



Evaluation Report
Modeling Bovine Tuberculosis Working
Group
February 17-18, 2010

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Executive Summary

Brief Synopsis of Event

This report is an evaluation of a NIMBioS Working Group entitled “Modeling Bovine Tuberculosis” (Bovine Tuberculosis), which held its first meeting at NIMBioS February 17-18, 2010. NIMBioS Working Groups are chosen to focus on major scientific questions at the interface between biology and mathematics. NIMBioS is particularly interested in questions that integrate diverse fields, require synthesis at multiple scales, and/or make use of or require development of new mathematical/computational approaches. NIMBioS Working Groups are relatively small (10-12 participants, with a maximum of 15), focus on a well-defined topic, and have well-defined goals and metrics of success. Working Groups will typically meet 2-3 times over a two-year period, with each meeting lasting 3-5 days; however, the number of participants, number of meetings, and duration of each meeting is flexible, depending on the needs and goals of the group.

The Bovine Tuberculosis group comprised 13 participants, including organizers Colleen Webb (Colorado State University, Department of Biology and Department of Mathematics) and Agricola Odoi (University of Tennessee, Department of Comparative Medicine). Participants came from six universities and one government agency across Nigeria, Sweden, the United Kingdom, and the United States (See Appendix A).

Bovine Tuberculosis (TB) is an infectious chronic disease found primarily in cattle, but has been identified in many other species. Despite progress in the eradication of bovine TB in the United States, small pockets of infection still exist in cattle and wildlife, and the US spent approximately \$31 million on eradication efforts in 2008 alone. The goal of this Working Group was to develop network models of cattle movement and the spread of bovine TB in the US that could be used to investigate alternative control and eradication strategies. Much of the progress in modeling bovine TB has been in European agricultural systems where cattle movement and disease spread data are highly detailed. The challenge to this Working Group is to develop similar models for the U.S., where cattle movements are more complex and only partially characterized. To meet this challenge, the group identified a number of cattle movement and TB datasets at both the state and national levels and assembled a group of experts in network and simulation modeling, bovine TB and control and eradication strategies. The Working Group proposed to address questions regarding the sources and spread of bovine TB in areas with high local prevalence and at the national scale and how understanding the sources and spread of bovine TB can be used to inform control and eradication strategies. Additionally, the group addressed how uncertainty in both TB infection status and cattle movement impacts our inference.

Evaluation Design

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

1. Were participants satisfied with the Working Group overall?
2. Did the meeting meet participant expectations?
3. Do participants feel the Working Group 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 Working Group's research problem?
6. What impact do participants feel the Working Group 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?

The final instrument was hosted online via the University of Tennessee's secure online survey host mrlInterview. Links to the survey were sent to nine Working Group participants on February 19, 2010 (Working Group organizers and NIMBioS staff attending the meeting were not sent the evaluation survey). Reminder emails were sent to non-responding participants on February 26 and March 2, 2010. By March 9, 2010, 5 participants had given their feedback, for a response rate of 56%.

An electronic demographic survey aligned to the reporting requirements of the National Science Foundation was designed by the NIMBioS Evaluation Coordinator with input from the NIMBioS Director. The final instrument was hosted online via the University of Tennessee's online survey host mrlInterview. Links to the survey were sent to the one Working Group participant who had not previously attended a NIMBioS event on January 28, 2010. Demographic questions regarding gender, race, and ethnicity, and disability status were optional (disability status is not reported in this evaluation report). All demographic information is confidential, and results are reported only in the aggregate. When feasible, the evaluator filled in missing demographic data from other sources (e.g. address, institution, field of study). The evaluator did not assume race, ethnicity, or disability status for any participant who did not report this information.

Highlights of Results

- Overall satisfaction with the Working Group was high among respondents, 100% of whom agreed that the meeting was very productive and met their expectations.
- 100% of respondents thought the presentations were useful, and that the presenters were very knowledgeable about their presentation topics.
- All respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Working Groups to their colleagues.
- Respondents were satisfied overall with the travel, housing, and other amenities offered by NIMBioS.
- Respondents reported high levels of learning overall, agreeing that they had a better understanding of the main research issues.
- All respondents agreed that the Working Group format was effective for achieving its goals, and that the group made adequate progress toward developing network models of cattle movement and the spread of bovine TB in the U.S. that can be used to investigate alternative control and eradication.
- 100% of respondents said they left this meeting with a good idea of what their contribution will be at the next meeting.
- All respondents said they planned to take the knowledge they gained during the Working Group and apply it to their own research.
- Three respondents said that they developed unanticipated plans for collaborative research with other Working Group participants.

Conclusions and Recommendations

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

Respondents overall reported high levels of learning, agreeing that they had a better understanding of both how the sources and spread of bovine TB can be used to inform control and eradication strategies, and how uncertainty in both TB infection status and cattle movement impacts inference.

All respondents agreed that the Working Group format was effective for achieving its goals, and felt that the group made adequate progress toward developing network models of cattle movement and the spread of bovine TB in the U.S. that can be used to investigate alternative control and eradication. All respondents said they felt the expectations for the next Working Group meeting were clear, in the sense that they were leaving the current meeting with a good idea of what their contribution would be at the next meeting, although one respondent indicated the expectations would become clearer with time.

All respondents indicated they planned to take the knowledge they gained during the Working Group and apply it to their own research, and several said they had developed solid plans for collaborative research with other Working Group participants.

Overall, participants were highly satisfied with the content and format of the current meeting. Two respondents, however, did offer suggestions for future meetings, including adding more participants and having the ability to video conference with off-site participants.

Based on analysis of participant response data, the recommendations to NIMBioS and/or Working Group organizers are as follows:

- The content and format of the Working Group appear to be on track, and thus no recommendations are made in these areas.
- Consider the possibility of setting up video conferencing for off-site participants at future meetings, if applicable.

Modeling Bovine Tuberculosis Working Group Evaluation Report

Background

Introduction

This report is an evaluation of a NIMBioS Working Group entitled “Modeling Bovine Tuberculosis” (Bovine Tuberculosis), which held its first meeting at NIMBioS February 17-18, 2010. The Bovine Tuberculosis group comprised 13 participants, including organizers Colleen Webb (Colorado State University, Department of Biology and Department of Mathematics) and Agricola Odoi (University of Tennessee, Department of Comparative Medicine). Participants came from six universities and one government agency across Nigeria, Sweden, the United Kingdom, and the United States (See Appendix A).

Working Group Background

Bovine Tuberculosis (TB) is an infectious chronic disease found primarily in cattle, but has been identified in many other species. Despite progress in the eradication of bovine TB in the United States, small pockets of infection still exist in cattle and wildlife, and the US spent approximately \$31 million on eradication efforts in 2008 alone. The goal of this Working Group was to develop network models of cattle movement and the spread of bovine TB in the US that could be used to investigate alternative control and eradication strategies. Much of the progress in modeling bovine TB has been in European agricultural systems where cattle movement and disease spread data are highly detailed. The challenge to this Working Group is to develop similar models for the U.S., where cattle movements are more complex and only partially characterized. To meet this challenge, the group identified a number of cattle movement and TB datasets at both the state and national levels and assembled a group of experts in network and simulation modeling, bovine TB and control and eradication strategies. The Working Group proposed to address questions regarding the sources and spread of bovine TB in areas with high local prevalence and at the national scale and how understanding the sources and spread of bovine TB can be used to inform control and eradication strategies. Additionally, the group addressed how uncertainty in both TB infection status and cattle movement impacts our inference.

Participant Demographics

Bovine Tuberculosis Working Group participants, who were college/university faculty (38%), government employees (31%), postdoctoral researchers (23%), and graduate students (8%), came from universities and government agencies in Nigeria, Sweden, the United Kingdom, and the United States (See Appendix A). Primary fields of study for the 16 participants included agricultural sciences/natural resources, biological/biomedical sciences, health sciences, and mathematics (Table 1).

