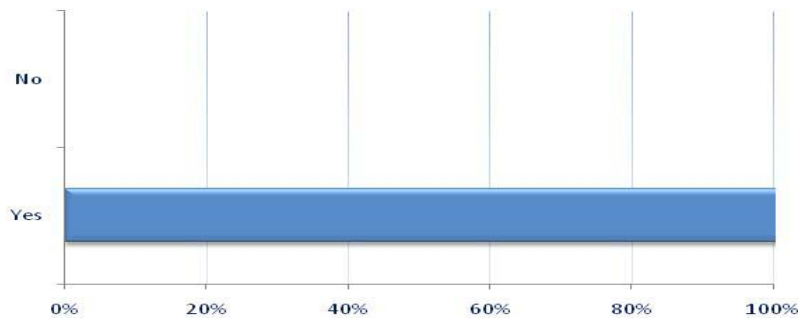
The opportunities given during the workshop (discussion sessions, group works, poster presentations, oral presentations, Dinner) are more than sufficient for interactions

Think about facilitating conversations after official workshop hours.

We got a chance to ask more questions after the talks were over. Therefore, 45 minute talk and few questions are enough in my view.

Progress Toward Goals

Figure 6. Do you feel the workshop made adequate progress toward finding a common language across disciplines for research on the workshop's topic?



Comments

Bringing expert of diverse background but with common goal was such a good idea. It helped solving common misunderstanding and clear some aspects in malaria modeling

I appreciated that the workshop seemed aimed towards facilitating collaborations between theoreticians and experimentalists, though it might have helped to include more people who have done experiments/field work on malaria.

Mathematics will be Biology's next microscope, and Biology will be Mathematics next Physics!

The groups that were formed had a good mixture of biologists and mathematicians and this help fruitful exchange.

The isolated work often lack adequate understanding of biological events. Therefore, interdisciplinary was the key that gave the event's success.

The presentations on the research results of different researchers helped to identify the relationships between mathematics and biology

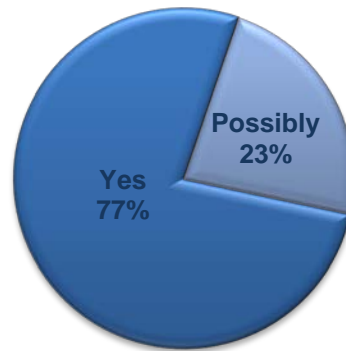
There was a good mix of biologists and mathematicians. This made discussions very interesting and the biologists helped to focus the discussion on the "Biology of the problem". It has in general been difficult for me to discuss my work with biologist, due to lack of the forum.

We appear to be able to talk to each other.

We are not there yet, but the participation of biologists is vital. Since the number of biologists is few compared to the mathematicians, they couldn't rotate in each group and give their input. Leading researchers in malaria were in one group. This could limit the opportunity one needs to find a common ground in a short period of time. Addition of statisticians could also help. This could be something to consider in the future. However, the workshop will definitely give a good base to start interdisciplinary collaboration.

Impact on Future Research Plans

Figure 7. Do you feel that the exchange of ideas that took place during the workshop will influence your future research?



Comments

Among other things, this workshop changed my view of the mosquito-parasite relationship, which should impact models I work on in the future.

For now, my work was focused on epidemiological description, and now, from the workshop, you can use mathematical modeling from the interaction with other group members. Moreover, as work also with tuberculosis, Dr Fola Augusto and Dr Calistus Ngonghala talked to me to try to test their modeling approach based on the actual data from the research that I coordinate in Brazil.

Having a "realistic" birth rate function mosquitoes will really enhance understanding of the models. The prospects are good.

I am interested in the applications of optimal control to biological/disease models and there is a lot that has not been exploited as far as malaria modeling is concerned. I may consider applying optimal control techniques to malaria with the hope of developing articulate strategies to combat the disease.

I hope so through collaborations with the colleagues I meet during the workshop.

I learned a lot about the disease itself, which serve better in understanding my models.

It was possible to identify researchers who work on different disciplines. I have already discussed with some participants for collaborations for future work in this field.

More minds the better specially from different research perspectives (i.e. math, biology, epidemiology)

Mostly on malaria modeling and control.

