TR11-04
TECHNICAL
REPORT

FINAL REPORT :

Summer Institute on Climate Information for Public Health 2011

by Rachel Lowe, Gilma Mantilla and Luciana Mendiola

Online at: http://iri.columbia.edu/publications/id=1123

Final Report:
Summer Institute on Climate Information for Public Health 2011

Technical Report on the Climate Information for Public Health Training Course

Palisades, New York

May 16-27, 2011

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International Research Institute for Climate and Society

The Earth Institute at Columbia University

Palisades, New York, 10964, USA

Organized in partnership with

Mailman School of Public Health, Columbia University

Center for International Earth Science Information Network, Columbia University

Sponsored by

Health and Climate Foundation
Hong Kong Government Health Department
PACT Madagascar
University of São Paulo
University of Franca
University of Guelph
World Health Organization

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Executive Summary

The greatest challenges facing the public health systems of today include an aging population, urbanization and climate change. A key component of climate variability and climate change adaptation is the training of a new generation of leaders to understand the role that climate plays in driving disease burden and impacting economic growth. Such capacity building will help to strengthen and improve decisions made in the public health sector to minimize the impacts of global environmental change.

As a contribution to this process, The International Research Institute for Climate and Society (IRI), in partnership with the Center for International Earth Science Information Network (CIESIN) and the Mailman School of Public Health (MSPH) at Columbia University initiated this two-week course in 2008. Building on the response of our 2008 - 2010 alumni, and a great demand from the climate and health community the 2011 Summer Institute on Climate Information for Public Health (SI11) was designed to engage professionals who play a key role in the operational decision-making for climate-sensitive diseases in identifying and evaluating appropriate use of climate information. SI11 was held at Columbia University's Lamont-Doherty Campus in Palisades, New York, between May 16th and May 27th, 2011.

Participant selection

The IRI received 212 applications for this year's Climate Information for Public Health Summer Institute. Applicants spanned the globe, with the continent of Africa leading in number of application submissions. By region, 102 applications were received from Africa, 67 from Asia, 20 from Latin America and the Caribbean, 12 from North America, 10 from Europe and 1 from Oceania. Of the applications received, the majority of applicants reported holding research positions (46). Also well represented amongst applicants were other members of academia, including professors and lecturers (41) and graduate students (26). Program managers, directors and officers followed (36), along with public health professionals (15), meteorologists (8) and others.

After removing applications that were incomplete or irrelevant to the course, applicants for SI11 were selected based on: (i) funding ability, (ii) strategic opportunity for engagement with key partner organization via an institutional support, and (iii) personal characteristics, skills, grasp of the central issues expressed on the Statement of Interest, as well as ambitions. Candidates were ranked depending on the number and priority of criteria they met. At the end of the selection process, ten professionals from eight countries in the Americas, Asia, Europe and Africa were selected out of the 212 applicants to participate in SI11. Participants hailed from Argentina (1), Brazil (2), Canada (1), China (2), Colombia (1), Madagascar (1), Switzerland (1) and the United States (1). Four participants worked in the climate or meteorological sector and the remaining six worked either in the public health sector or in health research fields. All participants were professionals who play a key role in decision-making for health-care planning, research, evaluation or control of climate-sensitive diseases.

Course Overview

The course was designed to help participants (i) understand the role climate plays in driving the infectious disease burden and public health outcomes, (ii) use new tools for accessing climate and epidemiological data, for analyzing and mapping using the IRI Data Library and other Geographic information Systems (GIS) and (iii) understand management and data integration as an opportunity to improve the decision making process in public health.

The structure of the course provided a balance of concepts and methods from the health and climate communities using an approach deeply oriented toward methodology, gathering and using evidence for decision-making. This helped participants to gain in-depth knowledge and skills in decision-making for health-care planning of climate-sensitive diseases. The concepts presented during the morning lectures were reinforced by lunch seminars, afternoon hands-on exercises using the on-line version of the IRI Data Library and Map Room, the daily quiz, summaries of the key messages discussed during the previous day, given by the participants, as well as the group discussion following the summary.

Twenty-eight facilitators (including lecturers and organizers), supported by fifteen information technology (IT), administrative, communication professionals, led the participants through the following modules: (i) Basic Concepts in Public Health and Climate, (ii) Sources and Tools for Analyzing Climate and Public Health Data and (iii) Use of Climate Information in Decision-Making for Climate-Sensitive Diseases.

Throughout the course, participants were assigned to develop a personal climate and public health project that would be relevant to their own institution and area of work. The participants projects addressed issues as varied as "Heat Wave Early Warning System in Buenos Aires", "Yellow Fever risk assessment in Cameroon", "Hantaviruses in Brazil: Land Use and Land Cover Changes", "The Economic Implications of Climate Variation on Dengue in Brazil", "Temporal Distribution of malaria diagnosis in San Jose del Guaviare in Colombia", "Relation between malaria cases and climate information in Madagascar district of Antsirabe II", "Use of sea surface temperature monitoring for dengue early warning in Ecuador", "Climate trend analysis for heat wave warning and emergency dispatch calls in Toronto" and "Temperature trend and extremes of Beijing ". In order to offer the participants the opportunity to share their learning experience with co-participants, facilitators and the Climate Information for Public Health (CIPH) network, these projects were presented on the last day of the course as posters, accompanied by a 300-word summary.

Several awards acknowledged the following outstanding performances during SI11: Best Poster, Best Facilitator, Best Team, Best Collaborator and Best Logistic Support.

The Climate Information for Public Health Action Network (CIPHAN) Web platform supported all course materials. Participants were also introduced to their expected role within the CIPH Alumni Network and the Climate Information for Public Health Action (CIPHA) Newsletter, which provides updates on the latest developments within the CIPH network, including the activities of alumni and facilitators, brief meeting reports, news from the health and climate community, and opportunities for collaboration.

Course Evaluation

The course evaluation process was designed to highlight any gaps in the contents and delivery of the course material and to provide the organizers with an insight into how changes in the course since SI10 were received. Overall, SI11 was deemed a great success by the participants, who highly valued the interaction with facilitators during the preparation of the poster projects and the final poster presentations. Participants were unanimous that the opportunity to network with other climate and public health researcher and practitioners was the best part of the course. Overall perceptions included opportunities for future joint research collaborations and international training courses similar to the SI.

In addition to the praise the course received, a number of recommendations were made to help improve future courses. In general, the participants would have liked more time for discussion both with the facilitators and between themselves in the form of small group breakouts. Some participants felt that there was a lot of focus on infectious diseases and would have liked to have learned more about heat and pollution related public health issues such as non-communicable and chronic disease. In general, participants felt that is would be useful to go into greater depth in fewer topics. It was suggested that it would be useful to have a politician or someone responsible for implementing climate and public health policy as a summer institute facilitator, to challenge the ideas that are generated amongst the climate and public health community.

Financial Support

Financial support to the course participants was provided by the Health and Climate Foundation, Hong Kong Government Health Department, PACT Madagascar, University of São Paulo, University of Franca, University of Guelph and the World Health Organization.

Acronyms

AMS	American Meteorological Society
AVHRR	Advanced Very High Resolution Radiometer
CDC	Centers for Disease Control
CIESIN	Center for International Earth Science Information Network
CIPH	Climate Information for Public Health
CIPHA	Climate Information for Public Health Action
CIPHAN	Climate Information for Public Health Action Network
CPT	Climate Predictability Tool
CRM	Climate Risk Management
ENSO	El Niño Southern Oscillation
EWS	Early Warning System
FAQ	Frequently Asked Questions
GIS	Geographic Information Systems
GPS	Global Positioning Systems
ICTP	International Centre for Theoretical Physics
IFRC	International Federation of Red Cross and Red Crescent Societies
IPCC	Intergovernmental Panel on Climate Change
IRI	International Research Institute for Climate and Society
LAC	Latin America and the Caribbean
LDEO	Lamont-Doherty Earth Observatory
MDGs	Millennium Development Goals
MERIT	Meningitis Environmental Risk Information Technologies
MEWS	Malaria Early Warning Systems
MoH	Ministry of Health
MSPH	Mailman School of Public Health
NDVI	Normalized Difference Vegetation Index
NIEHS	National Institute of Environmental Health Sciences
NIH	National Institute of Health
NOAA	National Oceanic and Atmospheric Administration
NRDC	Natural Resources Defense Council
PAHO	Pan American Health Organization
SI	Summer Institute
SST	Sea Surface Temperature
VL	Visceral Leishmaniasis
WHO	World Health Organization
WMO	World Meteorological Organization

Acknowledgements

The organizers of SI11 and the authors of this report would like to acknowledge all the sponsors, facilitators, support staff and participants of SI11 for contributing to the success of the course:

Sponsors

Health and Climate Foundation
Hong Kong Government Health Department
PACT Madagascar
University of São Paulo
University of Franca
University of Guelph
World Health Organization

Facilitators

John Balbus, NIEHS;
Tony Barnston, IRI;
Mark Becker, CIESIN;
Michael Bell, IRI;
Pietro Ceccato, IRI;
Laurence Cibrelus, IRI;
Remi Cousin, IRI;
Ashley Curtis, IRI;
John del Corral, IRI;
Ashley Curtis, IRI
Dia El Naiem, University of Maryland;
Wayne Elliot, UK Meteorological Office;
Francesco Fiondella, IRI;
Patricia Graves, the Carter Center;
Patrick Kinney, MSPH;
Kim Knowlton, MSPH and NRDC;
Rachel Lowe, ICTP;
Bradfield Lyon, IRI;
Gilma Mantilla, IRI;
Simon Mason, IRI;
Judy Omumbo, IRI;
Andrew Robertson, IRI;
Daniel Ruiz, IRI;
Jeffrey Shaman, MSPH:
Wendy Marie Thomas, AMS;
Madeleine Thomson, IRI;
Sylwia Trzaska, IRI;
Steve Zebiak, IRI.

Support Staff

Baaba Baiden, IRI;
Ann Binder, IRI;
Michael Dervin, IRI;
Hans Bosch, CIESIN
Francesco Fiondella, IRI;
Rise Fullon, IRI;
Luciana Mendiola, IRI
Althea Murillo, IRI;
Barbara Platzer, IRI;
Jason Rodriguez, IRI;
David Strom, CIESIN;
Jeffrey Turmelle, IRI;
Cathy Vaughan Green, IRI;
Sandy Vitelli, IRI;
Gavin Wu, Climate and Society Program, Columbia University.

Participants

Gustavo Almeira, National Weather Service, Argentina;
Emily Firth, World Health Organization, Switzerland;
Monica Morraye, University of Franca, Brazil;
Salua Osorio, National Institute of Health, Colombia;
Li Peng, Shanghai Center for Urban Environmental Meteorology, China;
Paula Pereda, University of Sao Paulo, Brazil;
Andry Rakotorahalahy, National Malaria Program, Madagascar;
Anna Maria Stewart, SUNY ESF & Syracuse University, New York;
May Kei Liza To, Department of Health, Hong Kong;
Jennifer Vanos, University of Guelph, Canada

Team Members

Organizers

Gilma Mantilla and Madeleine Thomson from the IRI, Mark Becker from CIESIN and Patrick Kinney from the MSPH, were responsible for the organization of SI11.

Development of the course agenda and training materials

The team was led by Gilma Mantilla, IRI.

Logistic team

The following persons led the logistics of SI11: Ann Binder, Mike Dervin, Baaba Baiden, Jeffrey Turmelle, Althea Murillo, Barbara Platzer, Ashley Curtis, Jason Rodriguez, Sandy Vitelli and Luciana Mendiola from the IRI, Hans Bosch and David Strom from CIESIN.

Evaluation group

The following persons were responsible for developing and overseeing the course evaluation: Gilma Mantilla and Luciana Mendiola from the IRI.

Poster Prize Committee

The following team evaluated the posters of the SI11 participants and attributed the Best Poster Prize: Mark Becker, CIESIN, Andrew Robertson, IRI, Rachel Lowe, SI09 alumna, Laurence Cibrelus, SI08 alumna and Wendy Marie Thomas, SI08 alumna.

Authors of this report

Rachel Lowe was a SI11 facilitator.
Gilma Mantilla was the general coordinator of SI11.
Luciana Mendiola conducted the course evaluation.

Detailed biographies of the participants, facilitators and support staff are provided in Appendix 1.

Introduction

The International Research Institute for Climate and Society (IRI)/Earth Institute at Columbia University is the premier global research and capacity building institution focused on the use of climate information in public health, agriculture and water decision-making. IRI is a collaborating center with WHO-PAHO on climate sensitive diseases and has active international partnerships concerning malaria, meningococcal meningitis, Rift Valley Fever and other diseases. IRI's areas of interest also include dengue, diarrheal diseases, Kala-azar (leishmaniasis) and conditions associated with flood, drought and disasters.

The mission of the IRI is to enhance society's capability to understand, anticipate and manage the impacts of climate in order to improve human welfare and the environment, especially in developing countries. The IRI conducts this mission through strategic and applied research, education, capacity building, and by providing forecasts and information products with an emphasis on practical and verifiable utility and partnership. In particular, the public health commitment of the IRI involves developing, with partners, a knowledge system based on three main components:

- Understand community of practice, identify needs and collaborate with Ministries of Health to work at local to regional levels;

- Develop tools to monitor, survey and predict disease epidemics based on climate data, patterns and trends;

- Build capacity through education and training of public health professionals on the relationship between climate and health.

The IRI is committed to converting knowledge gained into training and education products which are then communicated in person and in electronic media to expand the basis for learning about climate risks and introducing concepts into a decision making process of different sectors. The Summer Institute on Climate Information (SI) was created in 2008 to meet this need and achieve the Public Health goals of the IRI, in partnership with the Columbia University Center for International Earth Science Information Network (CIESIN) and Mailman School of Public Health (MSPH).

This report summarizes the Summer Institute 2011 on Climate Information for Public Health (SI11). It describes the content and the evaluation of the course with summaries of each training module. It also introduces the participants, organizers, facilitators and support staff – who contributed to the success of SI11.

Participants and facilitators of SI11. Barbara Platzer/IRI

Participants

Selection Process

The IRI received 212 applications for this year's Climate Information for Public Health Summer Institute. Applicants spanned the globe, with the continent of Africa leading in number of application submissions. By region, 102 applications were received from Africa, 67 from Asia, 20 from Latin America and the Caribbean, 12 from North America, 10 from Europe and 1 from Oceania. Of the applications received, the majority of applicants reported holding research positions (46). Also well represented amongst applicants were other members of academia, including professors and lecturers (41) and graduate students (26). Program managers, directors and officers followed (36), along with public health professionals (15), meteorologists (8) and others. The SI11 announcement, application form and the full application report can be found in Appendix 2, 3, and 4 of this document, respectively.