Table 1. Participant fields of study and areas of concentration

Field of Study	Concentration	# Participants
Agricultural Sciences/Natural Resources	Wildlife/Range management	2
	Animal Science, Other	1
Biological/Biomedical Sciences	Mathematical Biology	4
	Ecology	1
	Zoology	2
Health Sciences	Epidemiology	1
	Veterinary Medicine	1
Mathematics	Mathematical Biology	1

The 4 females and 9 males (none of whom self-identified as being of Hispanic/Latino ethnicity) mostly self-identified racially as white (Figures 1 & 2).

Figure 1. Racial composition of program participants (n =13)

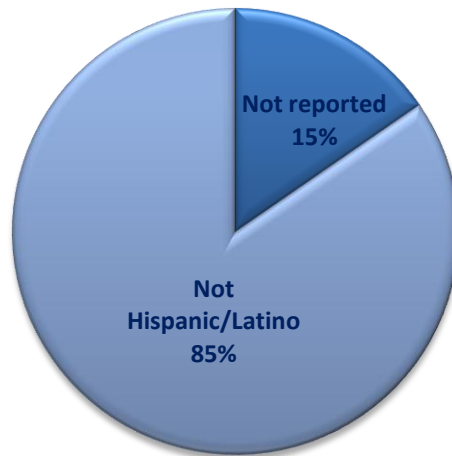
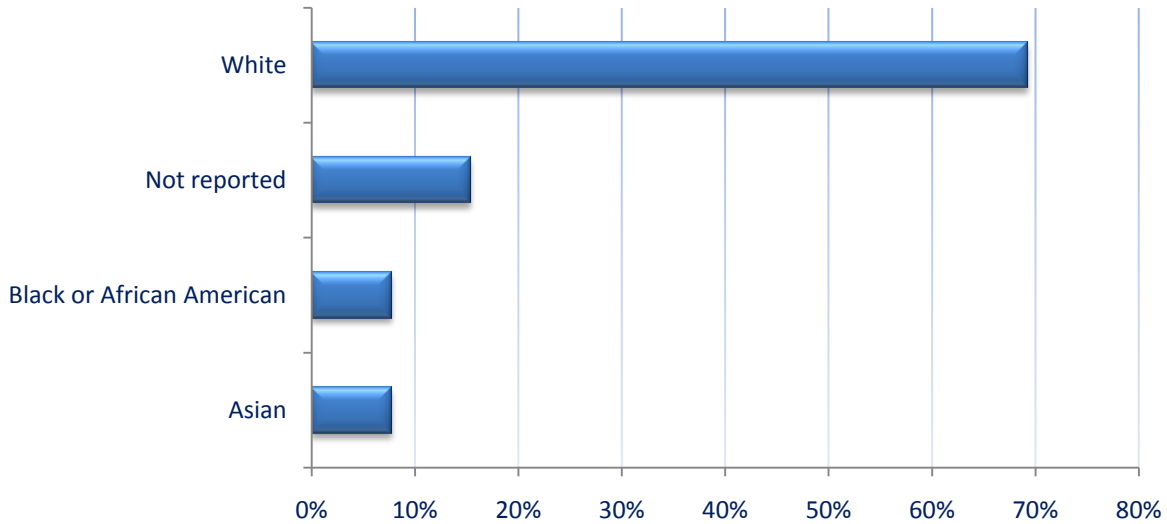


Figure 2. Ethnic composition of program participants (n =13)



Evaluation Design

Evaluation Questions

The evaluation of the Working Group 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 Working Group 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, 1994¹). Several questions constituted the foundation for the evaluation:

1. Were participants satisfied with the Working Group overall?
2. Did the meeting meet participant expectations?
3. Do participants feel the Working Group 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 Working Group's research problem?
6. What impact do participants feel the Working Group 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

The NIMBioS Evaluation Coordinator designed an electronic survey aligned to the evaluation questions with input from the NIMBioS Director and Deputy Director. The final instrument was hosted online via

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

the University of Tennessee's secure online survey host mrlInterview. Links to the survey were sent to 9 Working Group participants on February 19, 2010 (Working Group organizers and NIMBioS staff attending the meeting were not sent the evaluation survey). Reminder emails were sent to non-responding participants on February 26 and March 2, 2010. By March 9, 2010, 5 participants had given their feedback, for a response rate of 56%.

An electronic demographic survey aligned to the reporting requirements of the National Science Foundation was designed by the NIMBioS Evaluation Coordinator with input from the NIMBioS Director. The final instrument was hosted online via the University of Tennessee's online survey host mrlInterview. Links to the survey were sent to the one Working Group participant who had not previously attended a NIMBioS event on January 28, 2010. Demographic questions regarding gender, race, and ethnicity, and disability status were optional (disability status is not reported in this evaluation report). All demographic information is confidential, and results are reported only in the aggregate. When feasible, the evaluator filled in missing demographic data from other sources (e.g. address, institution, field of study). The evaluator did not assume race, ethnicity, or disability status for any participant who did not report this information.

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

Participant Satisfaction

Overall Satisfaction

Overall satisfaction with the Working Group was high among respondents, all of whom agreed that the meeting was very productive, and met their expectations. Some general participant comments:

"All and all very good."

"...it was very productive and collegial."

All respondents thought the presentations were useful, and that the presenters were very knowledgeable about their presentation topics. Additionally, 100% of respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Working Groups to their colleagues (Table 3).

Table 2. Participant satisfaction with various aspects of the Working Group

	<i>n</i>	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I feel the Working Group was very productive.	5	80%	20%	0%	0%	0%
The Working Group met my expectations	5	60%	40%	0%	0%	0%
The presenters were very knowledgeable about their topics.	5	80%	20%	0%	0%	0%
The presentations were useful.	5	60%	40%	0%	0%	0%
The group discussions were useful.	5	100%	0%	0%	0%	0%
I would recommend participating in NIMBioS Working Groups to my colleagues.	5	60%	40%	0%	0%	0%

Satisfaction with Accommodations

Overall, respondents reported being satisfied with the accommodations provided by NIMBioS during the Working Group. All respondents reported being satisfied with the comfort and resources of the NIMBioS facility, as well as the quality of meals provided (Table 4).

Table 3. Participant satisfaction with Working Group accommodations

Please indicate your level of satisfaction with the Working Group accommodations:	<i>n</i>	Very satisfied	Satisfied	Neutral	Dissatisfied	Strongly dissatisfied	Not applicable
Comfort of the facility in which the Working Group took place	5	80%	20%	0%	0%	0%	0%
Resources of the facility in which the Working Group took place	5	80%	20%	0%	0%	0%	0%
Quality of meals	5	60%	40%	0%	0%	0%	0%
Quality of drinks and snacks	5	60%	40%	0%	0%	0%	0%

Working Group Format and Content

Most Useful Aspect

Two respondents said the ability to discuss challenges in dealing with data was the Working Group’s most useful aspect. Participant comments [*the most useful aspect was*]:

“Putting all of the ideas on the table and addressing many of the data challenges explicitly and in depth. This helped to focus attention on the goal and what steps might be needed to get there.”

“Ability to discuss limitations and potential of the various data sources.”

Other respondents felt the diversity among participants was the most useful aspect [*the most useful aspect was*]:

“Input from researchers in UK and Sweden.”

“Various background of participants.”

Participant Learning

Respondents were asked two questions to gauge their gain in understanding in two general areas related to the research problem. Respondents reported high levels of learning overall in these areas (Table 5).

Table 4. Participant learning about issues related to the Working Group’s research problem

As a result of participating in this Working Group, I have a better understanding of:	<i>n</i>	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
how the sources and spread of bovine TB can be used to inform control and eradication strategies	5	20%	40%	40%	0%	0%
how uncertainty in both TB infection status and cattle movement impacts our inference	5	20%	80%	0%	0%	0%

Progress Toward Goals

All respondents agreed that the Working Group format was effective for achieving its goals, and felt that the group made adequate progress toward developing network models of cattle movement and the spread of bovine TB in the U.S. that can be used to investigate alternative control and eradication.

Participant comments:

“Very challenging topic with many data streams of differing resolution and biases are being synthesized to address this problem. Given the enormity of this challenge I think the group made substantial progress towards achieving its goals.”

“We’ve more closely specified the problem areas, data sources, and who will be doing what.”

All respondents said they felt the expectations for the next Working Group meeting were clear, in the sense that they were leaving the current meeting with a good idea of what their contribution would be

at the next meeting, although one respondent indicated the expectations would become clearer with time:

“Can't really say completely "yes", or completely "no" [that the expectations are clear]. Over the next 2-3 months these expectations will become more clear as data become available.”

Impact on Future Research Plans

All respondents said they felt that the exchange of ideas that took place during the Working Group would initiate and/or influence their future research. Some participant comments:

“[My research will be influenced] Particularly regarding funding opportunities, and which parts of the Michigan problem I'll be looking at.”

“The discussions were both broad and deep in several technical areas. I think having been exposed to these ideas and participating in exchanges among experts in the field will help shape my future research.”

In addition to new ideas for research, three of the five respondents said that they developed unanticipated plans for collaborative research with other Working Group participants.

Suggestions for Future Working Group Meetings

Respondents were asked several questions soliciting suggestions for future Working Group meetings. Overall, participants were highly satisfied with the content and format of the current meeting. Two respondents, however, did offer suggestions for future meetings, including adding more participants and having the ability to video conference with off-site participants.

“The ability to video conference with off-site participants is a little lacking right now. This could prove to be a valuable tool.”

Conclusions and Recommendations

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

Respondents overall reported high levels of learning overall, agreeing that they had a better understanding of both how the sources and spread of bovine TB can be used to inform control and eradication strategies, and how uncertainty in both TB infection status and cattle movement impacts our inference.

All respondents agreed that the Working Group format was effective for achieving its goals, and felt that the group made adequate progress toward developing network models of cattle movement and the spread of bovine TB in the U.S. that can be used to investigate alternative control and eradication. All respondents said they felt the expectations for the next Working Group meeting were clear, in the sense

that they were leaving the current meeting with a good idea of what their contribution would be at the next meeting, although one respondent indicated the expectations would become clearer with time.

All respondents indicated they planned to take the knowledge they gained during the Working Group and apply it to their own research, and several said they had developed solid plans for collaborative research with other Working Group participants.

Overall, participants were highly satisfied with the content and format of the current meeting. Two respondents, however, did offer suggestions for future meetings, including adding more participants and having the ability to video conference with off-site participants.

Based on analysis of participant response data, the recommendations to NIMBioS and/or Working Group organizers are as follows:

- The content and format of the Working Group appear to be on track, and thus no recommendations are made in these areas.
- Consider the possibility of setting up video conferencing for off-site participants at future meetings, if applicable.

Appendix A

List of Participants

Participants

Last name	First name	Institution
Agusto	Folashade	NIMBioS
Bansal	Shweta	Pennsylvania State University, University Park
Buhnerkempe	Michael	Colorado State University
Farnsworth	Matt	United States Department of Agriculture APHIS
Hickling	Graham	NIMBioS
Kaneene	John	Michigan State University
Lombard	Jason	United States Department of Agriculture APHIS
Miller	Ryan	United States Department of Agriculture APHIS
*Odoi	Agricola	NIMBioS
Portacci	Katie	United States Department of Agriculture APHIS
Vernon	Matthew	University of Warwick
*Webb	Colleen	Colorado State University
Wennergren	Uno	Linköping University

*** Organizer of Working Group**

Appendix B

Modeling Bovine Tuberculosis

Working Group Survey

Modeling Bovine Tuberculosis Working Group Survey

Thank you for taking a moment to complete this survey. Your responses will be used to improve the Working Groups 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 Working Group: (Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied)

I feel the Working Group was very productive.