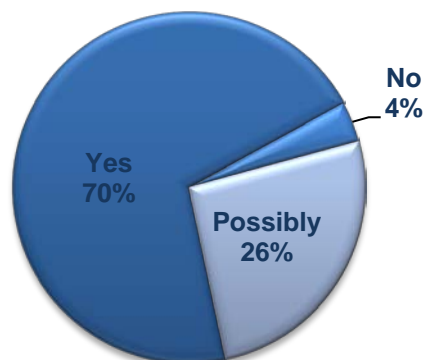
New research ideas and the direction of research of current research will definitely influence my research direction in the near future

The workshop gave me a much better sense of where the field of malaria control is at currently, and that will enable me to see the potential for collaborations as well as to communicate my ideas more effectively.

We see problems solving from different angles. When an expert from other area makes a suggestion, it enriches what we already have, either by offering additional idea or by directing our thoughts to what would be better to consider. My future research is influenced already.

Impact on Future Collaborations

Figure 8. Did you develop plans for collaborative research with other workshop participants?



Comments

As a result of this workshop, my teammates and I agree to continue to work on the impact of environmental effect on Mosquitoes Population Dynamic (Temperature, Rainfall, Humidity, Distance between the breeding sites to the nearest human Habitat...etc)

First, I have some friends attending the workshop. Thus, it provides a platform to discuss more. Moreover, there are quite common interests between me and other participants. Certainly the workshop meets and overshoots my expectation.

Had so leave earlier due a family emergency so the collaborations will follow after I am able to resolve the emergency

I am very positive on this, as it is one tool that helps in building and strengthening one's career.

I have been working in vector-borne diseases already. Further, the many lists of relevant problems given out during the group formation periods were rich in content. The group that I am in also has interest in pushing the project to a publishable level, and I will collaborate in the research. I also communicated with some participants, gave out my papers and talked to briefly and started a plan. The time was not sufficient to develop a detailed plan, but definitely I am optimistic that the research will soon take off.

In the group that participated directly, we begin the mathematical modeling to identify the optimal percentage of the mosquito nets usage for the disease control. This model is being refined for future publication. Additionally, I was contacted by another group to do a project on international collaboration between the United States, Philippines, Kenya and Brazil. In this project we intend to identify the impact of climate change on malaria. We are writing the project and will submit the request for funding. The proposal is at least 5 years duration, which has great potential for international collaboration. In my case, as I live in the Amazon, Brazil can contribute to the information area of the Americas where more cases of malaria is recorded and where we have the greatest tropical forest of the world. So the potential to positive results is promising

Our group has a problem, which we will most likely pursue. What the results will be is anybody's guess.

Our group has created Google documents to facilitate further communication on our project.

The workshop identified 4 working groups each work on a one or two areas (disciplines) of research. They got to know each other and agreed to develop proposals and communicate through internet to further development of the projects.

We plan to continue discussion and refine the model we are building in our discussion group. I also discussed collaborations with some participants and some of these collaborations are already on the start.

We plan to use data collected by biologist (workshop participants) from Kenya and Sri Lanka to attempt estimating growth rates functions for mosquito populations and other vital parameters that affect the population dynamics of mosquitoes.

Suggestions for Future workshops

A presentation on entomological aspects (mosquito collection methods and how to measure density of mosquitoes in different collection methods) could be included to make the mathematicians aware of entomological aspects of malaria as this information is necessary for modeling vector dynamics of malaria which is very important for malaria control

Fewer talks about policy and background information and more talks about math.

I don't think I would change anything, other than perhaps starting a day earlier (on the Tuesday), and having everyone leave Friday morning instead of in the afternoon. That way you would have 3 full days instead of 2.5 days. Also, traveling in the morning is somewhat preferable to the afternoon when returning home.

I liked of the few presentations, just to give an overview of the problem. So. I do not see negative points, because we had time to discuss and to work in the workshop. I suggest that additional workshops have the same kind of schedule.

I would have liked to see a more even ratio of biologists to mathematicians.

If groups should be formed, then share the leading researchers (in malaria) among groups. They could go around and share their thoughts. Probably, it would be a good idea to group researchers from diverse background to work on a common goal and spread students as well. This could benefits those who come to learn about the problem and how to model it better.

Increase the number of days for the meeting for more interactions

It might have been nice to spend a little less time on presentations after the first day, and a little more time on our group projects.