Applicants for the 2011 Summer Institute were selected based on a range of criteria. In order to facilitate the selection process of the pool of 212 applicants, an initial shortlist was compiled which appropriately narrowed down the pool of potential candidates. This was accomplished by removing applicants who did not submit a complete application on line, had previously been trained, or whose skills were less relevant to the course as it stands (e.g., lawyers or volunteers). Following the development of the short list, the following criteria were applied to each of the remaining candidates.

Criteria Applied to Each Candidate

Criteria	Criteria Description
1	Funding: self-funding is highly recommended
2	Strategic opportunity for engagement with key partner organization via an institutionally supported individual
3	Personal characteristics, skills, grasp of the central issues expressed on the Statement of Interest, and ambitions

Candidates were then ranked and selected according to the following method (1 = Highest Priority, 4 = Lowest Priority).

Criteria Applied to Rank the Candidates

Priority Rating	Criteria Required
1	Meets all three criteria
2	Meets criteria 1 and 2 or 3
3	Meets criteria 2 and 3
4	Meets one of the criteria listed

Accepted Participants

At the end of the selection process, ten professionals from eight countries in the Americas, Asia, Europe and Africa were selected out of the 212 applicants to participate in SI11. Participants hailed from Argentina (1), Brazil (2), Canada (1), China (2), Colombia (1), Madagascar (1), Switzerland (1) and the United States (1). Four participants worked in the climate or meteorological sector and the remaining six worked either in the public health sector or in health research fields. All participants were professionals who play a key role in decision-making for health-care planning, research, evaluation or control of climate-sensitive diseases.

The organizers of the course were very much honored to welcome the following professionals to SI11: Gustavo Almeira from the National Weather Service, Argentina, Emily Firth from the World Health Organization, Switzerland, Monica Morraye from the University of Franca, Brazil, Salua Osorio from the National Institute of Health, Colombia, Li Peng from the Shanghai Center for Urban Environmental Meteorology, China, Paula Pereda from University of Sao Paulo, Brazil, Andry Rakotorahalahy from the National Malaria Program, Madagascar, Anna Maria Stewart from SUNY ESF & Syracuse University, United States of America, May Kei Liza To from the Department of Health, Hong Kong and Jennifer Vanos from the University of Guelph, Canada.

The CIPHAN Web-page, the CIPHA Newsletter and the CIPH Alumni Network

For the second time since the implementation of the Summer Institute, the Climate Information for Public Health Action Network (CIPHAN) Web platform supported all course materials. Participants were also introduced to their expected role within the CIPH Alumni Network and the Climate Information for Public Health Action (CIPHA) Newsletter.

A lot of knowledge remains to be built in the area of climate and public health and the field efficiency of the new approaches implemented is yet to be assessed. For these reasons, it is critical that networking and interaction platforms allowing climate and public health professionals to communicate and share their knowledge and experience exist.

The CIPHAN platform was developed to respond to this need. It provides public health professionals with knowledge, methodologies, tools, and data to better manage climate sensitive diseases toward improving health outcomes. CIPHAN acts as a web portal to guide the learner towards other sources of information, as well as a source of learning resources, such as educational modules and exercises. There is also a library that contains a directory of published material to give the reader opportunity for further investigation.

Similarly, the CIPHA Newsletter was created to provide updates on the latest developments within the CIPH network, including the activities of alumni and facilitators, brief meeting reports, news from the health and climate community and opportunities for collaboration.

Participants from SI11, as well as from the previous summer institutes and in-country CIPH training courses, are expected to contribute to development and sustainability of these platforms and associated CIPH projects.

Course Overview

Week One: May 16-20, 2011

	Monday 16-May Monell Building	Tuesday 17-May Lamont Hall	Wednesday 18-May CIESIN Lab	Thursday 19-May Lamont Hall	Friday 20-May CIESIN Lab
Module	Basic Concepts in Public Health and Climate	Basic Concepts in Public Health and Climate	Sources and Tools for Analyzing Climate and Public Health Data	Sources and Tools for Analyzing Climate and Public Health Data	Sources and Tools for Analyzing Climate and Public Health Data
Morning 9:00am-12:30pm	**9:00-9:15am** Welcome *Stephen Zebiak* **9:15-9:30am** Introduction to Summer Institute 2011 and to the CIPHA network *Madeleine Thomson, Patrick Kinney, Mark Becker*	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day
	9:30-9:45am Overview of the Course *Gilma Mantilla* **9:45-10:15am** Introduction of the participants and facilitators Selection of the raporteur for the next day *Wendy Thomas*	**9:30-10:30am** Climate and Weather Information *Sylwia Trzaska*	**9:30-10:15am** Climate and Vector-Borne Disease Dynamics *Madeleine Thomson*	**9:30-10:15am** Remote Sensing as a Tool to Manage Environmental Data *Pietro Ceccato*	**9:30-10:30am, Field Practice** Using GPS, GIS and Google Maps for Public Health Part I *Mark Becker*
	10:15-10:30am Coffee Break	**10:30-10:45am** Coffee Break	**10:15-10:30am** Coffee Break	**10:15-11:00am** Cluster Analysis *Andy Robertson*	**10:30-10:45am** Coffee Break
	10:30-11:15am Climate Services in Urban Environments Wayne Elliot **11:15-12:15pm** Climate Risk Management in Health Madeleine	**11:00-11:45am** Core Concepts in Public Health and Epidemiology *Judy Omumbo*	**10:30-11:15am** Malaria Vector Distribution and Rainfall *Judy Omumbo* **11:15-12:15pm** Principles of Trends and Time Series Analysis *Andy Robertson*	**11:00-12:00pm, Monell Auditorium** Special Climate Briefing *Tony Barston*	**10:45-12:15am, Field Practice** Using GPS, GIS and Google Maps for Public Health Part II *Mark Becker*

	Thomson	**11:45-12:30pm** Public Health Surveillance and Opportunities to use Climate Information *Richard Luce*		***-- coffee break will be served at the Monell Auditorium --***	
Lunch 12:30-2:00pm	**Welcome Lunch**				**Nature Walk** *Cathy Vaughan Green- Ashley Curtis*
	2pm-3:30pm, CIESIN Lab Overview of the IRI Data library *Michael Bell*	**2:00-4:00pm, CIESIN Lab** Summarizing climate and health data using descriptive statistics and map tools *Michael Bell*	**2:00-3:00pm** Malaria Mapping and the Climate Suitability for Malaria Transmission Tool in the Health Map Room Judy Omumbo, Remi Cousin	**2:00-3:00pm** **CIESIN Lab** Remote Sensing tools in the Health Map Room Part I *Pietro Ceccato*	**2:00-3:30pm** Using GIS to Exploring the Links between Poverty and Natural Hazards Part I Mark Becker
	3:30-3:45pm Coffee Break	**4:00-4:15pm** Coffee Break	**3:00-4:00pm** IFRC Map Room Ashley Curtis	**3:30-3:45pm** Coffee Break	**3:30-3:45pm** Coffee Break
Afternoon 2:00-5:30pm CIESIN Lab	3:45-5:15pm Controlling the quality of the students' dataset *John del Corral, Michael Bell, Remi Cousin*	4:15-5:00pm Applications using the participants' datasets *John del Corral, Michael Bell, Remi Cousin*	**4:00 _ 4:15pm** Coffee Break	**3:35-4:45pm** Remote Sensing tools in the Health Map Room Part II *Pietro Ceccato*	**3:45-5:00pm** Using GIS to Exploring the Links between Poverty and Natural Hazards Part I Mark Becker
		5:00-5:15pm Open space for practice with the Data-Library or meetings with facilitators	**4:15-5:00pm**. Poster Clinic Francesco Fiondella	**4:45-5:15pm** Open space for practice with the Data-Library or meetings with facilitators	
	5:15-5:30pm Daily evaluation of the course	**5:15-5:30pm** Daily evaluation of the course	**5:15-5:30pm** Daily evaluation of the course	**5:15-5:30pm** Daily evaluation of the course	**5:15-5:30pm** Daily evaluation of the course
Evening		**Discussion about Projects Rachel Lowe**	**Palisades Mall Tour**	**Discussion about Projects Rachel Lowe**	**Discussion about Projects Rachel Lowe**

Week Two: May 23-27, 2011

	Monday 23-May Lamont Hall	Tuesday 24-May Lamont Hall	Wednesday 25-May Lamont Hall	Thursday 26-May Lamont Hall	Friday 27-May Commer Building
Module	Use of Climate Information in Decision-Making for Climate-Sensitive Diseases	Use of Climate Information in Decision-Making for Climate-Sensitive Diseases	Use of Climate Information in Decision-Making for Climate-Sensitive Diseases	Use of Climate Information in Decision-Making for Climate-Sensitive Diseases	Use of Climate Information in Decision-Making for Climate-Sensitive Diseases
Morning 9:00am-12:30pm	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day	**9:00-9:30am** 10min quiz 20 min summary of the previous day by a participant, followed by open discussion with the lecturers Selection of the raporteur for the next day
	9:30-10:45am Understanding Predictions and Projections in Climate *Sylwia Trzaska*	**9:30-10:30am** Climate change, War and Disease *Dia El Naiem*	**9:30-10:15am** Temperature Trends in the Highlands of East Africa *Bradfield Lyon*	**9:30-10:15am** Climate Change and Public Health John Balbus	**9:30-10:15am** **Influenza and Climate** Jeffrey Shaman
	10:45-11:00am Coffee Break	**10:30-10:45am** Coffee Break	**10:15-10:30am** Coffee Break	**10:15-10:30am** Coffee Break	**10:30-10:45am** Coffee Break
	11:00-11:45am Linking ENSO and Society *Tony Barnston*	**10:45-11:30am** Malaria Early Warning and Early Response Madeleine Thomson	**10:30-11:30am** Meningitits Environmental Risk Information Technology (MERIT) *Stephen H.*	**10:30-11:15am** Heat Waves in the USA from the Climate Perspective *Bradfield Lyon*	**10:30-12:30pm** Weather Roulette: How to Make Decisions Given Probabilistic Forecasts *Simon Mason - Ashley Curtis*
	11:45-12:30pm Climate Chance and Human Health Current Impacts and Future Risk Patrick Kinney	**11:30-12:15pm** Spatio-temporal modelling of Dengue Risk in Brazil *Rachel Lowe*	**11:30-12:30pm** Integrated Surveillance and Control Systems for Malaria in Colombia *Daniel Ruiz*	**11:15-12:00pm** Heat Waves and Public Health: a USA Case Study *Kim Knowlton* **12:00-12:30pm** Group Discussion	
Lunch 12:30-2:00pm		**Celebrity Walk** Barbara Platzer			

	2:00-4:00pm Climate Prediction for Skeptics Part I *Simon Mason - Ashley Curtis*	**2:00-3:30pm** Epidemic Detection and Monitoring using Thresholds Part I *Patricia Graves*	**2:00-3:30pm** Exercises on K-Means and Cluster Analysis: Malaria Seasonality *Pietro Ceccato*	**2:00-3:30pm** Open space to work on projects Part I	**2:00-3:00pm, Monell Lower Lobby** Presentation of participants' projects Part I
	4:00-4:15pm Coffee Break at CIESIN lab	**3:30-3:45pm** Coffee Break at CIESIN lab	**3:30-3:45pm** Coffee Break at CIESIN lab	**3:30-3:45pm** Coffee Break at CIESIN lab	**3:00-3:15pm** Coffee Break Monell Building
Afternoon **2:00-5:30pm** **CEISIN Lab**	**4:15-5:15pm** Climate Prediction for Skeptics Part II Simon Mason - Ashley Curtis	**3:45-4:45pm** Epidemic Detection and Monitoring using Thresholds Part II *Patricia Graves*	**3:45-5:15pm** Open space to work on projects or meetings with facilitators	**3:45-5:15pm** Part II Open space to work on projects	**3:15-4:15pm, Monell Lower Lobby** Presentation of participants' projects Part II
		4:45-5:15pm Open space for practice with the Data-Library or meetings with facilitators			**4:15-4:30pm, Monell Auditorium** Graduation and Award Ceremony Rachel Lowe
					4:30-5:00pm, Monell Computer Lab, room 136 Daily and Final Evaluation of the Course
	5:15-5:30pm Daily evaluation of the course	**5:15-5:30pm** Daily evaluation of the course	**5:15-5:30pm** Daily evaluation of the course	**5:15-5:30pm** Daily evaluation of the course	
Evening	**Discussion about Projects Rachel Lowe**	**Discussion about Projects Rachel Lowe**	**Discussion about Projects Rachel Lowe**	**Farewell Party**	**Closing**

Learning Goals

Module I: Basic Concepts in Public Health and Climate (Days 1-2)

To equip participants to (i) introduce the concept of Climate Risk Management and to promote discussion on how to incorporate it in the participants' activities in the health sector; (ii) understand how climate, in various temporal and spatial scales, drives the transmission of many diseases and, in particular, the role of climate in driving the transmission of vector-borne diseases, meningitis and cardio respiratory diseases; (iii) understand how climate may impact public health, in particular through increased hazards and vulnerability, resulting in increased risk; (iv) understand the terms: weather *versus* climate, climatology, climate variability *versus* climate change, climate anomalies, and climate data *versus* climate information (forecast products, monitoring products); (v) understand routine epidemiological measurements and their spatial and temporal resolution in the framework of Public Health Surveillance; and (v) understand the capabilities of the IRI Data Library and how it may be applied as a useful tool for analyzing climate and health data.

Module II: Sources and Tools for Analyzing Climate and Public Health Data (Days 3-5)

To equip participants to (i) understand time scales and spatial resolution, the benefits and limitations of different climate, health and environmental data sources including remotely sensed data, meteorological data, climate predictions and epidemiological data; (ii) use new tools for accessing climate and epidemiological data, for analysis and mapping through the IRI Data Library, Geographical Information Systems , Google Earth and Excel spreadsheet tools; (iii) select the appropriate type of health data required for different health/climate analyses; (iv) introduce basic concepts of the dynamics climatic drivers of transmission of vector-borne diseases; (v) define, interpret and understand when to use different statistical methods; and (vi) understand the power of maps to display data and as a tool for decision making in public health.

Module III: Use of Climate Information in Decision-making for Climate-Sensitive Diseases (Days 6- 10)

To equip participants to (i) understand the rationale behind different types of predictions and projections with an emphasis on the interpretation and limitations of the available predictive methods; (ii) show how sophisticated statistical modeling ideas can contribute to the solution of real-world public health problems;(iii) understand why climate information needs to be coupled with health information to inform public health decisions; (iv) understand how researchers can help decision makers to understand the sources of uncertainty in forecasts and predictions and what might be done to reduce it; (v) understand the concepts and methods pertaining to vulnerability analysis and adaptation to climate change; (vi)understand how an ENSO-modified seasonal climate can affect society; (viii) demonstrate how to analyze, create and replicate the simulation outputs of several malaria dynamical models using a case study from Colombia; and (viii) explore scenario-based integrated risk assessment for climate change and heat-related health impacts

Details on the daily lectures, practical sessions and associated readings per module are provided below.

Session Summaries

Module I: Basic Concepts in Public Health and Climate

Day One: Monday May 17 2011

Overview of the Course, by Gilma Mantilla, IRI

Instructional Goal:

- Provide an overview of the Summer Institute 2011 course on "*Climate Information for Public Health".*

Learning Objectives:

- Ensure that all participants have an understanding of the overall objectives of the Summer Institute and the expected outcomes.
- Establish the logistical aspects and follow up of the course.

Summary:

The 2011 Summer Institute course on '**Climate Information for Public Health**' is a two-week training course that offers public health decision makers the opportunity to learn practical methods and tools for integrating climate knowledge into decision-making processes. The course was designed to have three modules: 1) basic concepts of climate and public health, 2) sources and tools to analyze climate and public health data and 3) use of climate information in decision-making for climate-sensitive diseases. It also has an evaluation system that relied on on-line open-ended and numeric questions addressing the design and delivery of the course, as well as the opportunities that could arise from the course. The expected benefits of the course are that the participants can use the knowledge and skills gained during the Summer Institute to train their peers in their own institution and country.

Recommended readings:

- Visit the Web-page of the Climate Information for Public Health Action Network (CIPHAN) at: http://ciphan.iri.columbia.edu/

Climate Services in Urban Environments, by Wayne Elliot, UK Met Office

Instructional Goal:

- Provide an overview of how climate services can be developed to cope with urban environments.

Learning Objectives:

- To better understand how the urban environment is affected by weather and climate.
- To better understand how climate services can be developed to cope with urban environment.

Summary:

Current climate variability presents some challenging events for those living and working in the urban environment. Climate change will increase these stresses with disproportionate effects felt in some parts of the world. Aspects of how our urban environment is designed need to be addressed as soon as possible and public health services need to react to the changing needs of populations as temperatures increase.

Recommended readings:

- Julca, A and Paddison O. The challenges of adapting to a warmer planet for urban growth and development. United Nations. December 2009

Climate Risk Management in Health, by Madeleine Thomson, IRI

Instructional Goal:

- Provide an overview of Climate Risk Management (CRM) in public health.

Learning Objectives:

- Understand how climate knowledge and information can form a bridge between climate and health agendas.
- Give some examples of CRM approach in infectious diseases.

Summary:

During the past decade, the global health community has advocated for, planned and began resourcing global health initiatives focused on the needs of the poor - as indicated by the United Nations Declaration on the Millennium Development Goals (MDGs). The arrival of climate change on the global health centre stage, was marked by the address on climate change and global public health in November 2007 by Margaret Chan Director-General of the World Health organization (WHO) - "Climate change will affect, in profoundly adverse ways, some of the most fundamental determinants of health: food, air, water."

As societies in general and the health community in particular, start to adapt to climate change, will this new agenda detract from, or support the pro-poor global health agenda that has been so long in the making? Climate knowledge and information can form a bridge between these two agendas - managing the climate related risks of today while improving our understanding of the risks of tomorrow.

Recommended readings:

- Campbell-Lendrum D, Bertollini R, Neira M, Ebi K, McMichael A. Health and climate change: a roadmap for applied research. The Lancet 2009;373(9676):1663-1665.
- Connor S, Omumbo J, Green C, DaSilva J, Mantilla G, Delacollette C, et al. WS-1 Climate and human health: Health and Climate - Needs. In: World Climate Conference 3; 2009; Procedia Environmental Sciences, Volume 1, January 2010, Pages 27-36
- Kelly-Hope L, Thomson MC. Climate and infectious diseases. In: Thomson MC, Garcia Herrera R, Beniston M, editors. Seasonal Forecasts, Climatic Change and Human Health: Springer Netherlands; 2008. p. 31-70.

Overview of the Data Library, by Michael Bell, IRI

Instructional Goal:

- Introduce participants to the IRI Data Library to provide an initial understanding of its contents, structure and capabilities, and how it may be applied as a useful tool for analyzing climate and health data.

Learning Objectives:

- Become familiar with the organization of the Data Library and its data sets.
- Learn how to find data sets and select spatial and temporal domains.
- Learn how to perform simple arithmetic analyses in the Data Library.
- Learn how to create customized maps and graphs.
- Learn how to download data and images.
- Learn how the Data Library is related to the IRI Map Rooms.

Summary:

The IRI Data Library is a powerful online resource for accessing, analyzing, visualizing, and downloading climate-related data sets. It is capable of relating different types of data sets (e.g. gridded data, station data, geographic shapes) in a common data model such that relationships between gridded climate data and health data collected by geographic region, for example, can be analyzed. Specialized map and analysis tools in the IRI Map Rooms have been developed using Data Library functionality to meet specific needs in the health community and other sectors. This session provided an introduction to the IRI Data Library.

Recommended readings:

- The IRI Data Library: A Tutorial: http://iridl.ldeo.columbia.edu/dochelp/Tutorial/

Understanding Data and Data Quality Control, by John del Corral, IRI

Instructional Goal:

- Understand the difference between a collection of numbers and 'data'.

Learning Objectives:

- Consistency and uniformity of data.
- Prepare data in the context of multi-disciplinary analysis.
- Data analysis over long time periods and broad regions.

Summary:

Precisely describing the time and locale of the data is a major step in the data analysis process. This is particularly true in the instance of geo-referenced climate and health data, that we want to analyze temporally and spatially.

Ensuring good data quality includes: 1) ensuring self consistency, 2) ensuring geographical consistency and 3) providing useful and useable metadata. Although this process may appear quite demanding and time-consuming, it should not be neglected because it: 1) simplifies subsequent analysis, 2) allows more sophisticated functions to be applied and 3) allows ready comparison with other datasets.

This lecture led participants through the different steps required to control the quality of personal datasets.

Day Two: Tuesday May 18 2011

Introduction to Climate and Climate Information, by Sylwia Trzaska, IRI

Instructional Goal:

- Provide an overview of basic concepts in climate and a common understanding of what climate information is and its limitations.

Learning Objectives:

- Understand the terms weather vs. climate, climatology, climate variability vs. climate change, climate anomalies, and climate data vs. climate information (forecast products, monitoring products).
- Understand the time and space scales of the different climate phenomena.
- Understand different data sources and different approaches to transform climate data in climate information.

Summary:

One of the main issues of multidisciplinary research is that each discipline has its own approaches, methods and terminology, shaped during the development period of the discipline. Those are most often dictated by availability of the data and data acquisition methods, which led the discipline in given direction, sometime influenced by personal choices of people having contributed to the discipline. This lecture introduced the basic concepts in climatology to enable the participants from the Public Health Sector to efficiently interact with the Climate and Meteorological Community. For example, the notion of scale (spatial and temporal) is central to understanding climate and climate analyses and leads automatically to the distinction between climate variability and climate change (e.g., ENSO). Understanding climate/meteorological data acquisition methods and sources, and related constraints on available information as well as the basic distinction between data and information are also necessary steps to build a common understanding of what is possible. The most common analysis methods used in climate sciences were introduced with emphasis on the importance of scale adequacy for the problem at stake.

Recommended readings:
IPCC 4th Assessment FAQs:
http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faqs.html
FAQ 1.1, 1.2, 1.3, 2.1, 6.1, 6.2, 10.1

Core Concepts in Public Health and Epidemiology, by Judy Omumbo, IRI

Instructional Goal:

- Understand how the variability in malaria risk in space and at varying time scales is measured and how this variability is driven by the variability of climate.

Learning Objectives:

- Understand disease risk.
- Using space and time as a framework for measuring variability in disease risk.
- What the main measures of disease in epidemiology are; what is the difference between incidence and prevalence, how they are measured for malaria, their robustness in measuring risk and what each measure represents in space and time.

Summary:

Epidemiologists are concerned with the analysis of disease risk within population groups. Disease risk waxes and wanes between populations, geographical areas and in time. This variation is driven by environmental and social change. In the case of climate sensitive diseases, variations in disease risk are also driven by climate variability on a seasonal, annual, inter-annual or even decadal time scale. This seminar described how time and space are used as an epidemiological framework to measure and monitor variability in disease risk. From this lecture, participants learned how to capture and store spatial and temporal information and what aspects of space and time need to be measured and monitored for disease risk management. The rationale for organizing information, within a time and space framework and identifying patterns and associations, with the aim of providing insight to epidemiological processes was also discussed.

Recommended readings:

- Lafferty KD. The ecology of climate change and infectious diseases. Ecology 2009;90(4):888-900.

Public Health Surveillance and Opportunities to use Climate Information, by Richard Luce, CDC

Instructional Goal:

- Understand the value of applied public health surveillance.

Learning Objectives:

- Understand and describe different types of surveillance.
- Understand how surveillance data can incorporate climate data.
- Identify opportunities were climate data can enhance surveillance quality.

Summary:

The main purpose of surveillance is to control a disease or health condition. Therefore, surveillance is the critical foundation of knowledge upon which public health response, programs, and policy depend. Surveillance is the obligatory first step that is required to objectively identify a health problem. Once identified it is possible to investigate underlying contributing factors. Quality surveillance ensures appropriate and targeted interventions, more effective use of resources as well as meaningful monitoring and evaluation of control and prevention programs. Collection of surveillance data should be interpreted, analyzed and disseminated and linked to public health action. The use of climate data in surveillance is underdeveloped, but has the potential to enhance the usefulness of surveillance by adding predictive and explanatory power.

Recommended readings:

- Nsubuga P, White ME, Thacke SB, Anderson MA, Blount SB, Broome CV, et al. Public Health Surveillance: A Tool for Targeting and Monitoring Interventions. In: Disease Control Priorities in Developing Countries, 2nd edition; 2006. p. 997-1015.
- Centers for Disease Control and Prevention, Department Of Health And Human Services. Malaria Surveillance — United States, 2007. Morbidity and Mortality Weekly Report 2009;58(SS-2):1-17.

Summarizing Climate and Health Data Using Descriptive Statistics and Map Tools, by Michael Bell, IRI

Instructional Goal:

- Learn the fundamentals of the use of Expert Mode in the IRI Data Library and use the Data Library to calculate and visualize exploratory and descriptive statistics of climate and health data.

Learning Objectives:

- Learn how to work with multiple items in Data Library Expert Mode.
- Learn how to apply filters and functions.
- Learn how to use Data Library stack operations and constructs.
- Understand the Data Library grid matching notation.
- Learn how epidemiological data are organized in the Data Library.
- Learn how to display time series of epidemiological and climate data in the Data Library.
- Learn how to construct histograms of epidemiological data in the Data Library.
- Learn how to calculate a monthly climatology.
- Learn how to calculate various statistical measures of epidemiological and climate data in the Data Library, including mean, median, standard deviation, root mean squared error, and range.
- Learn how to calculate spatial averages of gridded climate and environmental data (over districts, etc.) in the Data Library.

Summary:

As a first step to understanding or summarizing a data set of observations, whether of climate or health information, it is often useful to calculate exploratory or descriptive statistics of the data. The IRI Data Library includes functions and options useful for calculating and displaying such statistics. This session presented fundamentals of using Expert Mode in the Data Library and practical exercises to calculate measures of central tendency and spread and spatial averages of gridded data.

Recommended reading:

- Statistical Techniques in the Data Library: A Tutorial: http://iridl.ldeo.columbia.edu/dochelp/StatTutorial/

Module II: Sources and Tools for Analyzing Climate and Public Health Data

Day Three: Wednesday May 19 2011

Climate and Vector-Borne Diseases Dynamics, by Madeleine Thomson, IRI

Instructional Goal:

- Introduce some basic concepts of the dynamics of transmission of vector-borne diseases and their relationship with climatic factors.

Learning Objectives:

- Understand the means by which climate impacts on vector abundance, species distribution, physiology, synchrony and relationships with hosts and the transmission dynamics of vector-borne diseases.
- Understand how climate information can be utilized not only in the spatial and temporal mapping of vectors and vector-borne diseases, but also in the design and evaluation of short-term and long-term disease control programs.

Summary:

Vector-borne diseases present serious problems to human health and welfare around the world, especially in tropical and subtropical regions. According to recent reports of the World Health Organization nearly half of the world's human population is affected by vector-borne diseases; with malaria, schistosomiasis, onchocerciasis and leishmaniasis infecting 270, 200, 90, 18 and 12 million people, respectively.

The role of climate in the transmission dynamics of vector-borne diseases in the context of replication of disease agents in their vectors and breeding, survival, distribution, abundance and longevity of vectors was discussed. Due attention was also given to the impact of climate change on the pattern of disease transmission and the geographical distribution of some diseases.

Recommended reading:

- Gage KL, Burkot TR, Eisen RJ, Hayes EB. Climate and vectorborne diseases. American journal of preventive medicine 2008; 35(5):436-450.

Malaria Vector Distribution and Rainfall, by Judy Omumbo, IRI

Instructional Goal:

- Be able to describe possible associations between disease distribution and environmental factors as seen on maps.

Learning Objectives:

- Use observational skills and prior knowledge of mosquito vector behavior and rainfall distribution and variability to make a decision on the most appropriate control intervention.

Summary:

Public health practitioners must make decisions based on quick assessments relying on limited information. This exercise used a map tool to spatially describe the distribution of malaria vectors, enabling decision making on what would work best. Key determinants of Anopheles mosquito distribution (the malaria vector) are their feeding, resting and habitat preferences, classifying them *anthropophilic*, *exophilic*, *endophilic or zoophilic*.

Some studies have shown that where there are cattle around a homestead and malaria vectors are predominantly zoophilic, the human population tends to have less malaria infection. Most mosquitoes prefer to breed in stagnant fresh water but there are a few species that are salt water breeders. These behavior traits, however, are not absolute and a zoophilic vector may feed on humans if animal hosts are not readily available. The behavioral differences displayed by malaria vectors are exploited for targeting interventions for controlling malaria.

Recommended reading:

- Coetzee M, Craig M, Le Sueur D. Distribution of African malaria mosquitoes belonging to the Anopheles gambiae complex. Parasitology today 2000; 16(2):74-77.

Principles of Trends and Time Series Analysis, by Andrew W. Robertson, IRI

Instructional Goal:

- Learn simple techniques for exploratory analysis of univariate time series of climate and health data.

Learning Objectives:

- Understand the nature of climate variability on daily to interannual time scales in terms of rainfall and temperature at a particular location.
- Learn how simple averaging and time-series plots can be used to separate different time scales of variability, namely weather variability, seasonal cycle, interannual variability, interdecadal variability and long-term trends.
- Learn how to identify the direction and strength of a long-term trend in a time series, evaluate the probability that a trend in a data set occurred only by chance, and learn two methods to remove a trend in a data set.
- Learn how several time series can be used in conjunction to identify and quantify associations between them.

Summary:

Climate and epidemiological data are often recorded as time series of a measurement at some location. Historical records of weather data have lead to much of our understanding of weather and climate, in terms of daily weather fluctuations, seasonality, interannual "climate" variations, and longer term trends. Epidemiological time-series data may show similar and contrasting features, and exploratory analysis of (univariate) time series forms the starting point for more complex statistical analysis, to identify associations between health and climate data, for example.

The lecture illustrated simple exploratory analyses of univariate time series, including how time-averaging can be used to *separate* different aspects of a climate time series, such as weather, the seasonal cycle, interannual variability, and longer-term variability and trends. Differing characteristics of temperature, rainfall, and malaria count data using an example from Colombia were illustrated, the implications for defining "normal" and "unusual" features in time series were considered and associations between climate and epidemiological data were identified.

Recommended readings:

- Tian L, Bi Y, Ho SC, Liu W, Liang S, Goggins WB, et al. One-year delayed effect of fog on malaria transmission: a time-series analysis in the rain forest area of Mengla County, south-west China. Malaria Journal 2008;7(1):110.
- Briët OJT, Vounatsou P, Gunawardena DM, Galappaththy GNL, Amerasinghe PH. Temporal correlation between malaria and rainfall in Sri Lanka. Malaria Journal 2008; 7(1):77.

Malaria Mapping and the Climate Suitability for Malaria Transmission Tool in the Health Map Room, by Judy Omumbo, IRI

Instructional Goal:

- Understand the utility of climate information for dynamic disease mapping.

Learning Objectives:

- To be able to navigate the Climate Suitability for Malaria Transmission tool, a clickable map interface that describes where, when and for how long the combination of climatic conditions (rainfall, temperature and humidity) may be suitable for malaria transmission on the African continent.
- Understand and be able to review the tool's graph, table and map outputs, including for intervention targeting (when and where to administer interventions) and impact evaluation.

- Discuss the importance of considering climate variability and unusual climate events when selecting a baseline year for assessing the impact of interventions against malaria.

Summary:

Disease maps are an important epidemiological tool for understanding the variability of disease distribution in time and in space, which is in part determined by climate. Maps of the suitability of climatic conditions for malaria transmission in a region have been applied widely in areas where empirical disease data are sparse, including for malaria control programs. The development of the malaria parasite and the mosquito vectors is sensitive to temperature, rainfall and humidity. Rainfall plays an important role in the distribution and maintenance of vector breeding sites. Temperature regulates the development rate of both the mosquito larvae and the malaria parasite, *Plasmodium falciparum*, within the mosquito. Relative humidity and temperature play an important role in the survival and longevity of the mosquito. Using historical data under laboratory conditions, Climate Suitability for Malaria Transmission is defined as the coincidence of precipitation accumulation greater than 80 mm, mean temperature between 18°C and 32°C, and relative humidity greater than 60 percent.

Recommended readings:

- Craig MH, Snow RW, Le Sueur D. A climate-based distribution model of malaria transmission in sub-Saharan Africa. Parasitology today 1999;15(3):105-110.
- Grover-Kopec EK, Blumenthal MB, Ceccato P, Dinku T, Omumbo JA, Connor SJ. Web-based climate information resources for malaria control in Africa. Malaria Journal 2006;5(1):38.

The IFRC-IRI Partnership to Save Lives, by Ashley Curtis, IRI

Instructional Goal:

- An understanding of how climate and weather information can inform humanitarian decision-making.

Learning Objectives:

- An understanding of the potentially useful weather and climate information available at a range of timescales and spatial scales.

- Gaining experience critically evaluating the range of possible tailored climate services and how this information can translate into specific actions for disaster risk management.

Summary:

Weather and climate-related natural disasters are increasing worldwide. However these types of threats can now be better anticipated than ever before using weather and climate information available on a wide range of time scales. The IFRC-IRI Partnership demonstrates the value of tailored climate services for humanitarian decision-making through the "early warning, early action" framework. One key component of this partnership is the IFRC Maproom, which provides tailored global forecast products answering specific questions of interest to disaster managers. In this lecture, participants explored the IFRC Maproom independently, focusing on regions or countries of interest to them. This was followed by a group discussion of how tailored climate service products of this kind could be best adapted for use by the public health community.

Recommended readings:

- International Federation of Red Cross and Red Crescent Societies. Early Warning/ early Action Handbook. 2008.
- International Federation of Red Cross and Red Crescent Societies. Pacific La Nina Case Study. 2010.

Posters are meant to be read! How to design research posters that draw people in, by Francesco Fiondella & Jason Rodriguez, IRI

Instructional Goal:

- Discuss simple ways to help design scientific posters that are easy-to-read, attractive and communicate research effectively.

Learning Objectives:

- To understand what research posters are and why they are important.
- To learn how to make your poster stand out from the crowd.
- To know the main sections of a poster.

- To become familiar with examples of bad poster design.
- To learn elements of good poster design, with examples.

Summary:

Research posters are a "tool of the trade" for most scientists, so why is that we find such a large percentage to be incomprehensible? Instead of drawing people in, many repel. Instead of informing, many leave readers confused, perhaps even downright irritated at having to read such a small font size and make sense of incredibly dense charts. Think of a poster as a giant business card. It will be seen by many people --some who know your specialty, others who don't. When done well, posters can be incredibly powerful tools of communication about your work and the questions you're trying to answer. But they first need to stand out from the crowd, or at least seem inviting. They also need to be as clearly written, with compelling images and convincing charts.

Day Four: Thursday May 20 2011

Remote Sensing as a Tool to Manage Environmental Data, by Pietro Ceccato, IRI

Instructional Goal:

- Introduce the concepts of remote sensing and provide information on how to retrieve environmental factors using remotely-sensed products.

Learning Objectives:

- Understand remote sensing as a tool to monitor environmental data.
- Know the remote sensing products available to monitor the environment.
- Understand the methodology to retrieve:
    - Rainfall
    - Air Temperature
    - Vegetation
    - Water bodies
- Learn how to use the Map Room to:
    - Visualize data on rainfall, temperature, vegetation and water bodies
    - Extract time series
    - Extract anomalies
    - Download data

- Download images
- Integrate images into ArcView®

Summary:

Remote sensing is the science of obtaining information about an object through the analysis of data acquired by a device (sensor) that is not in contact with the object (remote). As you read these words, you are employing remote sensing. Your eyes are acting as sensors which analyze the electromagnetic waves (visible light) reflected from this page. The light your eyes acquire is analyzed in your mental computer to enable you to explain the words. Apart from the eyes, more sophisticated sensors have been developed to measure the electromagnetic waves in domains outside the visible. By measuring the electromagnetic waves in domains from Gamma rays to Microwaves, we can retrieve information on objects we want to study.

Recommended readings:

- Ceccato P, Dinku T. IRI Technical Report 10-04 Introduction to Remote Sensing for monitoring rainfall, temperature, vegetation and water bodies.
- Ceccato P, Connor SJ, Jeanne I, Thomson MC. Application of Geographical Information Systems and Remote Sensing technologies for assessing and monitoring malaria risk. Parassitologia 2005; 47(1):81-96.

Introduction to Cluster Analysis, by Andrew Robertson, IRI

Instructional Goal:

- Learn how cluster analysis works as a method to identify patterns in multivariate data.

Learning Objectives:

- Understand what cluster analysis is.
- Learn how the K-means method works.
- Learn how to implement K-means, including how to choose the appropriate number of clusters, and how to interpret the results.

Summary:

In multivariate data analysis, identifying any shared behavior between locations or variables is a key simplifying step. This lecture showed how such data can be stratified into groups using cluster analysis, in order to identify patterns, and to facilitate the identification of associations between climate and health data.

Participants learned how the K-means method partitions a set of observations into sub-groups, based on their similarity according to a measure of the "distance" between them, and so as to minimize the scatter within each cluster. Examples included July temperatures at US cities, and malaria data gathered for Eritrea. The following questions were addressed: Do the patterns identified by cluster analysis always correspond to "real" underlying processes, or could they result from random data? When is cluster analysis a good choice for analyzing health and climate data?

Recommended readings:

- Ceccato P, Ghebremeskel T, Jaiteh M, Graves PM, Levy M, Ghebreselassie S, et al. Malaria stratification, climate, and epidemic early warning in Eritrea. The American journal of tropical medicine and hygiene 2007; 77(6 Suppl):61.
- Wikipedia: http://en.wikipedia.org/wiki/K-means_clustering

Remote Sensing Tools in the Health Map Room, by Pietro Ceccato, IRI

Refer to: Day Four, Remote Sensing as a Tool to Manage Environmental Data, by Pietro Ceccato, IRI.

Day Five: Friday May 21 2011

Using GPS, GIS and Google Maps for Public Health, by Mark Becker, CIESIN

Instructional Goal:

- Learn how the GPS System works and how to use the system for collecting data and use these data for mapping in a GIS system or in Google Maps.

Learning Objectives:

- Learn the underlying fundamentals of how the GPS system works and how to collect data using a popular Garmin GPS receiver.
- Learn the basic steps involved in planning out a GPS data collection survey and tips and tricks on how to collect the most accurate data possible.

Summary:

GPS is an increasingly popular way of collecting location information related to health studies. With GPS we can easily create highly accurate spatial data files to indicate the location of health clinics, schools, transportation routes and patient's home locations or village location. In this exercise, participants learnt the proper use of a standard GPS data collection unit and gained an understanding of procedures to insure data accuracy and integrity. Students also learned which tools are available for downloading their GPS data and converting it into formats accepted by, Google Earth®/Google Maps® and ArcGIS®.

Recommended readings:

- Montana L, Spencer J. Incorporating Geographic Information into MEASURE Surveys: A Field Guide to GPS Data Collection and Demographic and Health Survey GPS Cluster Position Form. Calverton; 2005.

Using GIS to Exploring the Links between Poverty and Natural Hazards, by Mark Becker, IRI

Instructional Goal:

- Explore how to use GIS to analyze and quantify the relationship between a population's level of poverty and their exposure to natural hazards.

Learning Objectives:

- Use ArcGIS® to learn basic spatial analysis techniques of overlays and intersections to create tables, charts and maps showing the ratio of people living in extreme poverty and their relative exposure to natural hazards.

Summary:

This hands-on GIS laboratory exercise taught participants to use the analysis tools in ArcGIS® to explore the relationship of poverty levels and exposure to natural hazards. Participants became familiar with the primary spatial data sets used to illustrate poverty and natural hazards across the globe. Participants produced a series of final products including maps and charts to show the results of their analysis.

Recommended readings:

- Warner K, Erhart C, de Sherbinin A, Adamo SB, Chai-Onn TC. "In search of Shelter: Mapping the effects of climate change on human migration and displacement." A policy paper prepared for the 2009 Climate Negotiations. Bonn: United Nations University Institute for Environment and Human Security, CARE International, and Center for International Earth Science Information Network at the Earth Institute of Columbia University; 2009.

Module III: Use of Climate Information in Decision-Making for Climate-Sensitive Diseases

Day Six: Monday May 23 2011

Understanding Predictions and Projections in Climate, by Sylwia Trzaska, IRI

Instructional Goal:

- Provide the participants with an understanding of the rationale behind different types of predictions and projections with an emphasis on the interpretation and limitations of the available information.

Learning Objectives:

- Understand predictions and climate projections with an emphasis on the interpretation and limitations of the available information.
- Introduce participants to the ensemble technique and probabilistic approach to climate prediction as well as the downscaling and verification procedures.

Summary:

Climate forecasts or projections are often misinterpreted due to their probabilistic format, often omitted in sectoral applications. There is of more and more interest in health impact of the future climate so it is important that the current generation of public health professionals understand what the projections can or cannot tell us. This lecture was aimed at explaining why forecasts/projections can only be produced in a probabilistic format, which, in fact, attempts to quantify the uncertainty attached to the forecast output. Sources of uncertainty as well as the main forecasting methods were presented. Some time was devoted to a practical interpretation of two examples of forecasts: the seasonal forecast and the climate change scenario. An important element for the decision process, forecast verification, was also briefly introduced.

Recommended readings:

- IRI Tutorials on forecasting

http://iri.columbia.edu/climate/forecast/tutorial

http://iri.columbia.edu/climate/forecast/tutorial2

- IPCC 4th Assessment: Introduction to regional projections in chapter 11

http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch11s11-1-2.html

- IPCC FAQs:

http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faqs.html

Linking ENSO and Society, by Tony Barnston, IRI

Instructional Goal:

- Gain an appreciation of the relevance of ENSO to human activities and welfare.

Learning Objectives:

- Understand how El Nino and La Nina affect climate throughout the world.
- Understand how an ENSO-modified seasonal climate can affect society.

Summary:

ENSO (La Niña and El Niño) refers to the year-to-year variation of sea surface temperature in the central and eastern tropical Pacific relative to its long-term average. The state of ENSO is important because it is known to influence the climate throughout various parts of the world, depending on the season, making possible advance warning of above or below average precipitation and/or temperature. Such variations of seasonal climate, in turn, may affect society in many ways. Some of these impacts are obvious, such as a negative impact of below-average rainfall on agricultural yield and on water reservoirs, or of above-average rainfall on malaria incidence in regions of epidemic malaria. Other impacts may be positive, such as reduction in heating requirements for extra tropical regions having a warmer-than-normal winter related to the ENSO state. In this lecture, these and other ways in which ENSO matters to human society and how its effects can be anticipated and managed—both to minimize negative effects and exploit positive ones, were discussed.

Recommended readings:

- McPhaden MJ, Zebiak SE, Glantz MH. ENSO as an integrating concept in earth science. Science 2006; 314(5806):1740.
- Thomson MC, Mason SJ, Phindela T, Connor SJ. Use of rainfall and sea surface temperature monitoring for malaria early warning in Botswana. The American journal of tropical medicine and hygiene 2005; 73(1):214.

Climate Change and Human Health: Current Impacts and Future Risks, by Patrick Kinney, Mailman School of Public Health

Instructional Goal:

- Appreciate the multiple ways in which climate change could adversely affect public health.

Learning Objectives:

- Gain a basic understanding of public health impacts of climate change.
- To be aware of the range of health outcomes likely to be influenced by climate change.
- Appreciate the ways in which scientific knowledge of climate/health associations are determined.
- Confront the challenges of projecting future health impacts of climate change.

Summary:

One of today's greatest public health challenges is to enhance population health in the face of emerging risks related to climate change. Scientists predict that climate change may lead to:

- Increasing heat-related deaths;
- Diverse health impacts of more intense storms and flood events;
- Risks to water quality, agricultural productivity, and regional peace due to shifting water resources;
- Worsening air quality and asthma;
- Changing patterns of vector-borne and other infectious diseases.

However, the scientific knowledge base upon which to build strategies to reduce health impacts of climate change is surprisingly sparse. By partnering with climate scientists, health scientists have the ability to make significant scientific advances to understand, anticipate, and prevent adverse health consequences. This lecture provided an introduction to this topic and discussed challenges and opportunities for new research.

Recommended readings:

- Pan American Health Organization. Climate change and human health: risk and responses: revised summary 2008. Washington DC; 2008.

Climate Prediction for Skeptics, by Simon Mason, IRI

Instructional Goal:

- An understanding of why it is theoretically possible to forecast beyond the limit at which weather forecasts become useless.

Learning Objectives:

- An understanding of why the weather cannot be predicted beyond a few days, but climate can be.
- Gaining of practical experience in making seasonal forecasts of climate and of malaria.

Summary:

In order to predict the weather we need to know (a) what the weather is like now and (b) how the current weather is likely to evolve. Our lack of knowledge of the exact weather conditions right now is the primary reason why weather forecasts become inaccurate after only a few days, because small errors in that knowledge rapidly grow into large errors in the predicted weather. Although it is impossible to forecast the exact weather at any given moment beyond a few days into the future, it is possible to predict whether wet or dry conditions, for example, are likely to be unusually frequent and/or intense. These predictions are possible at seasonal scales because in some parts of the world, and at some times of the year, the atmosphere can be affected by unusual conditions at the earth's surface, especially the surface of the sea.

Recommended readings:

- Mason SJ. "Flowering Walnuts in the Wood" and Other Bases for Seasonal Climate Forecasting. In: Thomson MC, Garcia Herrera R, Beniston M, editors. Seasonal Forecasts, Climatic Change and Human Health: Springer Netherlands; 2008. p. 13-29.

Day Seven: Tuesday May 24 2011

Climate Change, War and Disease, by Dia El Naiem, University of Maryland

Instructional Goal:

- Discuss the eco-epidemiology of Visceral Leishmaniasis in Sudan in relation to climate change and the possible impact of drought and civil War in Darfur on Recent Epidemics of kala azar in eastern Sudan.

Learning Objectives:

- Be introduced to the basic environmental factors affecting the epidemiology of kala azar in Sudan and other areas in East Africa.
- Understand how GIS and environmental mapping can help in risk-mapping and control of leishmaniasis.
- Understand how Sahelian drought and Darfur War have surprisingly influenced kala azar epidemiology in areas that are located far away from the conflict zone.

Summary:

The epidemiology of vector-borne diseases is influenced by climatic factors that affect the ecology of the vectors and the exposure of human populations to the pathogens. This lecture addressed the eco-epidemiology of visceral leishmaniasis (VL, kala azar), a neglected tropical disease that occurs within a defined climate space and affects some of the poorest communities in the world. One of the notable features of the epidemiology of kala azar in East Africa is that it remains silent for many years and then erupts in severe epidemics that affect the lives of thousands of people. Although environmental information models allowed the prediction of the transmission areas of the VL in Sudan, studies have overlooked the importance of climate-related socioeconomic factors that lead to Darfur War and migration of susceptible populations into kala azar transmission foci. Discussion included possible effects of these factors on the future epidemiology of the disease.

Recommended readings:

- Elnaiem DA, Schorscher J, Bendall A, Obsomer V, Osman ME, Mekkawi AM, et al. Risk mapping of visceral leishmaniasis: the role of local variation in rainfall and altitude on the presence and incidence of kala-azar in eastern Sudan. The American journal of tropical medicine and hygiene 2003; 68(1):10.
- Thomson MC, Elnaiem DA, Ashford RW, Connor SJ. Towards a kala azar risk map for Sudan: mapping the potential distribution of Phlebotomus orientalis using digital data of environmental variables. Tropical medicine and international health 1999; 4(2):105-113.

Malaria Early Warning and Early Response, by Madeleine Thomson, IRI

Instructional Goal:

- Provide an overview of the rationale, development, and testing of MEWS.

Learning Objectives:

- Understand why climate information needs to be coupled with health information to inform public health decisions.
- Illustrate how climate/ weather information could be used in malaria early warning and early response systems as a typical example to climate-sensitive diseases of public health significance

Summary:

Climate informed Malaria Early Warning Systems (MEWS) have been of interest for many years – at least since the beginning of the 20th century. The rationale behind MEWS is simply the pursuit of reliable and timely information on any changes in epidemic potential occurring that may be taking place. The information needs to be focal, i.e. applicable to specific geographic regions prone to epidemics; and timely, i.e. able to offer sufficient lead time for health services to be able to mobilize effective prevention and control interventions.

The integrated Malaria Early Warning and Response System (MEWS) approach developed since the inception of Roll Back Malaria in 1998 aims to assemble a set of available indicators from the spectrum between these two extremes, and to use these indicators to build up incremental evidence to stimulate and guide more timely and focal prevention and control of malaria epidemics.

Recommended readings:

- Thomson MC, Doblas-Reyes FJ, Mason SJ, Hagedorn R, Connor SJ, Phindela T, et al. Malaria early warnings based on seasonal climate forecasts from multi-model ensembles. Nature 2006; 439(7076):576-579.
- DaSilva J, Garanganga B, Teveredzi V, Marx SM, Mason SJ, Connor SJ. Improving epidemic malaria planning, preparedness and response in Southern Africa. Malaria Journal 2004; 3(1):37.

Spatio-temporal modeling of climate-sensitive disease risk: towards an early warning system for dengue in Brazil, by Rachel Lowe, the Abdus Salam International Centre for Theoretical Physics (ICTP)

Instructional Goal:

- Demonstrate how statistical methodologies for spatio-temporal data can be applied to model climate-sensitive disease risk.

Learning Objectives:

- Analyze and visualize spatio-temporal data and model results.
- Evaluate predictive validity of probabilistic forecasts.

Summary:

Many epidemiological studies have demonstrated statistically significant associations between disease incidence and climate variations. To establish how much variation in disease risk can be attributed to climatic conditions, non-climatic confounding factors should also be considered in the model parameterization to avoid reporting misleading climate-disease associations. Other important areas of investigation for modeling climate-sensitive disease risk and evaluating predictive results include:

- Choice of probability distribution in statistical models for count data.
- Consideration and modeling of overdispersion, typically found in disease data.
- Validation of predictive models using out-of-sample data.
- Evaluation of a models ability to correctly predict epidemics/produce false alarms.

Using data for dengue fever in Brazil, this lecture introduced a spatio-temporal modeling framework to help address some of these issues.

Recommended readings:

- Lowe, R., Bailey, T. C., Stephenson, D. B., Graham, R. J., Coelho, C. A. S., Carvalho, M. S., Barcellos, C., 2011. Spatio-temporal modelling of climate-sensitive disease risk: Towards an early warning system for dengue in Brazil. Computers & Geosciences 37, 371-381.

Epidemic Detection and Monitoring using Thresholds, by Patricia Graves, the Carter Center

Instructional Goal:

- Define a malaria epidemic and determine when one has occurred.

Learning Objectives:

- Define a malaria epidemic for situations of different endemicity.
- Understand the need to define epidemics in relation to known areas and time periods.
- Understand the need for sufficient past data on malaria cases in order to detect and define epidemics, and the influence of 'base years' chosen on the resulting epidemic threshold.
- Understand the concept of epidemic threshold as defined by various methods (third quartile, mean plus 2 standard deviations, moving average etc) and the implications for each method on the sensitivity and specificity of epidemic definitions and for early detection of epidemics.

- Estimate the monthly epidemic threshold by different cutoffs using example data from sub-zobas (districts) of Eritrea or elsewhere.
- Quantify the number of epidemics occurring in particular districts and months in Eritrea during the period 1996 to 2003.

Summary:

Detailed empirical data on malaria cases in space and time is needed in order to define the normal situation of malaria in a given area and to define epidemics. The geographical units used in the definition should correspond to planning units to facilitate response and prevention. In this practical, examples of malaria epidemics were illustrated with reference to a dataset of cases by subzone and month from Eritrea, 1997 to 2003. Several different proposed methods for estimating malaria epidemic thresholds were given, including third quartile, the mean plus 1 or 2 standard deviations, the moving average and the C-Sum method. It was emphasized that an epidemic definition is a practical and planning decision, with no objective standard. The participants produced graphs that illustrated the different thresholds estimated for particular subzones and quantified epidemics that occurred in particular time periods as an indicator of malaria control or for relating to climate factors.

Recommended readings:

- Hay SI, Simba M, Busolo M, Noor AM, Guyatt HL, Ochola SA, et al. Defining and detecting malaria epidemics in the highlands of western Kenya. Emerging Infectious Diseases 2002; 8(6):555-562.
- Cullen JR, Chitprarop U, Doberstyn EB, Sombatwattanangkul K: An epidemiological early warning system for malaria control in northern Thailand. Bull World Health Organ 1984, 62:107-114.

Day Eight: Wednesday May 25 2011

Temperature Trends in the Highlands of Kenya, by Bradfield Lyon, IRI

Instructional Goal:

- Understand the limitations of climatological data sets before performing data analysis.

Learning Objectives:

- Understand the source and intended use of climate data in order to avoid placing an excessive burden on these data when conducting analyses.
- Provide examples of regional variations in climate variability and trends.
- Understand the importance of data quality control.
- Gain an appreciation of some of the challenges in assessing temporal trends.

Summary:

Several studies have considered the impact of climate change, and temperature in particular, on the distribution and incidence of malaria in the highland regions of East Africa. The results, however, often led to different conclusions. This was in part related to the fact that they typically used different climate datasets which were either interpolated analyses based on station observations or an insufficient set of station observations, or length of record, for the specific areas of interest.

It is indeed a critical issue to understand the climate (or health) data being used in any study, including limitations in using such data before conducting any analysis. This includes the issue of data quality but also using the appropriate time scale of information (e.g., daily versus monthly rainfall data) for the health question being considered. One needs to take into account the caveats to using gridded data derived from point observations, for example, to avoid drawing potentially inappropriate conclusions from the analysis. Indeed, any analysis should begin with a simple, exploratory step that can subsequently be followed by more sophisticated methods. It is recommended that when undertaking interdisciplinary studies, experts from across disciplines are involved to help minimize misinterpretation of the datasets being used.

This lecture illustrated these points through considering the analysis of the relation between malaria and temperature in the highlands of Kenya.

Recommended readings:

- Hay SI, Cox J, Rogers DJ, Randolph SE, Stern DI, Shanks GD, et al. Climate change and the resurgence of malaria in the East African highlands. Nature 2002; 415(6874):905-909.

- Omumbo, J., B. Lyon, S. Waweru, S. Connor, and M. Thomson: Raised temperatures over the Kericho tea estates: revisiting the climate in the East African highlands malaria debate. Malaria Journal, 10 (1), 12 pp, doi: 10.1186/1475-2875-10-12.

Meningitis and the Environment: Meningitis Environmental Risk Information Technologies (MERIT), by Hugonnet, Stéphane Alexandre Hugonnet, WHO

Instructional Goal:

- Introduce participants to the potential for climate information to play a role in the prevention and control of meningococcal meningitis in the Sahel.

Learning Objectives:

- Introduce meningococcal meningitis and current and future control strategies.
- Present the historical evidence re the role of climate and other factors in epidemic occurrence.
- Present current questions that remain to be answered and the rationale for the MERIT consortium.

Summary:

Meningococcal meningitis is an environmental disease whose spatial and seasonal distribution is readily described by climatic and environmental characteristics. Epidemics of meningococcal meningitis occur throughout sub-Saharan Africa, most frequently in an area, known as the ‘Meningitis Belt’ that stretches from the Sahelian zone of West Africa to the Horn of Africa. This region is a major source of atmospheric dust over most of north and western Africa and has epidemics and seasonal upsurges in endemic disease in the latter part of the dry season, characterized between November and May by low absolute humidity and the dust-laden Harmattan trade winds. Given the association of the epidemics with a dry and dusty environment and their higher incidence in the ‘Meningitis Belt’, recent research has focused on developing maps that identify the populations at high risk of epidemics and climate-driven early warning systems that could provide longer lead-times for initiating response. The relevance of this work to the implementation of current and future epidemic meningitis control strategies in Africa was discussed.

Recommended readings:

- Cuevas LE, Jeanne I, Molesworth A, Bell M, Savory EC, Connor SJ, et al. Risk mapping and early warning systems for the control of meningitis in Africa. Vaccine 2007; 25: A12-A17.
- Roberts L. Infectious disease: an ill wind, bringing meningitis. Science 2008; 320(5884):1710-1715.

Additional resources:

- Video: The International Research Institute for Climate and Society at the Earth Institute CU. Climate and Health in Africa. Google Tour;2009. Available from : http://www.google.com/landing/cop15/
- Web link: Visit the Web-page of the MERIT initiative http://Merit.hc-foundation.org

Malaria dynamical models and integrated surveillance and control systems, by Daniel Ruiz Carrascal, IRI

Instructional Goal:

- To understand the role dynamical models play in the understanding of malaria complexity and in the general context of Malaria Integrated Surveillance and Control Systems.

Learning Objectives:

- To highlight the importance of conceptual models in the context of environmental health and public health.
- To understand the structure of malaria dynamical models.
- To explore the role dynamical models play in malaria risk assessments, control and interventions.
- To implement a dynamical model for exploring how climatic and non-climatic factors could drive fluctuations and trends in malaria incidence.
- To compare the simulation outputs of a mathematical model to an actual malaria morbidity profile.

Summary:

Dynamical models have played a significant role in understanding the complexity of malaria transmission dynamics. In this conceptual and practical talk participants were taught to understand the structure of several malaria process-based models and explore their importance in the general context of environmental health and public health. Tools were also introduced to: (a) explore the role that both climatic and non-climatic factors play in fluctuations and trends in malaria incidence; (b) compare their simulation outputs with actual malaria morbidity profiles observed in a specific malaria-prone region; (c) simulate the impact of intervention campaigns; and (d) assess several changing climate and future scenarios. Finally, the ongoing efforts of the Colombian Integrated Surveillance and Control System project were discussed.

Recommended readings:

- Ruiz D, Connor SJ, Thomson MC. A Multimodel Framework in Support of Malaria Surveillance and Control. In: Thomson MC, Garcia Herrera R, Beniston M, editors. Seasonal Forecasts, Climatic Change, and Human Health: Springer Netherlands; 2008. p. 101-125.

Exercises on K-means and Cluster Analysis: Malaria Seasonality, by Pietro Ceccato, IRI

Instructional Goal:

- Apply the concepts of clustering learned during Andy Robertson's lecture using two case studies (Eritrea and Madagascar) to understand clustering analysis and its implication for decision-making.

Learning Objectives:

- Analyze malaria patterns in Eritrea and Madagascar.
- Cluster malaria data collected at district levels over a long time period.
- Understand the spatial and temporal distribution of malaria in Eritrea and Madagascar in order to: 1) take decisions about control strategies and 2) understand the relationship between malaria and environmental factors.

Summary:

Cluster analysis or clustering is the assignment of objects into groups (called clusters) so that objects from the same cluster are more similar to each other than objects from different clusters. Often similarity is assessed according to a distance measure. Clustering is a common technique for statistical data analysis, which is used in many fields, including machine learning, data mining, pattern recognition, image analysis and bioinformatics.

Day Nine: Thursday May 26 2011

Climate Change and Human Health US Perspective, by John Balbus, NIH

Instructional Goal:

- Describe activities of the US federal government to address the public health implications of climate change.

Learning Objectives:

- Describe current health impacts associated with climate variability and change in the United States and likely future scenarios.
- Describe the role of the US Global Change Research Program and other federal activities in addressing the health implications of climate change.

Summary:

Increasingly severe heat waves and wildfires are causing morbidity and mortality in the United States, while populations in a warming Arctic region are experiencing population displacement and changes to their way of life. These problems are anticipated to worsen over coming decades as climate change progresses; some populations may also face higher risks of infectious diseases.

As part of a broader effort to increase focus on meeting societal needs, the United States Global Change Research Program (GCRP) chartered a new Interagency Workgroup on Climate Change and Human Health in December 2009. The public health community is viewed as a potential model for developing an "end-to-end" approach to the provision of scientific information. This presentation reviewed federal initiatives on climate change and human health and discussed potential ways for academic institutions to provide input and collaborate with federal partners.

Recommended readings:

- U.S. Global Research Program: http://www.globalchange.gov/

Heat Waves in the USA from the Climate Perspective, by Bradfield Lyon, IRI

Instructional Goal:

- Gain an increased awareness of some important characteristics of heat waves from a climate perspective.

Learning Objectives:

- Provide a general overview of the large-scale view of heat waves.
- Emphasize the local-scale aspects of heat waves, including examples of behavior in a warming climate.

Summary:

Reasons for studying heat waves were briefly discussed followed by some of the difficulties in defining a heat wave. The concept of a heat index was then introduced. The 1995 heat wave in the US was considered by examining the large-scale atmospheric circulation associated with the heat wave as well as important local-scale features of the heat wave using Chicago as an example. The final segment of the lecture briefly examined how all warming is not "equal" when considering climate change.

Recommended readings:

- Kunkel KE, Changnon SA, Reinke BC, Arritt RW. The July 1995 heat wave in the Midwest: A climatic perspective and critical weather factors. Bulletin of the American Meteorological Society 1996; 77(7):1507-1518.
- Lebassi B, González J, Fabris D, Maurer E, Miller N, Milesi C, et al. Observed 1970–2005 Cooling of Summer Daytime Temperatures in Coastal California. Journal of Climate 2009; 22:13.

Heat Waves and Public Health: a USA Case-Study, by Kim Knowlton, Natural Resources Defense Council, and Department of Environmental Health Sciences, Mailman School of Public Health

Instructional Goal:

- Discuss the effects of heat waves on public health, and help participants identify potential local strategies for reducing vulnerability to heat waves' harmful health effects.

Learning Objectives:

- Describe heat vulnerability factors- different categories and some specific examples
- Discuss a case study that evaluated morbidity from a US heat wave
- Identify strategies for enhancing heat wave preparedness to help prevent heat-related illness and death.

Summary:

Heat waves have substantial acute effects on local populations. A large heat-mortality literature has evolved over the years, yet few studies of heat morbidity have been done. Recent work suggests that a single heat wave can have widespread effects. A US Case Study of morbidity during a 2006 California heat wave was discussed (Knowlton et al., 2009). Heat vulnerability factors include biomedical, demographic, housing, and community geographic characteristics. We can use this information to identify the most at-risk communities for climate sensitive health outcomes. Climate models project that the frequency, intensity, and duration of heat waves will increase in the future as climate change continues. Climate-health preparedness will be enhanced by developing strategies that identify vulnerabilities, establish tracking systems, apply climate-smart design, and employ public education to protect the most climate-vulnerable among us today, thereby learning how to provide better climate-health protection for all of us in the future.

Recommended readings:

- Knowlton K, Rotkin-Ellman M, King G, Margolis HG, Smith D, Solomon G, et al. The 2006 California heat wave: impacts on hospitalizations and emergency department visits. Environmental health perspectives 2009;117(1):61.
- Harlan SL, Brazel AJ, Prashad L, Stefanov WL, Larsen L. Neighborhood microclimates and vulnerability to heat stress. Social Science & Medicine 2006;63(11):2847-2863.

Day Ten: Friday May 27 2011

Influenza and Climate, by Jeffrey Shaman, Mailman School of Public Health

Instructional Goal:

- Explore how laboratory, epidemiological, statistical and modeling evidence can be used to inform our understanding of the environmental drivers of infectious disease.

Learning Objectives:

- Understand how absolute humidity affects influenza survival, transmission and seasonality.
- Understand the distinction between absolute humidity and relative humidity.
- Understand how model studies can be used to further understand and predict infectious disease transmission.

Summary:

Much of the observed wintertime increase of mortality in temperate regions is attributed to seasonal influenza. In this lecture it was shown through reanalysis of laboratory experiments that absolute humidity strongly modulates the airborne survival and transmission of the influenza virus. This finding is corroborated by epidemiological evidence showing that increased wintertime influenza-related mortality in the United States is associated with anomalously low absolute humidity levels. An epidemiological model was then used; in which observed absolute humidity conditions temper influenza transmission rates, to successfully simulate the seasonal cycle of observed influenza-related mortality. These findings provide epidemiological support for the hypothesis that absolute humidity drives seasonal variations of influenza transmission in temperate regions. Changes in absolute humidity are consistent with the general timing of pandemic influenza outbreaks observed for 2009 A/H1N1 in temperate regions.

Recommended readings:

- Shaman J, Kohn M. Absolute humidity modulates influenza survival, transmission, and seasonality. Proceedings of the National Academy of Sciences 2009;106(9):3243.
- Shaman et al. Absolute Humidity and the Seasonal Onset of Influenza in the Continental United States. PLoS Biology, 2010; 8 (2): e1000316 .

Weather Roulette: How to Make Decisions given Probabilistic Forecasts, by Simon Mason and Ashley Curtis, IRI

Instructional Goal:

- An understanding of how to make decisions given probabilistic forecasts.

Learning Objectives:

- That using probabilistic forecasts will occasionally result in loss-making decisions.
- Gaining of practical experience in making seasonal forecasts of climate and of malaria.

Summary:

A series of ten seasonal forecasts were issued, and the delegates were required to make investment choices based on the forecasts. The forecasts were presented in standard format, with three probabilities indicating the chances of “below-normal”, “normal” and “above-normal” rainfall. The forecasts and observations were drawn from a real operational set of forecasts and observations, but the location and years were not revealed so that the participants could not cheat using any prior knowledge. The participants made profits or losses depending upon the amount invested on the category that occurred. The delegates worked in pairs, and the team that accumulated the largest profit won.

Winners of the Weather Roulette Game: Salua Osorio and Gustavo Almeira.Liza To/Participant

Personal Projects

Guidelines

The following guidelines were provided to the participants about the preparation of a personal project:

It is critical to ensure and capture the opportunity for participants of the Summer Institute to explore their own ideas through the course lectures, seminars, exercises and discussions and to demonstrate their newly acquired competency. Therefore, we would like you to begin, from the beginning of the training, to follow through on a personal project that you decide either individually or in a small group with individuals of both the health and climate communities. We are asking you to define your project and (when applicable) form your working group on the second day of the training and to provide this information to the Summer Institute Team during the first session of the third day of the training.

You will build up your project throughout the entire course, applying what you have learned - using either your own data, when applicable, or some datasets made available to you by the IRI - and linking these results to aspects of your own work or interest. For instance, the projects may explore the relationship between malaria and rainfall in the Kenya Highlands, or between dengue and temperature in Bogota.

We are asking you to develop your project using the results and figures obtained with your data (either personal or provided by the IRI) during the daily practical sessions. A pen drive will be provided to each participant to save these results on a daily basis. Some additional time will also be allocated everyday for you to work on your own projects.

Poster presentations of these projects will be made by the participants on the final day of the course, allowing participants the opportunity to share the learning experience with co-participants, facilitators, distance learners and the climate information for public health network. The poster should include (but not be limited to) the following items:

brief overview of the project's targeted country, objectives, project's targeted audience/users, hypothesis, methods, results, interpretation (including new hypothesis that arose), tables and figures (when applicable). We are also asking you to frame your project in the context of public health decision-making.

These projects will not be graded but they will be used to share with co-participants, facilitators, instructors and distance learners. There will also be a "Best Poster Prize Committee" awarding outstanding poster presentations.

In addition to the poster, participants will need to write up a 300-word summary which would include the following: title, author(s)' name(s), author(s)' affiliation(s), background, objectives, hypothesis and methods, results, interpretation and conclusion. This summary needs to be written on a Word document.

Recommended resources:

The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public, by Debika Shome and Sabine Marx, Center for Research on Environmental Decisions, Columbia University, NY, available from:

http://www.csc.noaa.gov/digitalcoast/inundation/pdf/CRED_Psychology_Climate_Change_Communication.pdf

Advice on Designing Scientific Posters, by Colin Purrington, Department of Biology, Swarthmore College, Pennsylvania, available from:

http://www.swarthmore.edu/NatSci/cpurrin1/posteradvice.htm

Scientific Poster Design, Cornell Center for Materials Research, Cornell University, Ithaca, NY, available from:

http://sciencetalk.posterous.com/toward-a-better-scientific-poster

Project Summaries

The summaries of the participants' projects may be found below. The full poster presentations are available in Appendix 6 and the Poster Prize Evaluation Form can be found in Appendix 7.

Heat Wave Early Warning System in Buenos Aires, Argentina

Gustavo Javier Almeira, National Weather Service, Argentina

Buenos Aires is a major urban agglomeration of the world, with a population of 12 million inhabitants between the city and the metropolitan area and concentrates a third of the total population of Argentina. The mean maximum temperatures in summer are around 29°C. Over the last 10 years the absolute maximum temperature in summer reached 43.3°C and the lowest temperature was -2.1°C. Every summer, citizens endure high temperatures (> 30°C) and heat waves. These heat waves have variable duration, which can go from 2 to 15 consecutive days, and average duration period of 4-7 days. Daily mortality in Buenos Aires city is significantly related to temperature extremes. There is a relationship between temperature and daily mortality in a "U" shape, i.e. the population is susceptible to high temperatures in the summer. In the warm season (December-March) the daily mortality rises with maximum temperatures above 32°C and minimum temperatures above 20°C, defined as heat wave. My goal is to design and develop a Heat Wave EWS in the city of Buenos Aires, to reduce mortality and improve population health. Furthermore, my aim is to discuss the new approach and evaluation of Heat Wave EWS in Buenos Aires, operating in an experimental mode at the National Weather Service.

The ideas I have developed from participating in the 2011 Summer Institute include:
-Redefine heat waves with duration of 48 hours (early warning / false alarms).
-Thorough examination of death certificates during heat waves events (age, sex, address, etc).

-Inclusion of demographic data: identify vulnerable populations using most recent census.
-Strengthen relations with the Ministry of Health and emergency services and obtain emergency dispatch data.
-Include humidity as a variable in an early warning system to predict heat waves.
-Use of MODIS images for the spatial study of heat waves around Buenos Aires.

Yellow Fever risk assessment in Cameroon: Ecological variables

Emily Firth, Global Alert and Response, World Health Organization

Under the Yellow Fever Initiative, a multidisciplinary risk assessment will be conducted in south-west Cameroon in mid-2011. The study will assess yellow fever (YF) viral circulation and epidemic potential and will lead to detailed recommendations regarding a preventive vaccination campaign proposed by the Ministry of Health in Cameroon. Based on the design of recent YF risk assessments conducted in the African region, the SW Cameroon study will for the first time take into consideration a number of ecological variables. This additional component will inform both the planning phase of the study and create a more detailed picture of the underlying environmental and demographic conditions to help interpret the findings.

The primary objective of the YF risk assessment is to survey the human, non-human primate, and mosquito (Aedes aegypti - largely recognized as the major vector of YF virus in Africa) populations to determine the level of YF viral activity within two distinct ecological zones in the area of interest. In order to investigate the ecological variables which influence the disease transmission in SW Cameroon, this project aims to 1) create an interactive large-scale climate suitability map for YF viral circulation in Africa; and 2) provide guidance on accessing high resolution spatial and temporal data specific to the environmental and demographic conditions at each of the sites selected for serosurvey sampling in the study.

A Yellow Fever climate suitability map was developed as an interactive tool in the IRI Data Library, which allows the user to zoom into an area of interest and gain an understanding of the number of months suitable for yellow fever transmission, taking into consideration pre-defined temperature, humidity and rainfall thresholds suitable for the YF virus and mosquito presence. The inclusion of the ecological variables in the risk assessment promises to strengthen the SW Cameroon yellow fever risk assessment. These results will be discussed at an expert consultation organized by WHO later in 2011, during which time the relevance and value of the information put forward here will be discussed in further detail with a view to being used in future risk assessments in the African region.

Hantaviruses in Brazil: Land Use and Land Cover Changes

Mônica de Andrade Morraye, Universidade de Franca

Introduction: The Earth's surface is changing rapidly for natural causes or human-induced such as urban expansion, agricultural intensification, resource extraction, and water resources development that have significant impact upon people, the economy, and resources. Changes can be local, regional, national, and even global in scope. The consequences are often dramatic and widespread; mostly upon pristine areas, which can generate close contacts between human and other living organisms, causing emergent disease. Hantaviruses are zoonotic disease agents responsible for two syndromes: Hemorrhagic Fever with Renal Syndrome endemic in Asia and Europe and Hantavirus Pulmonary Syndrome endemic in Americas. In Brazil, more than 1,000 cases of Hantavirus Pulmonary Syndrome were reported in the last two decades. The aim of the present study was to identify spatial and temporal distribution of Hantavirus infection from 2002 to 2009 in order to understand the role of land use and land cover changes in Brazil.

Methods: The data of hantaviruses cases were obtained from the Brazilian Information System of Diseases Notification (SINAN) and land use and land cover changes, from Brazilian Institute of Geography and Statistics. Graphs and maps were generated using Data Library and TABWIN tools.

Results: From 2002 to 2009, 986 hantaviruses cases were reported in Brazil, according to the notification of probable site of infection confirmed (mortality rate 38%), distributed in 9 states. The prevalence was higher in small municipalities, whose main economic activity is agriculture, which shows that it is a zoonosis mainly related to rural areas. When it occurs in populous counties, the cases tend to be concentrated in the outskirts, near the crops mainly soybeans and sugarcane. The data showed that transmission of hantavirus infection occurs in two types of land use and land cover, one related to agricultural areas with intensive fragmentation of forest areas semi-deciduous or cerrado and another related to deforestation and irregular occupation in the wild environment of the Atlantic Forest.

The Economic Implications of Climate Variation on Dengue in Brazil

Paula Carvalho Pereda, Economics Department, São Paulo University

Dengue fever is the most important vector-borne disease in the Americas. The disease is transmitted by the Aedes aegypti female mosquitoes to humans, which leads to rapid transmission rates of dengue in urban areas. In Brazil, 3 million cases of dengue were notified from 2001-2009, mostly between January and May (warm and wet climate). The aim of this study is to understand the climate variation relationship with dengue incidence, using an economic approach to address the impacts estimation.

The climate factors were chosen based on the specific conditions the mosquitoes need to survive (warm and humid environment). The Generalized Linear Model was chosen to estimate the model, using a Poisson distribution for the dengue cases in Brazil by municipalities for the period from 2000 until 2009 [Lowe et al, 2011]. The climate effects on dengue relative risk were estimated by vulnerable areas in Brazil and the results showed that the effect is stronger for the most vulnerable areas.

The results indicate that climate covariates play a statistically significant role in dengue cases and that is important to account for other factors (poverty measures, urban density, and other regional specificities). The statistical model can be refined by using random/fixed effects estimation and by considering auto-regressive factors. This economical and statistical modeling approach could be useful for decision makers as it provides the information for cost-benefit analysis. For example, different government actions can be compared to address the problem of dengue epidemics in Brazil.

Temporal Distribution of malaria diagnosis in San Jose del Guaviare in Colombia

Salua Osorio-Mrad, Instituto Nacional de Salud, Colombia

Successful malaria vector control depends on landscape conditions and location of the population. The landscape of Colombia is particularly difficult given the variety of ecological systems. An alternative approach is to focus the attention in prompt diagnosis and treatment. This strategy could be improved if the health authorities had information about when the peak malaria season will commence and where, in order to assure the capacity of the health facilities to diagnose malaria in a timely fashion. At the end local health authorities will be able to effectively allocate logistic and financial resources in time and space. On the other hand, given the difficulties about downscaling the location of malaria transmission, health facility could be used as proxy for estimating the local areas where malaria transmission occurs. In this study, malaria data (monthly cases 2008-2010) from the National Surveillance System from Colombia was used. Given the previous evidence about seasonality in malaria transmission, San Jose del Guaviare was the chosen municipality. A cluster analyses was performed using health facility as the spatial unit. Five cluster classes were chosen and the IRI Data Library was use to perform the analysis. Cluster number 1 has some seasonality and follows the pattern of the rainy season in San Jose del Guaviare with a peak in May and October. In the second cluster, the peaks occur three months earlier than the first cluster. Cluster number 3 has some seasonality at the same time of cluster number one. Clusters 4 and 5 have very low cases throughout the year. Health authorities should allocate financial and logistic resources for cluster number 1, 2 and 3 and ensure that the health facilities are well equipped ahead of the peak malaria seasons. The next step is to perform a spatial analysis of to represent the seasonal movement of populations between and within the municipalities in Colombia.

Relation between malaria cases and climate information in Madagascar district of Antsirabe II

Andry Rakotorahalahy, National Malaria Control Program, Madagascar

Madagascar has two types of transmission season for malaria transmission that varies by location and climate. This study concerns the relationship between rainfall, temperature, vegetation NDVI and the number of malaria cases in the district of Antsirabe II. This district is located in the central highlands. The data used in the study are the National Program against Malaria in Madagascar and the data in the IRI Data Library. The method is the use of time series of monthly anomalies of the three parameters (rainfall, temperature and vegetation NDVI). Climatic parameters do not have direct influence on malaria in the district of Antsirabe II because of its altitude and the impact of control strategies implemented by the program against malaria. This study will be conducted in other districts of Madagascar and used to perform modeling for supervision for Madagascar.

Use of sea surface temperature monitoring for dengue early warning in Ecuador

Anna M. Stewart, Department of Environmental and Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY, USA

Dengue fever, a mosquito-borne viral disease, is one of the most important emerging tropical diseases in Ecuador. The objective of this research was to explore the importance of climate as a driver for inter-annual variability in dengue fever in southern coastal Ecuador. I explored the association between annual dengue fever incidence (1993-2010) and (1) anomalies of mean December-January-February (DJF) daily precipitation, min/max/mean air temperature, and relative humidity from a meteorological station and (2) 3 month running mean DJF Pacific sea surface temperature (SST) anomalies in the Nino 3.4 region (Oceanic Nino Index). During El Niño events (positive Pacific SST anomalies), southern coastal Ecuador experiences warmer and wetter conditions, while during La Niña events (negative Pacific SST anomalies), the climate is cooler and drier. Preliminary results indicate that years with an above normal incidence of dengue fever were associated with El Niño events and years with below normal incidence of dengue were associated with La Niña events. Increased rainfall and warmer temperatures increase the availability of breeding sites and the development rate of the dengue mosquito (Aedes aegypti). Due to time lags involved in the climate disease transmission system, monitoring El Niño / La Niña evolution in the Pacific Ocean could provide some predictive lead for forecasting dengue epidemics. This is the first study of dengue fever and climate in this region. This research provides the foundation to develop a climate-driven early warning system for dengue fever in Ecuador.

Climate trend analysis for heat wave warning and emergency dispatch calls in Toronto, Canada

Jennifer K. Vanos, School of Environmental Sciences, University of Guelph, Ontario, Canada

With the resounding threats of climate change and the amplified growth of urban regions, heat waves are anticipated to increase in intensity and frequency. As the most detrimental weather-related killer in the United States, Heat Health Warning Systems (HHWS) using Synoptic Scale Climatology (SSC) have been developed, which quantifies the vital aspects of location and time of year.

The objectives of the current study are as follows: 1) evaluate the 30-year trends in dry tropical (DT) and moist tropical air masses (MT) air masses in the mid-latitude city of Toronto, Canada; 2) assess observed versus predicted emergency calls during an MT++ heat wave in Toronto from Jul 5 – 8, 2010; 3) observe the daily temporal relationship of emergency calls with mean apparent temperature.

Results show positive, yet weak, linear trends in DT and MT extreme heat air masses over the last 30 years. These are also significantly related to urban temperature increase. Comparison of predicted and observed emergency dispatch calls was significant ($r=0.668$), with overestimation on 72% of the days. A strong temporal trend of dispatch calls with mean daily Ta was also found, indicating that additional emergency dispatchers should be available on extreme heat days.

Investing in accurate and advanced HHWSs is essential for emergency preparedness to protect vulnerable populations and save lives. Predicted temperature increase with climate change, plus increased urbanization, will both exacerbate the urban heat island (UHI) effect. Hence, decision makers must focus on both climate change and UHI mitigation to lessen the frequency of such air masses. Effective bioclimatic urban design incorporates natural cooling through parks and trees to block radiant energy, both deemed a vital aspect to diminish urban heat. In the future, providing nationally standardized HHWS can provide more guidance and warning of heat events to the public and health care systems.

Losing Winter -Temperature trend and extremes of Beijing over a 35 year period

Dr Li PENG, Shanghai Meteorological Bureau, Dr Liza TO, Department of Health, Hong Kong

Background: Climate change is closely linked to urban development. Hot days, hot nights and heat waves have become more frequent. Heat has had among the most direct, discernable impacts and receives considerable public attention. Beijing is studied because it is one of the most rapidly growing cities in the world, with population increased by 44% in the past 10 years.

Objective: To study the temperature trends and temperature extremes of Beijing in 35 years from 1971 to 2005.

Method: Daily temperatures of Beijing were available from the IRI Data Library China Meteorological Administration Station ID Beijing 54511. We used 35 years' data from 1 January 1971 to 31 December 2005. In the late 1960s, Beijing meteorological observatory moved to the south suburban. Temperature recordings changed obviously after the movement, so we only analyze data from 1971 to 2005. Daily temperatures from June to August and from December to February were analyzed. Criteria for hot days (exceeding 35/37/40^{o}C) and cold days (below -10^{o}C/-12^{o}C) were based on Beijing's weather warning thresholds. Linear regression was performed with SPSS software for trend analysis.

Results: For the summer months, there are increasing trend of mean maximum and minimum temperature. All trends are statistically significant at 5% level. Long term trend analysis shows that the mean maximum temperature of every summer increases by 0.48^{o}C per decade. Mean minimum temperature of every summer increases by 0.64^{o}C per decade. The trend difference between maximum and minimum temperatures indicates that the diurnal temperature difference is becoming smaller. For the winter months, there is increasing trend of mean maximum temperature. There is rapid increasing trend of mean minimum temperature. Long term trend analysis shows that the mean maximum temperature every winter increases by 0.45^{o}C per decade. Mean minimum temperature every winter increases by 1.01^{o}C per decade.

From 1971 to 2005, the number of hot days with maximum temperatures > 35^{o}C increases obviously at rates of 2.93 days per decade (y = 0.293x -575.793) (significant at 5% level). Hot days are more frequent in the recent years 7 years and they occur mostly in June and July. Year 2000 has the largest number of hot days. From 1971 to 2005, the number of cold days with minimal temperature < -10 and -12^{o}C are decreasing by 8.46 and 3.81 days per decade respectively (y = -0.846x + 1698.768 (below -10^{o}C, significant at 5% levels) (y = -0.381x + 763.962 (below -12^{o}C, significant at 5% levels). In 1977, Beijing experienced the most frequent cold days. Recently in year 2000, weather was very cold. Cold days occur most frequently occur in January.

Conclusion: Temperatures in Beijing are increasing. Winter is affected more than summer. Minimal temperatures are rising with greater speed. Number of hot days is increasing and number of cold days is decreasing significantly.

Discussion: Our weather information is from one single station in Beijing. We cannot compare rural areas with urban areas on urban heat island effect. The location of the weather station was changed in late 1960s and so we have discarded data before 1971. Urban heat island effect may affect the night time minimal temperatures more seriously. Winter temperatures are affected more than summer and may be a result of global warming and urbanization.

Recommendations: We wish that findings of this exercise would inspire further studies on the underlying causes of temperature changes; health impact and vulnerable groups; timing of risk communication programmes; and preparedness of the healthcare system and other emergency responses. We also hope that the findings would reach stakeholders and policy makers for public health planning, response programmes, community education and legislation.

Facilitators and participants during the Poster session. Liza To/ Participant

Course Awards

For the second time since the implementation of the Summer Institute, award prizes were implemented to acknowledge outstanding performances.

As acknowledged by the Poster Prize Committee, the “Best Poster” awards were attributed to (in no particular order): Paula Pereda from the University of São Paulo, Jenifer Vanos from the University of Guelph and Anna Stewart from Syracuse University. The “Best Facilitator,” award was attributed by the participants to Rachel Lowe, from the International Centre for Theoretical Physics. Benno Blumenthal and his Data Library team (Michael Bell, Remi Cousin and John del Corral) received an award for the “Best Team”. The “Best Collaborator” prize was attributed to Mark Becker, from CIESEN. Sandy Vitelli, from the IRI, received the award for “Best Logistic Support”.

Closing Ceremony (from left to right): Monica de Andrade Morraye, Rachel Lowe and Madeleine Thomson. Liza To/ Participant

Course Evaluation Report

This section provides a comprehensive report of the evaluations submitted by the participants, the facilitators, the organizers and the support staff regarding the overall delivery and administration of the 2011 Summer Institute. The feedback received through online and anonymous multiple choice and open-ended questions, is of great importance for ensuring the quality of future climate and health training courses.

Methods

During the 2011 Summer Institute, the participants were invited to fill out Daily Evaluations at the end of each day regarding their opinion on the content and format of the lectures, whose responses were then sent to the participating facilitators of that same day. At the end of each week, the participants were asked to submit a Weekly Evaluation, in order to evaluate the efficacy of the lectures of the respective week. The responses of the Weekly Evaluation were sent to the SI organizers for feedback. On the final day of the course, participants, facilitators, organizers and support staff, were asked to provide their opinion on the End Of Course Evaluation, which assessed, among other aspects, the content, delivery and administration of the course. The perceptions and suggestions expressed on the End of Course Evaluations included opportunities for future joint efforts in research and international training courses similar to the SI.

The platform utilized for the creation and the completion of the Evaluations was Google Docs Form (http://docs.google.com). Links to the forms were made available to the participants on the Climate Information for Public Health Action Network (CIPHAN) website on the day of their expected completion and via email to the facilitators, organizers, and support staff. Formats of the questions were open-ended, yes/no, or multiple choice. Performance and satisfaction were assessed using numeric (one to five, with five being the highest) or nominal scales (from very ineffective (1) to highly effective (5); from strong disagreement (1) to strong agreement (5)).

This report presents some descriptive statistics of the yes/no and multiple-choice questions, as well as a comprehensive analysis of the participants to the open-ended questions.

Results

Participants

Daily Evaluation

Response Rate: A 15-minute session at the end of the day was allocated to complete the online daily evaluation form. Response rates varied from the first week to the second, with the first week having a higher mean of response of 9.2 while the second had only 7.8.

Firstly, the participants had to self-identify themselves as being from the Climate or from the Public Health area. Six were associated to the Public Health field, while four had Climate as their area of expertise and/ or professional activity.

Secondly, six statements followed, where participants were asked to Disagree/Agree with each statement on a scale of 1 to 5, with 5 representing an expression of strong agreement. More information is provided in Figure 1 where the one to five scales reflect either on the efficiency of an item or on the respondent's agreement with a statement.

In general, the participants found the contents of the lectures and practical sessions interesting and informative. However, there was some concern regarding the pace of the practical sessions and a need for more time to perform the exercises was expressed on two different days during the first week.

Regarding the adaptation and knowledge assimilation processes, some of the participants expressed the need and interest to review epidemiological terms and training in temporal series. Many of the participants enjoyed how the facilitators brought their own experiences from the field to the Course presentations, and preferred the presentations whose facilitators had a 'steady pace', seemed 'passionate' about their topics and 'explained clearly' the concepts and exercises.

Furthermore, it has been suggested by one of the participants that the lectures should 'alternate with exercises in morning and afternoon [sessions]', and that the facilitators should ask the participants more questions so as to 'keep us interested, involved and thinking'. One suggestion was made for the Daily Evaluations, which should 'be separate for each professor'.

Finally, some of the reflections of the participants expressed through open-ended comments regarding the efficacy of the 2011 Summer Institute daily lectures and practical sessions include:

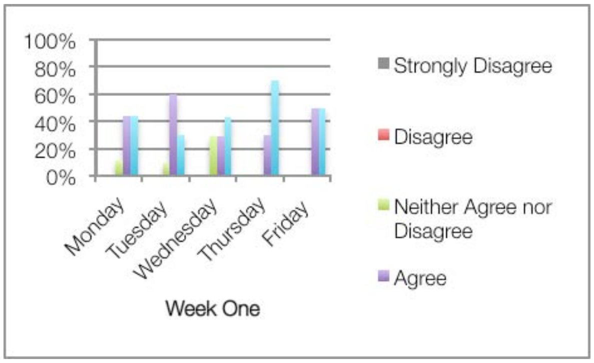
"Remote sensing discussions filled in many gaps! Good to know more how to access the information and data, what is available and understand better the uses/applications of the different satellite products."