The Working Group 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 Working Groups 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 Working Group, I have a better understanding of:

(Strongly agree, Agree, Neutral, Disagree, Strongly disagree)

how the sources and spread of bovine TB can be used to inform control and eradication strategies

how uncertainty in both TB infection status and cattle movement impacts our inference

Do you feel the Working Group made adequate progress, for its first meeting, toward its ultimate goal of developing network models of cattle movement and the spread of bovine TB in the U.S. that can be used to investigate alternative control and eradication?

Yes

No

Comments:

Do you feel the expectations for the next Working Group are clear (in the sense that you are leaving this meeting with a good idea of what your contribution will be at the next meeting)?

Yes

No

Comments:

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

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

Please explain:

What do you feel was the most useful aspect of the Working Group?

What would you have changed about the Working Group?

How do you feel about the format of the Working Group?

This was a very effective format for achieving our goals

This was not a very effective format for achieving our goals ->

The Working Group format would have been more effective if:

Is your work currently supported by an NSF grant?

Yes ->

No

Name of NSF grant:

Institution at which NSF grant is held:

Please indicate your level of satisfaction with the Working Group accommodations:

(Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied)

Comfort of the facility in which the Working Group took place

Resources of the facility in which the Working Group took place

Quality of meals

Quality of drinks and snacks

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

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

Appendix C

Open-ended Survey Responses

Open-ended responses, by question and response category

Do you feel the Working Group made adequate progress, for its first meeting, toward its ultimate goal of developing network models of cattle movement and the spread of bovine TB in the U.S. that can be used to investigate alternative control and eradication? (n=2)

Very challenging topic with many data streams of differing resolution and biases are being synthesized to address this problem. Given the enormity of this challenge I think the group made substantial progress towards achieving its goals.

We've more closely specified the problem areas, data sources, and who will be doing what.

Do you feel that the exchange of ideas that took place during the Working Group will influence your future research? (n=2)

Particularly regarding funding opportunities, and which parts of the Michigan problem I'll be looking at.

The discussions were both broad and deep in several technical areas. I think having been exposed to these ideas and participating in exchanges among experts in the field will help shape my future research.

Did you develop unanticipated plans for collaborative research with other Working Group participants? (n=1)

A collaboration with Shweta was unexpected, but I think will be fruitful.

Do you feel the expectations for the next Working Group are clear (in the sense that you are leaving this meeting with a good idea of what your contribution will be at the next meeting)? (n=1)

Can't really say completely "yes", or completely "no". Over the next 2-3 months these expectations will become clearer as data become available.

What do you feel was the most useful aspect of the Working Group? (n=4)

Ability to discuss limitations and potential of the various data sources

Input from researchers in UK and Sweden

Putting all of the ideas on the table and addressing many of the data challenges explicitly and in depth. This helped to focus attention on the goal and what steps might be needed to get there.

various background of participants

What, if anything, would you change about the Working Group? (n=2)

Add more folks.

Nothing, it was very productive and collegial.

Please indicate any changes NIMBioS can make to improve the resources and/or accommodations available to Working Group participants. (n=2)

All and all very good.

The ability to video conference with off-site participants is a little lacking right now. This could prove to be a valuable tool.

Please provide any additional comments about your overall experience with the Working Group. (n=0)

NIMBioS is creating a web page with links to blogs written by our participants about relevant research topics. If you maintain a blog and would like to be included in our list of links please provide your URL, as well as a brief description of the topic. (n=0)