It was scheduled for three days, but really it was two days. Time was sort of short.

It's kind of short (3 days) especially for people coming from other countries..

Limit the number of problems and give participants to opportunity to participate in more than one problem.

Maybe add an extra day to be able to go a bit deeper into the finalization of a research project.

More participants from south-east Asia.

Not really. As I suggested, the policy makers should address their problems more directly so that mathematicians and modelers know what they can contribute to.

Period for working groups and production of group reports was short. It would also have been good to have a survey presentation on existing mathematical methods in malaria modeling.

Plead for more days in order to fully develop a working projects for subgroups within the workshop

Social events (informal) to have more communications and friendship building up. But I know it's difficult since it's only 3 days and most of people leave on last day.

The group formation took place without adequate discussion of the general problems that the groups might discuss. Those problems need to be proposed with more thought. 20 minutes of discussion is not really enough to determine what the central issues of the workshop are going to be. If we are all housed in the same hotel, there should really be some effort to find ways to exploit that as opposed to just letting things happen, which takes too long for a short workshop.

The order / scheduling of the talks.

The time was too short.

There is a need to be clear about the use of the models and whether there is a benefit in their use. There is also a need to identify the end users of the models

This workshop was very well organized. Maybe, with more time (a week) we would more presentations from participants and more discussion for future collaborations.

Additional Comments

Excellent job organizing this workshop!

Great workshop.

I am a senior scientist in the field of malaria control specially entomology. I am very much interested in work towards reducing malaria prevalence globally as this affects socio economic situation especially in the poor countries. Thus, I would like to collaborate with other scientists and to develop models for different disciplines of malaria

I study the epidemiology of malaria, tuberculosis and dengue, using statistical models. For now on I intend to include mathematical models with the collaborative network started at the workshop.

I would like to thank the NIMBioS administrators for giving me this opportunity to interact with other researchers, learn from and share with others, and be aware of the present trend of research in the domain of malaria modeling.

I wouldn't make it if NIMBioS didn't support me financial. Therefore, I would like to take this opportunity to say thank you. I am looking forward to make contributions in malaria research in the near future and acknowledge NIMBioS in my works.

Please indicate the correct agenda prior to booking flights. Thank you!

The meeting was a great knowledge sharing experience

Appendix

Malaria Modeling and Control Workshop Evaluation Survey

Malaria Modeling and Control Workshop Survey

Thank you for taking a moment to complete this survey. Your responses will be used to improve the workshops hosted by the National Institute for Mathematical and Biological Synthesis. Information supplied on the survey will be confidential, and results will be reported only in the aggregate.

Please check the appropriate box to indicate your level of agreement with the following statements about this workshop: (Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied)

- I feel the workshop was very productive.
- The workshop met my expectations.
- The presenters were very knowledgeable about their topics.
- The presentations were useful.
- The group discussions were useful
- I would recommend participating in NIMBioS workshops to my colleagues.

Please check the appropriate box to indicate your level of agreement with the following statements. As a result of participating in this workshop, I have a better understanding of: (Strongly agree, Agree, Neutral, Disagree, Strongly disagree)

- The research data available on malaria modeling and control
- Mathematical tools available for modeling malaria
- New methods and modeling techniques that need to be developed
- How to adapt existing theoretical frameworks to fully use available data

Do you feel participating in the workshop helped you better understand the research going on in disciplines other than your own?

- Yes
- No
- Comments:

Do you feel the workshop made adequate progress toward finding a common language across disciplines for research on the workshop's topic?

- Yes
- No
- Comments:

Do you feel that the exchange of ideas that took place during the workshop will influence your future research?

- Yes
- No

Possibly
Comments:

Did you develop unanticipated plans for collaborative research with other workshop participants?

Yes
No
Possibly
Comments:

What do you feel was the most useful aspect of the workshop?

What would you have changed about the workshop?

How do you feel about the format of the workshop?

This was a very effective format for achieving our goals
This was not a very effective format for achieving our goals ->
The workshop format would have been more effective if:

How satisfied were you with the opportunities provided during workshop presentations and discussions to ask questions and/or make comments?

Very satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied

Please indicate any suggestions you have for facilitating communication among participants during the workshop:

Please use this space for additional comments: