NIMBioS

Evaluation Report
Investigative Workshop: Modeling Bovine Tuberculosis
July 7-9, 2009

Pamela Bishop
Program Evaluation Coordinator
National Institute for Mathematical and Biological Synthesis
October, 2009

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Bovine Tuberculosis Workshop Evaluation Executive Summary

Brief Synopsis of Event

This report is an evaluation of a NIMBioS Investigative Workshop entitled "Modeling Bovine Tuberculosis," which took place at NIMBioS July 7-9, 2009. 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 Modeling Bovine Tuberculosis group comprised 38 participants, including co-organizer Colleen Webb (Colorado State University) and Agricola Odoi (NIMBioS). Participants included a diverse collection of theoreticians and biologists specializing in fields such as veterinary medicine, epidemiology, ecology, applied mathematics, and mathematical biology.

The focus of the Workshop was discuss cutting-edge approaches to model bovine tuberculosis (TB) transmission in the United States, with the goal of developing a model that would help inform policy on TB control strategies. Much of the progress in modeling bovine TB has been in European agricultural systems where cattle movement and disease spread data are quite detailed. This Workshop investigated how modeling approaches developed for the European systems might be applied to the U.S. system, which differs quite significantly from the systems in Europe and where available data are not quite as detailed. Workshop organizers and participants plan to form a working group to develop models of cattle movement that would allow prediction of bovine TB spread and investigation of alternative control and eradication plans in the United States at both the state level (in states with high prevalence of bovine tuberculosis) and at the national level.

Evaluation Design

An electronic survey aligned to the following evaluation questions was designed by NIMBioS' Evaluation Coordinator with input from the NIMBioS Director and Deputy Director:

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. Were participants satisfied with the accommodations offered by NIMBioS?

8. What changes in accommodations, group format, and/or content would participants like to see at future similar meetings?

The final instrument was hosted online via the University of Tennessee's secure online survey host mrInterview. Links to the survey were sent to 37 Workshop participants (NIMBioS employee Agricola Odoi was excluded from the evaluation) on July 9, 2009. Reminder emails were sent to non-responding participants on July 16 and 21, 2009. By July 28, 2009, 29 participants had given their feedback, for a response rate of 78%

Highlights of Results

- Overall satisfaction with the Workshop was high among respondents, the majority of whom indicated they either agreed or strongly agreed that the Workshop was productive (94%) and met their expectations (93%).

- Almost all respondents thought the presentations were useful (93%), the presenters were very knowledgeable about their presentation topics (97%), and the group discussions were useful (97%).

- All respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Workshops to their colleagues.

- Overall, respondents reported being satisfied with the travel, housing, and other amenities provided by NIMBioS.

- Respondents reported relatively high levels of learning about bovine TB transmission dynamics and cattle movement patterns in the U.S. Learning gains, however, were lower for knowledge gains regarding control options for bovine TB and new methods and modeling techniques that need to be developed

- Most respondents said the multidisciplinary composition of the Workshop was its most useful aspect.

- Ninety-seven percent of respondents said they felt that participating in the Workshop helped them understand the research going on in other disciplines regarding bovine TB.

- Ninety-three percent of respondents agreed that the format of the Workshop was very effective for achieving its goals

- The majority of respondents (74%) agreed that the Workshop made adequate progress toward its goal of developing predictive models to determine the conditions under which the bovine TB disease may spread, although most agreed much work still needed to be done.

- Twenty-three respondents said they felt that the exchange of ideas that took place during the Workshop would (or potentially would) initiate and/or influence their future research.

- Fourteen respondents reported they developed solid plans for collaborative research with other Workshop participants, while six indicated they saw potential for collaboration in the future.

Conclusions and Recommendations

Overall, the Workshop was successful in making progress toward its goals. Survey respondents were satisfied with the meeting, indicating that it was a productive experience that met their expectations. Respondents were also satisfied with the travel, housing, and other amenities offered by NIMBioS.

The Workshop had good diversity regarding gender, occupational status, geographic dispersion, and primary field of study of its participants; however, little diversity existed in the racial and ethnic composition of the group.

Respondents reported relatively high levels of learning about bovine TB transmission dynamics and cattle movement patterns in the U.S. Learning gains, however, were lower regarding control options for bovine TB and new methods and modeling techniques that need to be developed. A large majority of respondents said they felt that participating in the Workshop helped them understand the research going on in other disciplines regarding bovine TB. Several participants also made comments about the benefits of seeing international research presented as well.

The majority of respondents agreed that the Workshop made adequate progress toward its goal of of developing predictive models to determine the conditions under which the bovine TB disease may spread, although most agreed much work still needed to be done. Several respondents said the discussions during the Workshop laid the foundation for the next step in developing these models, while some felt that the Workshop focused too much on the modeling approaches in other countries instead of discussing what could potentially work in the U.S.

Most respondents indicated they planned to take the knowledge they gained during the Workshop and apply it to their own research. Fourteen respondents reported they had developed solid plans for collaborative research with other Workshop participants, while six indicated they saw potential for collaboration in the future.

Several suggestions for improvement of future Workshops were suggested by participants, including better organization, and a more clearly defined agenda with clear objectives and goals. Other suggestions from respondents included providing participants with background information/reading materials before the Workshop, having smaller breakout groups for discussion, making electronic copies of presentations available to participants during the Workshop, and designating time to synthesize the information from the Workshop and discuss the next steps towards creating models.

Based on analysis of participant response data, the recommendations for future Workshops are as follows:

- Ensure that a clearly defined agenda with clear objectives and goals is conveyed to Workshop participants before the start of the Workshop, and discuss the day's objectives at the start of each day of the Workshop.
- Make background research and reading materials available to participants before the Workshop. If feasible, consider offering a preconference webinar to Workshop participants to get everyone up to date on the latest research about the Workshop research problems.

- When possible, provide electronic copies of presentations to participants.
- Create smaller breakout groups (10 or fewer participants each) and clearly define and communicate the goals of each of the breakout group discussion sessions each day.
- Before the conclusion of the Workshop, consider designating a specific time slot to synthesize the information provided, address the next steps that should be taken, and assign specific tasks to individuals or groups with tentative timelines for completion.

Modeling Bovine Tuberculosis Workshop Evaluation Report

Background

Introduction

This report is an evaluation of a NIMBioS Investigative Workshop entitled "Modeling Bovine Tuberculosis," which took place at NIMBioS July 7-9, 2009. 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 Modeling Bovine Tuberculosis group comprised 38 participants, including co-organizers Colleen Webb (Colorado State University) and Agricola Odoi (NIMBioS). Participants included a diverse collection of theoreticians and biologists specializing in fields to include veterinary medicine, epidemiology, ecology, applied mathematics, and mathematical biology. The focus of the Workshop was discuss cutting-edge approaches to model bovine tuberculosis (TB) transmission in the United States, with the goal of developing a model that would help inform policy on TB control strategies. Much of the progress in modeling bovine TB has been in European agricultural systems where cattle movement and disease spread data are quite detailed. This Workshop investigated how modeling approaches developed for the European systems might be applied to the U.S. system, which differs quite significantly from the systems in Europe and where available data are not quite as detailed. Workshop organizers and participants plan to form a working group to develop models of cattle movement that would allow prediction of bovine TB spread and investigation of alternative control and eradication plans in the United States at both the state level (in states with high prevalence of bovine TB) and at the national level.

Workshop Background

Bovine Tuberculosis is an infectious chronic disease found primarily in cattle but has been identified in many other species. The State and Federal Cooperative Bovine TB Eradication program, which began in 1917, has made significant progress decreasing the prevalence of *M. bovis* in humans and cattle; however, small pockets of *M. bovis* infection still exist in cattle and wildlife in the United States. In fiscal year 2008, the United States Department of Agriculture (USDA) spent approximately $31 million depopulating *M. bovis* affected herds, in addition to costs incurred for surveillance and control activities. In an effort to increase efficiency and effectiveness of TB control in the U.S., it is important to consider and assess other control strategies.

The use of disease simulation models is one method of exploring control options that could be used as alternatives to whole herd depopulation. Understanding cattle movement patterns as well as the connectivity of the various sectors of the U.S. cattle industry and incorporating these in the models

would allow USDA Animal Plant Health Inspection Service (APHIS) Veterinary Services (VS) to develop more effective regulations and control strategies for various animal diseases, including bovine TB.

A number of interesting mathematical questions exist at the intersection of statistical and process-based models and research on these approaches are relevant to the problem of modeling TB transmission. This Investigative Workshop brought together experts from across the globe to discuss cutting-edge approaches to model bovine TB transmission in the United States, with the goal of developing a model that would help inform policy on TB control strategies.

Participant Demographics

Program participants were college/university faculty (37%), government employees (23%), graduate students (21%), postdoctoral researchers (16%), or college/university staff (3%). Primary fields of study for the 38 participants included agricultural sciences/natural resources, biological/biomedical sciences, computer and information sciences, health sciences, mathematics, and social sciences (Table 1).

Table 1. *Participant fields of study and areas of concentration*

Field of Study	Concentration	# Participants
Agricultural Sciences/Natural Resources	Agricultural Economics	2
	Animal Science	1
	Wildlife/Range management	2
Biological/Biomedical Sciences	Ecology	4
	Evolutionary Biology	1
	Mathematical Biology	5
	Microbiology	1
	Zoology	2
Computer & Information Sciences	Computer Science	1
Health Sciences	Epidemiology	4
	Veterinary Medicine	9
Mathematics	Applied Mathematics	2
	Mathematical Biology	2
	Statistics	1
Social Sciences	Geography	1

Participants represented 22 different institutions across three countries, including Sweden, the United Kingdom (both England and Scotland), and the U.S. Within the U.S., 14 different states were represented. Included in the institutions were both government entities and colleges/universities.   Of the colleges/universities, most were classified as 4-year, comprehensive (having undergraduate and graduate programs) schools (Figure 1).

Figure 1. Characteristics of participants' colleges/universities
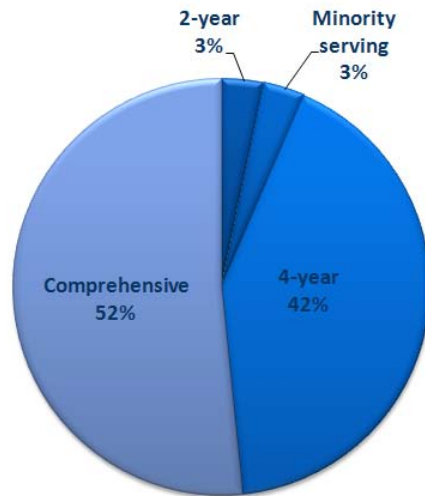
The 14 females and 23 males (two of whom self-identified as being of Hispanic/Latino ethnicity) mostly self-identified racially as white (Figures 2 & 3).

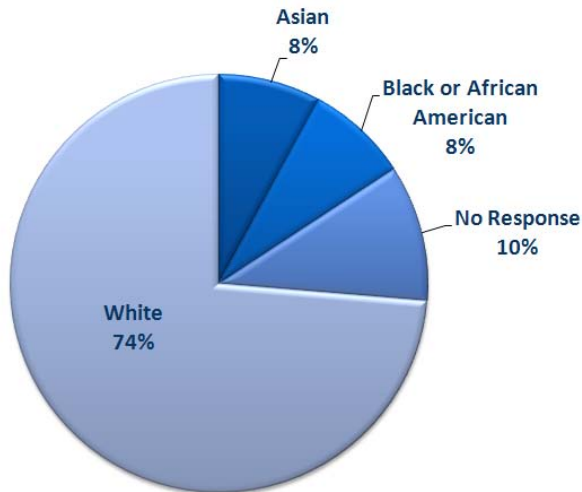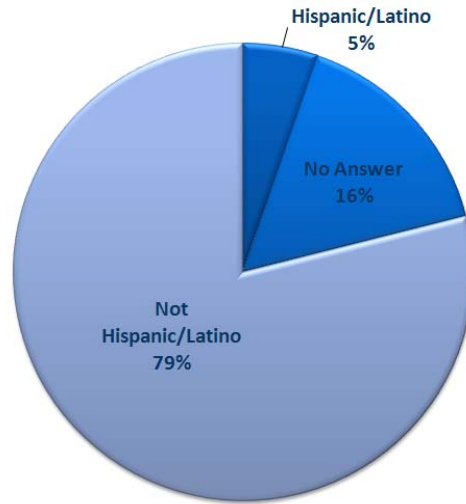*Figure 2. Racial composition of program participants (n =38)*

Figure 3. Ethnic composition of program participants (n =38)

Three respondents indicated their work is currently supported by a National Science foundation grant (Table 2).

Table 2. *NSF grants supporting participant research*

Name of grant	Institution(s) at which grant is held
NSF Grant (Name of grant not provided)	Colorado State University
Graduate Research Fellowship	University of Texas, Austin
National Center for Ecological Analysis and Synthesis	University of California, Santa Barbara

Evaluation Design

Evaluation Questions

The evaluation of the Workshop was both formative and summative in nature, in that the data collected from participants was intended to both gain feedback from participants about the quality of the current Workshop and also to inform future meetings. The evaluation framework was guided by Kirkpatrick's Four Levels of Evaluation model for training and learning programs (Kirkpatrick, 1994[1]). The evaluation questions were developed according to level one of the model, participants' reactions, in order to gather information about how participants felt about the content and format of the Workshop, as well

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

as the accommodations provided by NIMBioS. Several questions constituted the foundation for the evaluation:

Workshop

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. Were participants satisfied with the accommodations offered by NIMBioS?
8. What changes in accommodations, group format, and/or content would participants like to see at future meetings?

Evaluation Procedures

An electronic survey aligned to the evaluation questions was designed by 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 mrInterview. Links to the survey were sent to 37 Workshop participants on July 9, 2009 (NIMBioS employee Agricola Odoi was excluded from the evaluation). Reminder emails were sent to non-responding participants on July 16 and 21, 2009. By July 28, 2009, 29 participants had given their feedback, for a response rate of 78%

Data Analysis

Data from the electronic survey included both forced-response and supply-item questions. All data were downloaded from the online survey host into the statistical software package SPSS for analysis. Quantitative data were analyzed using SPSS, while qualitative data were analyzed in SPSS Text Analysis for Surveys. Qualitative responses were categorized by question and analyzed for trends.

Findings

Overall Satisfaction

Overall satisfaction with the Workshop was high among respondents, the majority of whom indicated they either agreed or strongly agreed that the Workshop was very productive (94%) and met their expectations (93%). Some general participant comments:

> *"It was great. I'm looking forward to seeing the formation of working groups."*

> *"It was a nice mix of people from different countries and occupations..."*

> *"I am excited about the prospects."*

One respondent who disagreed that the Workshop was productive though the organization could have been better:

> "I think the organization could have been greatly improved. The objectives of the Workshop were not really clear until towards the end, and even then I'm not sure I understood the Workshop and organize[rs'] objectives."

Almost all respondents thought the presentations were useful (93%), the presenters were very knowledgeable about their presentation topics (97%), and the group discussions were useful (97%). Additionally, all of the respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Workshops to their colleagues (Table 2).

Table 2. *Participant satisfaction with various aspects of the Workshop, by level of agreement*

	n	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I feel the Workshop was very productive.	29	44.8%	48.3%	3.4%	3.4%	0%
The Workshop met my expectations.	28	35.7%	57.1%	7.1%	0%	0%
The presenters were very knowledgeable about their topics.	29	51.7%	44.8%	3.4%	0%	0%
The presentations were useful.	29	55.2%	37.9%	6.9%	0%	0%
The group discussions were useful.	29	44.8%	51.7%	3.4%	0%	0%
I would recommend participating in NIMBioS Workshops to my colleagues.	29	51.7%	48.3%	0%	0%	0%

Satisfaction with Accommodations

Overall, respondents reported being satisfied with the travel, housing, and other accommodations provided by NIMBioS during the Workshop. Twenty-seven respondents answered questions about their travel accommodations, 22 of whom said they were satisfied with their accommodations, while five indicated feeling "neutral." The less satisfied participants indicated they would have liked to have received their flight details sooner and/or that they were confused about the reimbursement process:

> "Please send out the details of travel information sooner, we received it only a few days ahead of the travel - at least one to two weeks ahead of time would be appreciated. Provide detail about how the reimbursement process works with our agency, as I am still unclear how this is going to work for miscellaneous expenses such as a the baggage fee, airport parking and mileage to/from the airport for my personal vehicle (driving from work to the airport in Colorado)."

> "I only wish I could have booked a flight earlier, so I could have had more direct flights at reasonable prices."

The majority of participants reported being satisfied with the comfort and resources of the NIMBioS facility, as well as the quality of meals provided (Table 3). Several participants, however, indicated they would like some lighter vegetarian meals and more water and soft drink options.

Table 3. *Participant levels of satisfaction with Workshop accommodations*

Please indicate your level of satisfaction with the Workshop accommodations:	*n*	Very satisfied	Satisfied	Neutral	Dissatisfied	Strongly dissatisfied
Comfort of the facility in which the Workshop took place	29	79.3%	13.8%	6.9%	0%	0%
Resources of the facility in which the Workshop took place	29	79.3%	6.9%	13.8%	0%	0%
Quality of meals	29	48.3%	37.9%	13.8%	0%	0%
Quality of drinks and snacks provided	29	51.7%	31%	17.2%	0%	0%

Workshop Content and Format

Participant Learning

Ninety-seven percent of respondents said they felt that participating in the Workshop helped them understand the research going on in other disciplines regarding bovine TB. Several participants also made comments about the benefit of seeing international research presented as well:

> "I found the various modeling approaches from the UK very interesting, and also had some great insight into Agency wants and needs, and their approaches to research. It was fascinating to hear all the viewpoints and information."

> "It was very beneficial to have the international perspective and to see how those other countries are able to utilize their data for modeling."

> "It was very interesting to hear about the available data on TB and livestock movements in the US (and lack thereof!), and to meet people working in particular areas where there is more data available."

Respondents were also asked several questions to gauge their levels of learning about specific issues related to the research problem. Respondents reported relatively high levels of learning about bovine TB transmission dynamics and cattle movement patterns in the U.S. Learning gains, however, were lower regarding knowledge gains about control options for bovine TB and new methods and modeling techniques that need to be developed (Table 3). Of the respondent s who disagreed that they learned anything about the methods and modeling techniques that needed to be developed, one had this recommendation:

"[Include] a more diverse group of presenters regarding BTB control programs and modeling in other countries (rather than mostly focusing on the UK experience). I mention this point, because it is well known that the UK BTB experience is very distinctive, with very specific epidemiological features, thus, BTB models applied in different circumstances could also contribute to the USA main objectives."

Table 3. *Participant self-reports of learning about issues related to the Workshop's research problem*

As a result of participating in this Workshop, I have a better understanding of:	n	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
bovine TB transmission dynamics.	29	51.7%%	27.6%	17.2%	3.4%	0%
cattle movement patterns in the U.S.	29	62.1%	20.7%	17.2%	0%	0%
control options for bovine TB.	29	20.7%	34.5%	41.4%	0%	3.4%
new methods and modeling techniques that need to be developed.	29	17.2%	51.7%	17.2%	13.8%	0%

Progress Toward Goals

Ninety-three percent of respondents felt the Workshop format was effective for achieving it goals. The majority of respondents (74%) agreed that the Workshop made adequate progress toward its goal of developing predictive models to determine the conditions under which the bovine TB disease may spread, although most agreed much work still needed to be done. Several respondents said the discussions during the Workshop laid the foundation for the next step in developing these models:

"The transmission dynamics of bTB are very poorly understood even in countries with relatively rich sources of epidemiological data. In the US, you face a particularly difficult challenge in that the levels of prevalence are so low it is difficult to obtain a clear picture of the patterns of transmission from which more general principles could be extrapolated. It did become clear by the end of the Workshop that there were a variety of data sources which could be exploited to obtain some of the baseline information that will be vital for any form of prediction."

"…we certainly made great progress towards describing qualitatively those models, reviewing available data, and charting a course towards designing and implementing models."

"I think it helped identify issues related to modeling [bovine] TB"

Other respondents felt that the Workshop focused too much on the modeling approaches in other countries instead of discussing what could potentially work in the U.S.:

"The available data and existing knowledge on cattle movement are very limited to develop a predictive model. Perhaps it would have been good to explore more modeling approaches

beyond TB modeling in Europe, as it was clear from the beginning that the data necessary for those approaches were inexistent."

"There was a lot of talk about models that were done in other countries, but I still do not know how the US plans to approach it and which models they would use. There was not enough discussion on how and who was going to do that."

Although some participants expressed concern over who would actually take on the task of developing the models, several respondents felt a potential working group following the Workshop would provide an opportunity to begin the modeling work:

"I think that people certainly sorted out different avenues to pursue, although they didn't (as far as I know) actually begin model development yet. That will hopefully come out of working groups and visiting research spawned from this Workshop."

"Development of working group topics was a large outcome and will provide a strong footing to begin the work."

Impact on Future Research Plans

Most respondents said the multidisciplinary composition of the Workshop was its most useful aspect, as they were able to learn from those in fields other than their own:

[The most useful part of the Workshop was…]

"The mix in expertise give me new points and angles that i haven't considered before. I feel I have a better "integrated" knowledge of the TB problem and available data and tools."

"Working together with professionals in both applied and academic fields, it was an incredible learning experience that really highlighted to importance and utility of these types of meetings."

"The insights of participants with a diverse, but very complimentary set of expertise."

"I felt the Workshop was very useful in that it brought together diverse groups of researchers who may not have interacted in such a positive way otherwise."

Other respondents felt the discussions, both within groups and between individual participants, were the most useful aspect of the Workshop:

[The most useful part of the Workshop was…]

"The group discussions were the most useful aspect for me in that it offered the opportunity for anyone to share their ideas as we worked toward a common goal."

"The discussions following presentations, with everyone in the same room. I thought it was really valuable to get all the different perspectives, and to see emergent ideas forming."

"… the presentations on US data were an eye-opener, but some of the discussions were very constructive, too."

Twenty-three respondents said they felt that the exchange of ideas that took place during the Workshop would (or potentially would) initiate and/or influence their future research. Some participant comments:

> *"…The range of expertise and academic disciplines offered new perspectives on tackling the economic issues which form an important part to my current research."*

> *"…I felt this Workshop did a fantastic job of bringing people of diverse backgrounds and expertise together. The ideas that were exchanged helped to develop cross-disciplinary ties that will prove useful."*

> *"… I learned a lot about modeling strategies for livestock movement and the complexity of studying livestock disease in the US/Europe. I also met a myriad of very interesting scientists and professionals who I hope will continue to be collaborators."*

> *"… I had no idea that GIS could integrate so nicely with some of these questions, in pretty straightforward ways. I also met people working on the agency side of questions, who clearly want to collaborate - this is possibly my first real interface with them."*

> *"…By promoting the communication between researchers with both mathematical and biology backgrounds, the Workshop was very successful in identifying new questions that can be answer by the joint work on these ends. I definitely have a better idea now of what kind of questions can be formulated, and what kind of working groups can be formed to answer them. This will certainly help me in defining future research projects…"*

> *"…The application of specific modeling techniques that I was previously unaware of will be applicable to my own research at some point."*

In addition to new ideas for research, 14 respondents said that they developed plans for collaborative research with other Workshop participants, while six said the potential for collaboration was present:

> *"…I now have three potential new collaborations established; one on optimization of cattle management related to TB, another with an NCEAS postdoc on simulation modeling, and finally a potential collaboration on cattle fever tick population dynamics. I was very surprised at the level of interaction and clear interest in developing collaborations that emerged from this Workshop."*

> *"…Even though some of the plans (conversations) were started before NIMBioS, the BTB Workshop was crucial to consolidate previous ideas. Now, after the NIMBioS we are working in conducting research related to BTB in the USA."*

> *"…previously US data has been seen as entirely unavailable. We now appreciate that there is data available, and people interested in collaborating with modelers using that data."*

> *"…The group was more important in networking for future projects than I expected, and I am confident that we can go ahead with the plans of having a work group studying cattle movement at the national level."*

Suggestions for Future Workshop Meetings

Respondents were asked several questions soliciting suggestions for future Workshop meetings. Several themes emerged from analysis of participant responses, including better organization. Suggestions for better organization included a more clearly defined agenda with clearly communicated objectives and goals:

> *"I think there was some confusion in the minds of participants regarding the intent of the Workshop. Specific and focused research questions were not posed intentionally."*

> *"I think the organization could have been greatly improved. The objectives of the Workshop were not really clear until towards the end, and even then I'm not sure I understood the Workshop and organize objectives."*

> *"I think the objectives could have been more clearly stated. Information about objectives, the agenda…should have been distributed in advance. The format was not conducive to someone walking up to a board and starting to actually hash through the problem (even in the break out groups)."*

> *"I think the specific goals of the Workshop and the agenda could have been sent to participants beforehand, so we could have had a better idea of what to expect from the meeting."*

> *"I would be up front and tell the attendees the goals of the Workshop. I thought that we wasted a lot of time guessing what the planners wanted us to accomplish."*

Some respondents suggested it would also be useful to make background information about the research problem available to participants before the Workshop so they would feel more prepared:

> *"Sending more information out as reading assignments to help prepare."*

> *"I was a little nervous beforehand that I didn't have enough information - perhaps because I was an application participant rather than an invited one. I wasn't sure what schedule to anticipate and didn't know what type of preparation I should have done…"*

Twenty-eight of the 29 survey respondents said they were either "very satisfied" or "satisfied" with the opportunities provided during Workshop presentations and discussions to ask questions and/or make comments. Several respondents, however, made suggestions for facilitating better communication. A common suggestion was to either have a smaller group of participants at the Workshop, or to make the breakout groups smaller to facilitate better discussions:

> *"…Perhaps breaking into 5 (instead of 3) groups randomly just to try to do something would have been more effective?"*

> *"Small groups help introverted scientists to feel less threatened. Have several questions and mix up the groups."*

"The group was too big. Generally, the discussions could have been facilitated better. NIMBioS might want to invest in some large group facilitation tools/ personal for these larger Workshops."

Other suggestions for improving communications included a demonstration of the Wiggio on the first day, making electronic copies of speakers' presentations available before the presentations, and capturing presentations with software that syncs the voice of the presenter with his/her PowerPoint slides so that participants can revisit the presentations as needed after the Workshop.

Several respondents also felt that additional time to discuss modeling would have been beneficial:

"I would have started some of the projects. Perhaps have an afternoon starting on some of the models, identifying funding, allocating roles or writing summaries. I also think it would have been useful to have had a breakout session with the modelers to discuss feasible approaches."

"More discussion of the results of the different small groups and how they would approach getting answers to the questions that were developed."

"…More time for discussion and perhaps some opportunity to touch the data but there is only so much time."

"I felt the synthesis portions of the Workshop may have been a little rushed. Perhaps a full day of alternating between small and full group discussions could be beneficial."

Other suggestions included providing more sustainable/recyclable cups and cutlery, having an IT staff person readily available for the duration of the meeting to resolve technology issues, and providing a wireless microphone for presenters.

Conclusions and Recommendations

Overall, the Workshop was successful in making progress toward its goals. Survey respondents were satisfied with the meeting, indicating that it was a productive experience that met their expectations. Respondents were also satisfied with the travel, housing, and other amenities offered by NIMBioS.

The Workshop had good diversity regarding gender, occupational status, geographic dispersion, and primary field of study of its participants; however, little diversity existed in the racial and ethnic composition of the group.

Respondents reported relatively high levels of learning about bovine TB transmission dynamics and cattle movement patterns in the U.S. Learning gains, however, were lower regarding control options for bovine TB and new methods and modeling techniques that need to be developed. A large majority of respondents said they felt that participating in the Workshop helped them understand the research going on in other disciplines regarding bovine TB. Several participants also made comments about the benefits of seeing international research presented as well.

The majority of respondents agreed that the Workshop made adequate progress toward its goal of of developing predictive models to determine the conditions under which the bovine TB disease may

spread, although most agreed much work still needed to be done. Several respondents said the discussions during the Workshop laid the foundation for the next step in developing these models, while some felt that the Workshop focused too much on the modeling approaches in other countries instead of discussing what could potentially work in the U.S.

Most respondents indicated they planned to take the knowledge they gained during the Workshop and apply it to their own research. Fourteen respondents reported they had developed solid plans for collaborative research with other Workshop participants, while six indicated they saw potential for collaboration in the future.

Several suggestions for improvement of future Workshops were suggested by participants, including better organization, and a more clearly defined agenda with clear objectives and goals. Other suggestions from respondents included providing participants with background information/reading materials before the Workshop, having smaller breakout groups for discussion, making electronic copies of presentations available to participants during the Workshop, and designating time to synthesize the information from the Workshop and discuss the next steps towards creating models.

Based on analysis of participant response data, the recommendations for future Workshops are as follows:

- Ensure that a clearly defined agenda with clear objectives and goals is conveyed to Workshop participants before the start of the Workshop, and discuss the day's objectives at the start of each day of the Workshop.
- Make background research and reading materials available to participants before the Workshop. If feasible, consider offering a preconference webinar to Workshop participants to get everyone up to date on the latest research about the Workshop research problems.
- When possible, provide electronic copies of presentations to participants.
- Create smaller breakout groups (10 or fewer participants each) and clearly define and communicate the goals of each of the breakout group discussion sessions each day.
- Before the conclusion of the Workshop, consider designating a specific time slot to synthesize the information provided, address the next steps that should be taken, and assign specific tasks to individuals or groups with tentative timelines for completion.

Appendix A: List of Participants

Participants

Last name	First name	Institution
Asano	Erika	University of South Florida Saint Petersburg
Benjamin	Lisa	Texas A&M University College Station
Brooks Pollock	Ellen	Harvard University
Brown	Victoria	University of Bath
Buhnerkempe	Michael	Colorado State University
Chen	Xiongwen	Alabama A & M University
Conlan	Andrew	University of Cambridge
Dorea	Fernanda	University of Georgia
Duenckel	Todd	United States Department of Agriculture APHIS
Farnsworth	Matt	United States Department of Agriculture APHIS
Fenichel	Eli	Arizona State University
Grohn	Yrjo	Cornell University
Hickling	Graham	NIMBioS
Jones	Susan	University of Minnesota Twin Cities
Kaneene	John	Michigan State University
Lanzas	Cristina	Cornell University
Lindström	Tom	Linköping University
Lombard	Jason	United States Department of Agriculture APHIS
Meyer	Robert	United States Department of Agriculture APHIS
Miller	Ryan	United States Department of Agriculture APHIS
Moraes	Alvaro	University of Tennessee Knoxville
New, Jr.	John	University of Tennessee Knoxville
*Odoi	Agricola	NIMBioS

Last name	First name	Institution
Olea Popelka	Francisco	Colorado State University
Orloski	Kathy	United States Department of Agriculture APHIS
Orton	Richard	University of Glasgow
Pala	Susan	University of Tennessee Knoxville
Payeur	Janet	National Veterinary Services Laboratories
Portacci	Katie	United States Department of Agriculture APHIS
Rawls	Emmit	University of Tennessee Knoxville
Robbe Austerman	Suelee	United States Department of Agriculture APHIS
Ryan (Simonovich)	Sadie	University of California Santa Barbara
Scarpino	Samuel	University of Texas Austin
Shaw	Shih-Lung	University of Tennessee Knoxville
Tildesley	Michael	University of Edinburgh
Vernon	Matthew	University of Warwick
*Webb	Colleen	Colorado State University
Wennergren	Uno	Linköping University

* Organizer of Workshop

Appendix B: Modeling Bovine Tuberculosis Workshop Survey

Modeling Bovine Tuberculosis 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.

NIMBioS will send two reminder emails to Workshop participants who have not responded to this survey. If you would like to be excluded from these reminder emails, please enter your name below. Your survey results will still remain confidential and your name will not be associated with any of your responses in reporting of survey results.

Name:

Workshop Evaluation

How did you hear about this Workshop?

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)

bovine TB transmission dynamics
cattle movement patterns in the U.S.
control options for bovine TB
new methods and modeling techniques that need to be developed

Do you feel that participating in the Workshop helped you understand the research going on in other disciplines regarding bovine tuberculosis?
 Yes
 No
Comments:

Do you feel the Workshop made adequate progress toward its goal of developing predictive models to determine the conditions under which the bovine tuberculosis disease may spread
 Yes
 No
Comments:

Do you feel that the exchange of ideas that took place during the Workshop will influence your future research? Please explain:

Did you develop unanticipated plans for collaborative research with other Workshop participants? Please explain:

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:

Please indicate your level of satisfaction with the Workshop accommodations:
(Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied, Not applicable)

Travel arranged by NIMBioS
Housing arranged by NIMBioS
Comfort of the facility in which the Workshop took place
Resources of the facility in which the Workshop took place
Quality of meals
Quality of drinks and snacks provided

Please indicate any changes NIMBioS can make to improve the resources and/or accommodations available to Workshop participants:

Communications Evaluation

NIMBioS is currently exploring innovative avenues for communication among its Workshop participants. Your responses to the following questions will allow us to better understand the communication needs of our scientific communities.

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:

If you maintain a blog about your research and would like a link posted on the NIMBioS website, please provide the URL here, along with a brief description of the blog:

Please provide any additional comments about your overall experience with the Workshop:

Demographic Information

Your participation in answering the following questions is completely voluntary. Answer only those questions with which you feel comfortable.

If your work is currently supported by an NSF grant, please indicate the name of the grant:

Institution at which NSF grant is held:

I am a(n):
 Graduate student--master's level
 Graduate student--doctoral level
 Postdoctoral researcher
 College/University faculty—teaching/research
 College/University faculty—teaching only
 College/University faculty—research only
 College/University staff
 College/University administrator
 Government employee
 Business/industry employee
 Non-profit organization employee

If you are from a college/university, please describe your institution: (check all that apply)
 2-year institution
 4-year institution
 Minority serving institution

Women's only institution

Not applicable

Please select response that best describes your general area of expertise/research/study:

Agricultural Sciences/Natural Resources

Astronomy/Atmospheric Sciences/Meteorology

Biological/Biomedical Sciences

Chemistry

Computer & Information Sciences

Education

Engineering

Geological & Earth Sciences

Health Sciences

Humanities

Mathematics

Ocean/Marine Sciences

Physics

Social Sciences

Other Professional Field

Please select the response that best describes your area of concentration within Agricultural Sciences/Natural Resources:

Agricultural Economics

Agricultural Animal Breeding

Agricultural Science, other

Agriculture, General

Agronomy & Crop Science

Animal Nutrition

Animal Science, Other

Environmental Science

Fishing and Fisheries Sciences/Management

Food Science

Food Science and Technology, Other

Forest Sciences and Biology

Forest/Resources Management

Forestry & Related Science, Other

Horticulture Science

Natural Resources/Conservation

Plant Breeding

Plant Pathology/Phytopathology

Plant Sciences, Other

Poultry Science

Soil Chemistry/Microbiology

Soil Sciences, Other
Wildlife/Range management
Wood Science & Pulp/Paper Tech.

Please select the response that best describes your area of concentration within Biological/Biomedical Sciences:
Anatomy
Bacteriology
Biochemistry
Biomedical Sciences
Biometrics & Biostatistics
Biophysics
Biotechnology
Botany/Plant Biology
Cell/Cellular Biology and History
Developmental Biology/Embryology
Ecology
Endocrinology
Entomology
Genetics, Human & Animal
Immunology
Mathematical biology
Microbiology
Molecular Biology
Neuroscience
Nutrition Sciences
Parasitology
Pathology, Human & Animal
Pharmacology, Human & Animal
Physiology, Human & Animal
Plant Genetics
Plant Pathology/Phytopathology
Plant Physiology
Toxicology
Biology/Biological Sciences, General
Biology/Biomedical Sciences, Other
Zoology, Other

Please select the response that best describes your area of concentration within Health Sciences:
Environmental Health
Environmental Toxicology
Epidemiology

Health Systems/Service Administration

Kinesiology/Exercise Science

Nursing Science

Pharmacy

Public Health

Rehabilitation/Therapeutic Services

Speech-Language Pathology & Audiology

Veterinary Medicine

Health Sciences, General

Health Science, Other

Please select the response that best describes your area of concentration within Engineering:

Aerospace, Aeronautical & Astronautical

Agricultural

Bioengineering & Biomedical

Ceramic Sciences

Chemical

Civil

Communications

Computer

Electrical, Electronics and Communications

Engineering

Engineering

Engineering Physics

Engineering Science

Environmental Health

Industrial & Manufacturing

Materials Science

Mechanical

Mechanics

Metallurgical

Mining & Mineral

Nuclear

Ocean

Operations Research

Petroleum

Polymer & Plastics

Systems

Engineering, General

Engineering, Other

Please select the response that best describes your area of concentration within Computer & Information Sciences:
 Computer Science
 Information Science & Systems
 Computer & Information Science, Other

Please select the response that best describes your area of concentration within Mathematics:
 Algebra
 Analysis & Functional Analysis
 Applied Mathematics
 Computing Theory & Practice
 Geometry/Geometry Analysis
 Logic
 Mathematical biology
 Number Theory
 Operations Research
 Statistics
 Topology/Found.
 Math/Statistics, General
 Math/Statistics, Other

Please select the response that best describes your area of concentration within Astronomy/Atmospheric Science/Meteorology:
 Astronomy
 Astrophysics
 Atmospheric Chemistry and Climatology
 Atmospheric Physics and Dynamics
 Meteorology
 Atmospheric Science/Meteorology, General
 Atmospheric Science/Meteorology, Other

Please select the response that best describes your area of concentration within Chemistry:
 Analytical
 Inorganic
 Medicinal/Pharmaceutical
 Organic
 Physical
 Polymer
 Theoretical
 Chemistry, General
 Chemistry, Other

Please select the response that best describes your area of concentration within Geological & Earth Sciences:

Geochemistry
Geology
Geomorphology & Glacial Geology
Geophysics & Seismology
Mineralogy & Petrology
Paleontology
Stratigraphy & Sedimentation
Geological and Earth Sciences, General
Geological and Earth Sciences, Other

Please select the response that best describes your area of concentration within Physics:

Acoustics
Atomic/Molec/Chem
Biophysics
Condensed
Matter/Low Temp
Nuclear Physics
Optics/Phototonics
Particle (Elem)
Plasma/Fusion
Polymer
Applied Physics
Physics, General
Physics, Other

Please select the response that best describes your area of concentration within Ocean/Marine Sciences:

Hydrology & Water Resources
Marine Sciences
Oceanography, Chemical and Physical
Ocean/Marine, Other

Please select the response that best describes your area of concentration within Social Sciences:

Anthropology
Area Studies
Criminology
Demography/Population Studies
Econometrics
Economics
Geography

International Relations/Affairs
Political Science & Government
Public Policy Analysis
Sociology
Statistics
Urban Affairs/Studies
Social Sciences, General
Social Sciences, Other

Please select the response that best describes your area of concentration within Humanities: :
History
Letters
Foreign Languages & Literature
Other Humanities

Please select the response that best describes your area of concentration within Education:
Adult & Continuing Education
Counseling & Guidance
Curriculum & Instruction
Educational Administration & Supervision
Educational Assessment/Testing/Measurement
Educational Leadership
Educational Psychology
Educational Statistics/Research Methods
Educational/Instructional Media Design
Elementary Education
Higher Education/Evaluation & Research
Pre-elementary/Early Childhood Education
School Psychology
Secondary Education
Social/Philosophical Foundations of Educational
Special Education
Education, General
Education, Other
Other Professional Fields: Please select the response that best describes your area of concentration:
Business Management/Administrative
Communications
Family/Consumer/Human Science, General
Law
Library Science
Parks/Sports/Rec./Leisure/Fitness
Public Administration

Social Work
Other field, please specify:

Gender:
 Male
 Female

Are you Hispanic or Latino?
 Yes
 No

What is your racial background?
 American Indian or Alaska Native
 Native Hawaiian or other Pacific Islander
 Asian
 Black or African-American
 White

Disability status
 No disability
 Hearing impairment
 Visual impairment
 Mobility impairment
 Other disability, please specify below:

Citizenship:
 U.S. citizen
 Permanent resident
 Other non-U.S. Citizen

Appendix C: Open-ended Survey Responses

Open-ended Survey Responses

How did you hear about this Workshop? (n=29)

Word of mouth via one of the conference organizers.

Invited to speak by Colleen Webb

A faculty member of my institution forwarded me an email with the Workshop details

Colleague

By a collogue

I was the organizer

TB data and modeling

I was invited to participate this Workshop.

I was an organizer

Organizer

I heard about this Workshop through a colleague.

My Adviser Lauren Meyers (UT Austin)

Was contacted by one of the organizers.

Katie emailed Beth who emailed me

Part of the local organizing team.

Through veterinary colleague

Through my PI Rowland Kao

Through Drs. Odoi, New, and Portacci

Via email on ECOLOG-L

I was invited to attend by one of the organizers

Invited by the organizers

E-mail newsgroup (epivet).

Suelee Robbe-Austerman

Discussion within animal disease modeling circles

Via Dr. Agricola Odoi

Invited by organizing committee

I received an email from one of the organizers about the Workshop.

Invitation

One of the co-investigators called me.

Do you feel that participating in the Workshop helped you understand the research going on in other disciplines regarding Bovine Tuberculosis? (n=11)

I think that this question is a little difficult given the specific focus of the Workshop on applying cattle tracing information/models to the epidemiology of bTB. Coming from a background of disease transmission modeling I already had a good appreciation of the type of research going on in these fields. Some of the historical and economic perspectives were new to me, a new perspective which I believe added considerable added value to the Workshop.

The Workshop did a nice job in summarizing the existing TB modeling research, perhaps i miss a wider range of approaches.

to some extent quite a lot was already known to me, yet not the US situation

good Workshop. I like it.

The presentations regarding spoligotyping were particularly useful.

I am not sure the right mix of people were at the Workshop. While there seemed to be a number people with math backgrounds, who were already working on animal disease, there were no other math folks there to bring new tools (e.g., people who may not have modeled bTB before). I also think that given the nature of cattle movements there should have been more social scientists. Overall, I did learn the state of the research on the problem. I think there was a lot of untapped potential left on the table.

It was very beneficial to have the international perspective and to see how those other countries are able to utilize their data for modeling.

I found the various modeling approaches from the UK very interesting, and also had some great insight into Agency wants and needs, and their approaches to research. It was fascinating to hear all the viewpoints and information.

It was very interesting to hear about the available data on TB and livestock movements in the US (and lack thereof!), and to meet people working in particular areas where there is more data available.

It was very interesting to see how many people are truly interested in this disease and the different approaches.

The spectrum of mathematical and statistical models presented, particularly on research from the U.K., was very informative.

Do you feel the Workshop made adequate progress toward its goal of developing predictive models to

determine the conditions under which the bovine tuberculosis disease may spread? (n=18)

The transmission dynamics of bTB are very poorly understood even in countries with relatively rich sources of epidemiological data. In the US, you face a particularly difficult challenge in that the levels of prevalence are so low it is difficult to obtain a clear picture of the patterns of transmission from which more general principles could be extrapolated. It did become clear by the end of the Workshop that there were a variety of data sources which could be exploited to obtain some of the baseline information that will be vital for any form of prediction.

yes, but I am not sure how much.

The available data and existing knowledge on cattle movement are very limited to develop a predictive model. Perhaps it would have been good to explore more modeling approaches beyond TB modeling in Europe, as it was clear from the beginning that the data necessary for those approaches were inexistent.

I think we could have actually started developing models.

maybe the goals was set too high, still there is was an obvious and reasonable progress

I think it helped identify issues related to modeling bTB

I didn't think the goal was to actually develop any models during the Workshop, but we certainly made great progress towards describing qualitatively those models, reviewing available data, and charting a course towards designing and implementing models.

Predictive models of trade probably requires greater economic input than was available at the Workshop. There was also not enough time to get into the guts of trying to do something. Perhaps breaking into 5 (instead of 3) groups randomly just to try to do something would have been more effective?

There is a lot of work that needs to be done yet

I think there was some confusion in the minds of participants regarding the intent of the Workshop. Specific and focused research questions were not posed intentionally.

...but there is a very long way to go before something substantial and useful can be produced

I think that people certainly sorted out different avenues to pursue, although they didn't (as far as I know) actually begin model development yet. That will hopefully come out of working groups and visiting research spawned from this Workshop.

It remains to be seen how well the proposed working groups move forward, but I think the Workshop succeeded in getting USDA people, people with data, and modelers together to talk about the problems, and propose modeling approaches.

There was a lot of talk about models that were done in other countries, but I still do not know how the US plans to approach it and which models they would use. There was not enough discussion on how and who was going to do that.

The goal was not to develop the models, but to develop working groups to work on the models. This

was achieved.

Development of working group topics was a large outcome and will provide a strong footing to begin the work.

Maybe. The meeting was a start only. It is unclear and uncertain whether the next steps will be taken to develop predictive model of cattle movement.

The Workshop made great progress and has the potential to conduct useful modeling programs

Do you feel that the exchange of ideas that took place during the Workshop will influence your future research? Please explain: (n=27)

Yes. The range of expertise and academic disciplines offered new perspectives on tackling the economic issues which form and important part to my current research.

I am involved but only minimally in research. Greater understanding of what goes on in the UK was very helpful.

Yes, the organizers did a great job in bringing very different expertise.

It was very nice to meet other researchers interested in M bovis

If I will start to collaborate with the US people it absolutely will. But, if not the challenges are very different

it is possible.

Yes. We have been working on Johne's disease modeling and I am interested in learning whether these same techniques could be used in bovine tb.

Yes, we hope to move forward with a working group.

Yes, it was very helpful to have an explicit discussion of how modeling work for the UK system might be extended to the US system, which operates differently and for which we have different types of data.

Yes, I felt this Workshop did a fantastic job of bringing people of diverse backgrounds and expertise together. The ideas that were exchanged helped to develop cross-disciplinary ties that will prove useful.

Yes, I learned a lot about modeling strategies for livestock movement and the complexity of studying livestock disease in the US/Europe. I also met a myriad of very interesting scientists and professionals who I hope will continue to be collaborators.

Maybe. I do have some new ideas as a result of the Workshop that I might try to pursue.

Maybe even better, it has emphasized the importance of those of us in the Lab to work harder at making sure we go back to the submitter to clarify incomplete submission information.

Not really because this is not a research area of mine.

Possibly yes, the meeting was a great opportunity to meet with researchers with similar interests and

may very well turn into cooperation. Either via NIMBioS or other formal or informal cooperation

Perhaps - we had quite clear directions for our future research prior to the Workshop., and these have not changed. However, it was very good to see what else was going on in the area and to compare the relative strengths and weaknesses and overlap between the different approaches and groups.

I enjoyed being with people from several different backgrounds and areas of expertise. It opened my mind to the possibility of pursuing work/research in these areas.

Absolutely. I had no idea that GIS could integrate so nicely with some of these questions, in pretty straightforward ways. I also met people working on the agency side of questions, who clearly want to collaborate - this is possibly my first real interface with them.

Yes; not least that we are seriously hoping to model TB spread in Michigan.

probably not - mathematical modeling is not my area of specialty

Yes. By promoting the communication between researchers with both mathematical and biology backgrounds, the Workshop was very successful in identifying new questions that can be answer by the joint work on these ends. I definitely have a better idea now of what kind of questions can be formulated, and what kind of working groups can be formed to answer them. This will certainly help me in defining future research projects, as I am right now having to think of a project for my PhD.

probably not - not enough discussion on who and how the modeling will be done.

Yes. I am working hard on TB prevention strategies and this was a very interesting opportunity to learn other methods.

I think the Workshop was extremely productive for identifying some areas in which my own research could fit, towards the study and control of Bovine Tuberculosis in the USA.

Yes. The application of specific modeling techniques that I was previously unaware of will be applicable to my own research at some point.

No - not applicable.

Yes, I will at least have individuals interested in the subject matter and quantitative skills to help my research

Did you develop unanticipated plans for collaborative research with other Workshop participants? Please explain: (n=25)

Not yet!

No, that was not my purpose for attending.

Yes, collaborations beyond TB modeling

yes... some of ideas I had previously had were developed further

Absolutely, I met groups that we joined up with besides the obvious collaboration at US perspective

Not sure

Yes. Several collaborative projects separate from TB where identified.

Yes. Several people were interested in participating in collaborative research whom I have not worked with before.

Yes, various contacts could lead to collaborative research although further exploration of these opportunities is needed.

No, one of my goals for this working group was to build collaboration for the future.

Nothing concrete but met many people that I could see myself collaborating with in the future.

Yes. Sharing and collecting genotyping data from the host to help with animal movement by determining relatedness.

No

Not yet, but some things may spin out in the future from the working groups etc.

I did not.

Yes. Using some simple GIS based ideas, we're hoping to make some very quick inroads into adding information to the mystery of the farm size placement structure, in conjunction with USDA and modelers from the UK. I did not anticipate this role, or that it would be a potentially valuable component of unraveling the movement network questions that seem to be the roadblock to much of the modeling in question.

Yes; previously US data has been seen as entirely unavailable. We now appreciate that there is data available, and people interested in collaborating with modelers using that data.

no

Yes. The group was more important in networking for future projects than I expected, and I am confident that we can go ahead with the plans of having a work group studying cattle movement at the national level.

I met several people who made very interesting presentations and opened up my mind to new resources that are available.

yes, many agreed to be on a working group. Even people from overseas were interested in the U.S. issue b/c they have their own limitations.

Yes I did ! Even though some of the plans (conversations) were started before NIMBioS, the BTB Workshop was crucial to consolidate previous ideas. Now, after the NIMBioS we are working in conducting research related to BTB in the USA.

Yes. I now have three potential new collaborations established; one on optimization of cattle management related to TB, another with an NCEAS postdoc on simulation modeling, and finally a

potential collaboration on cattle fever tick population dynamics. I was very surprised at the level of interaction and clear interest in developing collaborations that emerged from this Workshop.

No - while modeling may be useful in aspects of our work, we do not have the time or resources to devote to such an effort and do not have the modeling expertise.

Yes, I will be working with individual to conduct risk assessment models for bovine transmission

What do you feel was the *most* useful aspect of the Workshop? (n=27)

The small group setting with multi-disciplinary backgrounds is an excellent format to stimulate discussion and sow the seeds for future collaborations.

raising my level of understanding about bovine TB, Learning how cattle health issues had been handled in the UK

The mix in expertise give me new points and angles that i haven't considered before. i feel i have a better "integrated" knowledge of the TB problem and available data and tools.

Discussions - although the talks were essential

developed collaborations. also an insight in the us cattle industry, an amazing insight.

the data and modeling of TB

To learn the community working on this topic.

Discussion and social time with participants. This allowed for exchange of ideas and identification of additional areas for collaboration.

The insights of participants with a diverse, but very complimentary set of expertise.

I felt the Workshop was very useful in that it brought together diverse groups of researchers who may not have interacted in such a positive way otherwise.

Working together with professionals in both applied and academic fields, it was an incredible learning experience that really highlighted to importance and utility of these type of meetings.

Conversations during breaks about the details of some of the work that was discussed.

Meeting other researchers. getting feedback and comments on the services we offer and how we can improve.

The exchange of ideas and experiences. I think the whole process of controlling TB in cattle will be improved by the exchange.

Can't pinpoint one part since they are all connected

Having a small number of people, all working in the same area but from different angles, in the same place for a large period of time.

The group discussions were the most useful aspect for me in that it offered the opportunity for anyone to share their ideas as we worked toward a common goal.

The discussions following presentations, with everyone in the same room. I thought it was really valuable to get all the different perspectives, and to see emergent ideas forming.

Difficult to say - the presentations on US data were an eye-opener, but some of the discussions were very constructive, too.

meeting scientists with an interest in TB and movement

Having researchers of different background communicating.

listening to the presenters from the UK and there approach to the wildlife situation.

meeting everyone who I will work with

Networking, meeting crucial and key BTB researchers in the USA., Learn what other researchers are doing !

A synthesis of where the state of knowledge lies with respect to TB transmission dynamics and cattle movements. In addition developing potentially new collaborations was great.

Hearing about the TB models developed in other countries, especially the UK.

Presentations and small groups

What would you change about the Workshop? (n=23)

Involve more people from the US Universities who may have done some modeling on similar problems and not just USDA people.

I feel there was a little bit of mismatch between data available and presented modeling approach, perhaps the organizers should have anticipated this and bring for example more statistical approaches on the table besides the approaches presented in the Workshop.

I would have started some of the projects. Perhaps have an afternoon starting on some of the models, identifying funding, allocating roles or writing summaries. , I also think it would have been useful to have had a breakout session with the modelers to discuss feasible approaches

Maybe too many participants, still some maybe not contributed that much yet they may have achieved something which they bring home instead. Not clear to me if that was the case. If, then the size was within its borders

make it into 1.5-2.0 days.

The order of the presentation was good, however, one could suggest starting with the problem and then the data rather than the data first and then the problem.

Difficult to say. More time for discussion and perhaps some opportunity to touch the data but there is

only so much time.

It was a bit too large, but not by much.

I felt the synthesis portions of the Workshop may have been a little rushed. Perhaps a full day of alternating between small and full group discussions could be beneficial.

NIMBioS should strive for more sustainable food/beverage options.

I think the organization could have been greatly improved. The objectives of the Workshop were not really clear until towards the end, and even then I'm not sure I understood the Workshop and organize objectives.

Sending more information out as reading assignments to help prepare.

No major changes come to mind except perhaps the capture of presentations using software like Camtasia which syncs the voice of the presenter with his/her ppt slides. A ppt file alone is limited in what it can provide as a review/refresher.

It may have been a good idea if the organizers had presented their expectations of potential working group more clearly and at a earlier stage.

I think the Workshop worked really well and nothing obvious comes into mind to change about it.

I was a little nervous beforehand that I didn't have enough information - perhaps because I was an application participant rather than an invited one. I wasn't sure what schedule to anticipate and didn't know what type of preparation I should have done. Fortunately, it didn't matter much, and the few papers on the Wiggio prior to the meeting were useful background reading.

I think the specific goals of the Workshop and the agenda could have been sent to participants beforehand, so we could have had a better idea of what to expect from the meeting.

More discussion of the results of the different small groups and how they would approach getting answers to the questions that were developed.

nothing

Including a more diverse group of presenters regarding BTB control programs and modeling in other countries (rather than mostly focusing on the UK experience). I mention this point, because it is well known that the UK BTB experience is very distinctive, with very specific epidemiological features, thus, BTB models applied in different circumstances could also contribute to the USA main objectives.

nothing.

That a post-doc/graduate student could be located in any university - e.g., that one of the attendees from a university could apply for and receiving the funding for the student. These individuals were invited because of their expertise and would seem to be the key candidates to have a grad student/post-doc. I think the requirement that the post-doc be placed at the U of Tennessee will be a limiting factor in the success of whether the next step is taken to have a graduate student, or not.

I would be up front and tell the attendees the goals of the Workshop. I thought that we wasted a lot of

time guessing what the planners wanted us to accomplish.

The Workshop format would have been more effective if: (n=1)

I think the objectives could have been more clearly stated. Information about objectives, the agenda and what not should have been distributed in advance. The format was not conducive to someone walking up to a board and starting to actually hash through the problem (even in the break out groups).

Please indicate any changes NIMBioS can make to improve the resources and/or accommodations available to Workshop participants: (n=13)

Should have had some alternatives to chicken on Wednesday at lunch.

More water and soft drinks served with lunch could be a good idea. But it was very good as it was already. Thanks

Was a local participant

I thought several of the rooms were quite cold. The hotel was great. I really liked it. We had some problems because a mac and PC were not easily accessible for presentations. Often, there were only diet drinks left for those at the end of the line.

More sustainable cups and cutlery.

There were occasional glitches in switching between Mac and pc computers which caused some delays. Optimally, this would be seamless.

Some lighter alternative and more vegetarian meals available might be a good idea.

I only wish I could have booked a flight earlier, so I could have had more direct flights at reasonable prices. , , My other minor comment is that it wasn't clear how or whether there were data storage capabilities - I assume that these will evolve with the center's needs.

Not NIMBioS' fault, but it might be worth advising Europeans that their driving licenses may not be accepted as ID in Knoxville. Also, that they need to photocopy their visa-waiver forms before leaving the US for expenses claims.

great job

Still confused on reimbursement process

All fine !

Please send out the details of travel information sooner, we received it only a few days ahead of the travel - at least one to two weeks ahead of time would be appreciated. , Provide detail about how the reimbursement process works with our agency, as I am still unclear how this is going to work for miscellaneous expenses such as a the baggage fee, airport parking and mileage to/from the airport for

my personal vehicle (driving from work to the airport in Colorado).

Please indicate any suggestions you have for facilitating communication among participants during the Workshop: (n=4)

a brief demonstration using the Wiggon sp? technology would have been helpful on the first day.

The group was too big. Generally, the discussions could have been facilitated better. NIMBioS might want to invest in some large group facilitation tools/ personal for these larger Workshops. Facilitating a group of 40+ researchers is hard.

Would have liked electronic copies of PowerPoint's so those of us who can could make comments directly on the slides and follow along.

small groups helps introverted scientists to feel less threatened. Have several questions and mix up the groups.

Other social networking tools: (n=4)

I used email with other participants during the meeting

email

Skype, Wiggio (don't know if these are social networking)

email. gov does not allow the use of any of the above. We must not access during business hours

If you maintain a blog about your research and would like a link posted on the NIMBioS website, please provide the URL here, along with a brief description of the blog: (n=4)

do not use a blog

http://blogs.warwick.ac.uk/mcvernon (although I've not written anything about the Workshop yet!).

Not applicable

Not applicable to me since I do not use one

Please provide any additional comments about your overall experience with the Workshop: (n=12)

speakers should have been asked/required to use the wireless mike for all presentations. The mike was only effective when they stood by the podium. Your next facility probably will not have columns which block view of the screen. If you are going to use apple technology, then let people know ahead or have the IT person close at hand so time is not taken to get the technology working., I really enjoyed the

Workshop. Did not know what to expect, but was a good experience.

overall very good

I'm very satisfied with the arrangements. Thank you.

It would have been nice to receive the program/schedule before coming to the Workshop.

excellent!

Overall, I think it was a very successful Workshop. It's success was due to a combination of NIMBioS support and the work of the organizers. As an organizer, I really appreciated how helpful the NIMBioS staff were. Chris was extremely helpful with a lot of mundane details, but I wonder if it might be more efficient for NIMBioS for organizers to have another point of contact for the small stuff.

I was very very happy with an experience at a NIMBioS working group so my expectations for the Workshop may have been unjustly high. So take my comments with a grain of salt.

It was a nice mix of people from different countries and occupations. More structured facilitators with identified goals of what the product should look like. I am not sure if the desired product outcome was made.

I enjoyed very much participating at NIMBioS

It was great. I'm looking forward to seeing the formation of working groups.

None

I am excited about the prospects