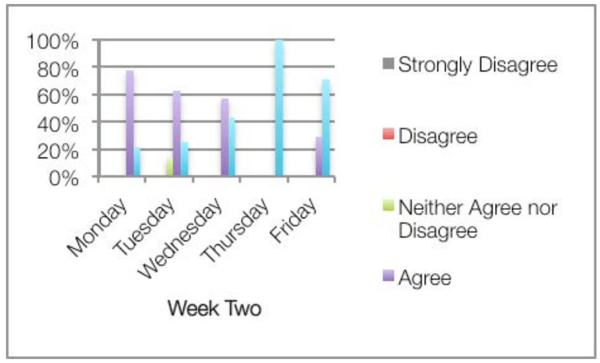
"Great start and good to be back in this environment- Interested to learn more about the experience and areas of focus of the other participants in the course."

"Great speakers today! They made GIS and remote sensing exciting and interesting."

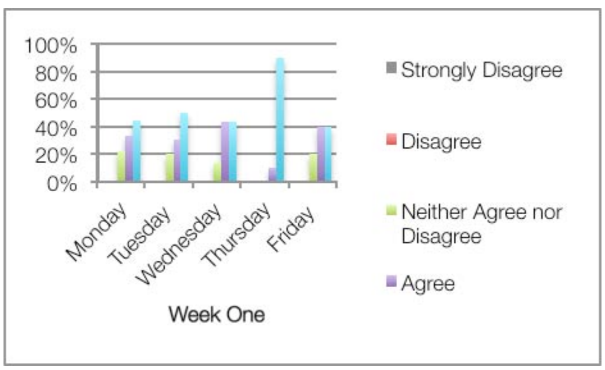
Figure 1: Participant daily evaluation responses for Week One (left column) and Week Two (right column)

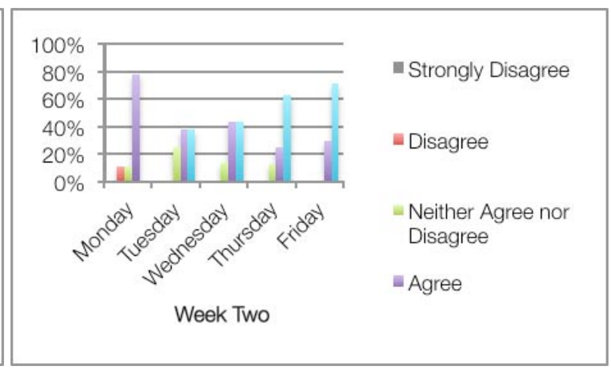
The lecture speakers were clear and easy to understand.



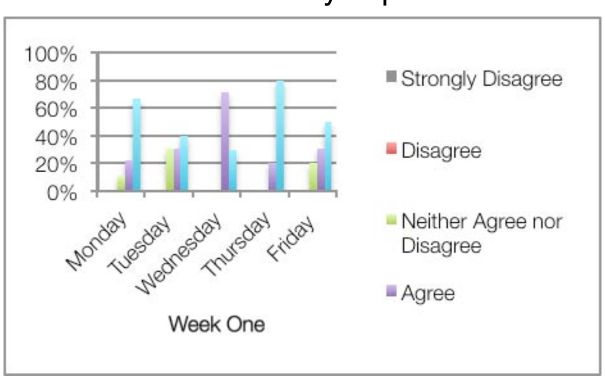


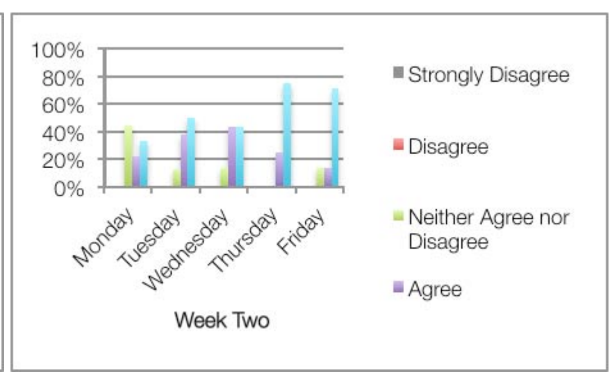
Today's lecture challenged me to think in new ways.



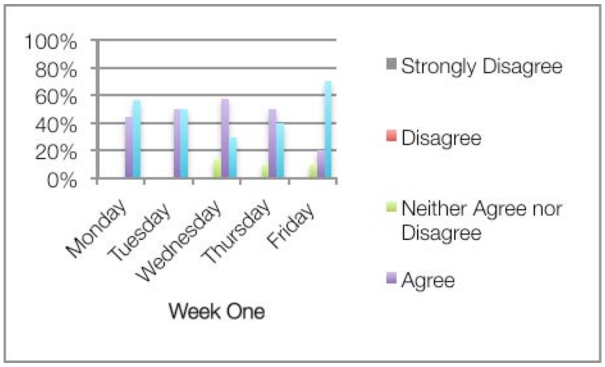


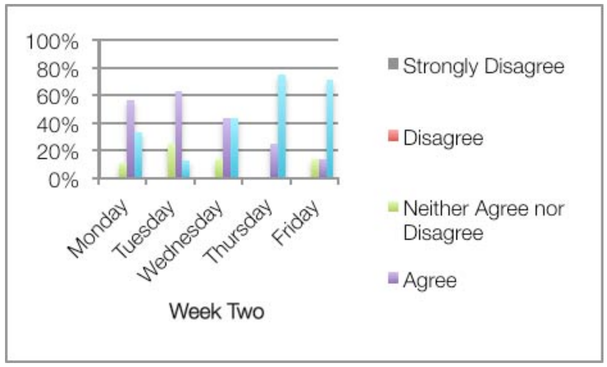
The lectures fulfilled my expectations.



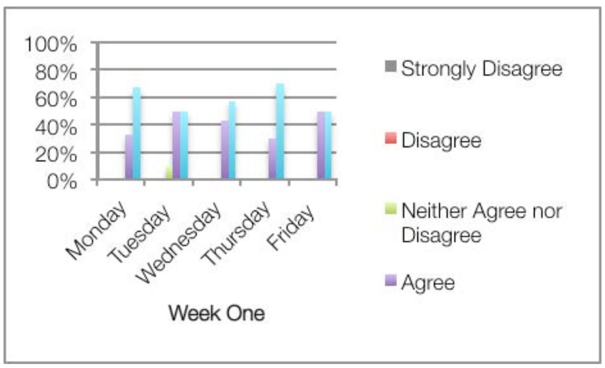


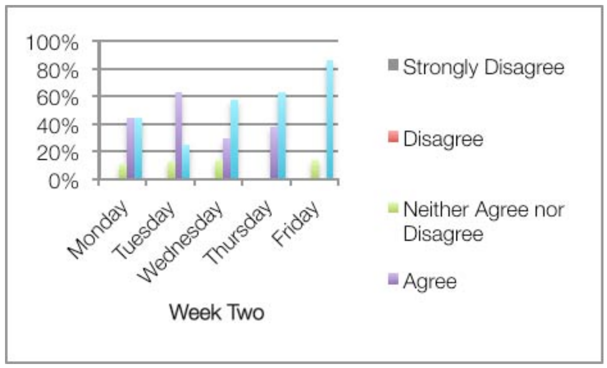
The scheduling and sequence of the lectures made sense.



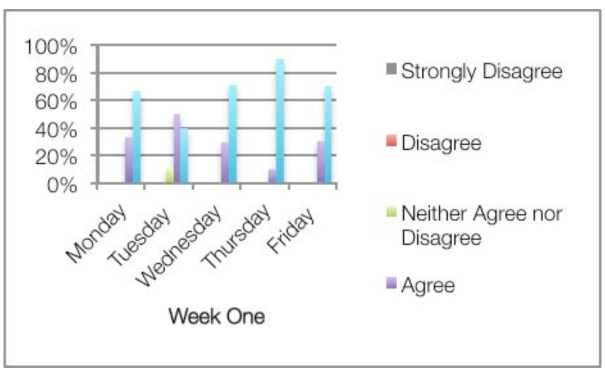


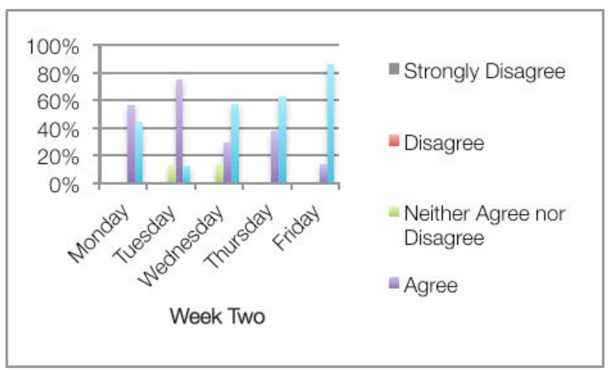
The resources, references and other materials were appropriate and helped me understand the content.





The visual aids used in the lecture were appropriate and helpful.





Weekly Evaluation

Response Rate: All participants completed the Week One Evaluations, whereas 70% completed the Week Two Evaluation.

The Weekly Evaluations consisted in four statements which participants were asked to Disagree/Agree with, and to rate the overall effectiveness of six aspects of the course (reading materials, lectures, practical exercises, daily summary by participant, daily quiz) and the helpfulness of facilitators. All ratings were on a scale of 1 to 5, 5 representing the highest level of agreement or highest effectiveness of the course aspect. As with the Daily Evaluations, the participants were also invited to provide their comments regarding the previous week. Furthermore, the Weekly Evaluations invited the participants to make observations on how they intend to incorporate methods learned in their ongoing work. Figure 2 shows the responses for the Weekly Evaluations.

During the Week One and Week Two Evaluations, the participants strongly agreed with the statements that the sessions accomplished their stated objectives and found the contents of the lectures and other activities relevant to the course. They felt challenged by the material included in both weeks of the course and anticipated incorporating the methods learned in their ongoing work.

In terms of effectiveness, the reading materials during Week Two were considered more relevant than Week One, and the practical exercises of Week One were considered most effective. The lecture effectiveness and the helpfulness of facilitators were considered to be strong during both weeks by the participants, whereas the effectiveness of the daily summary by the participants was considered most effective during Week Two.

Further comments were made regarding the time constraints of the course, in particular with the allotted time for practical exercises, and the limited data availability in the Data Library. It was suggested that the lecturers open discussion sessions during their presentations so that the participants might have the possibility to interact with each other and with the other facilitators.

The daily quiz received mixed agreements on both weeks. During Week One, the daily quiz was considered “somewhat effective”, whereas during Week Two, it was considered “competent”. The daily quiz is a fairly new feature of the Summer Institute and still needs some improvements in the material covered and format. Please refer to the Daily Quiz Report for more details.

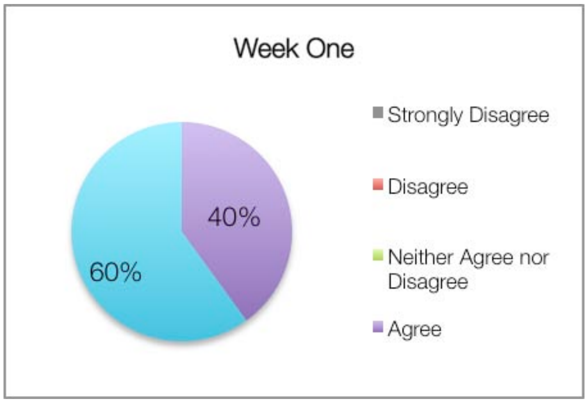
Finally, two of the comments shared by the participants on the Weekly Evaluations regarding the possible use of methods learned during the SI include:

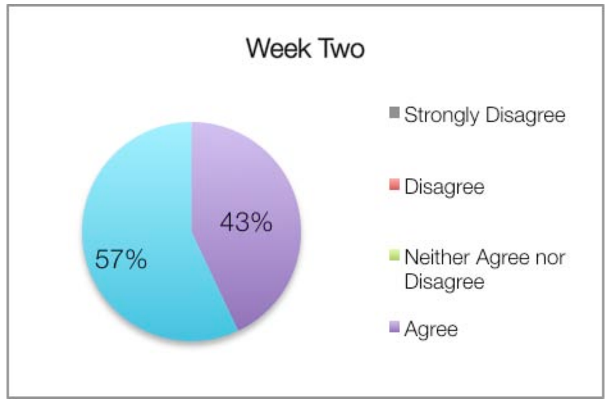
“I think the introduction of the impacts of vapor pressure on influenza gave me a new concept. I hope it will be helpful to the influenza forecast in Shanghai.”

“I learned a lot this week! It was a great synthesis of many topics I have previously studied in separate contexts but never all together. I love the focus on operational research - thinking about how decision makers will use the tools and information generated through research.”

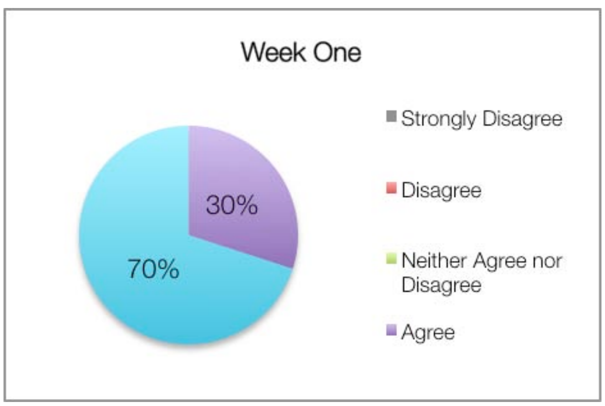
Figure 2: Participant weekly evaluation responses for Week One (left column) and Week Two (right column)

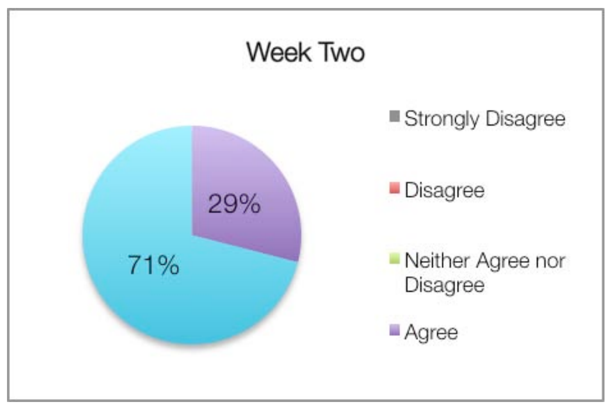
Overall, the sessions have accomplished their stated objectives throughout the week.



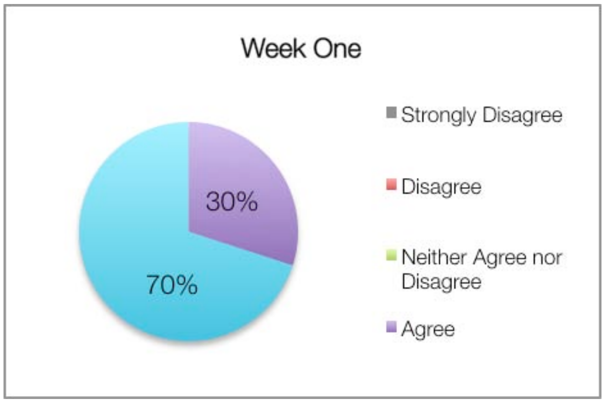


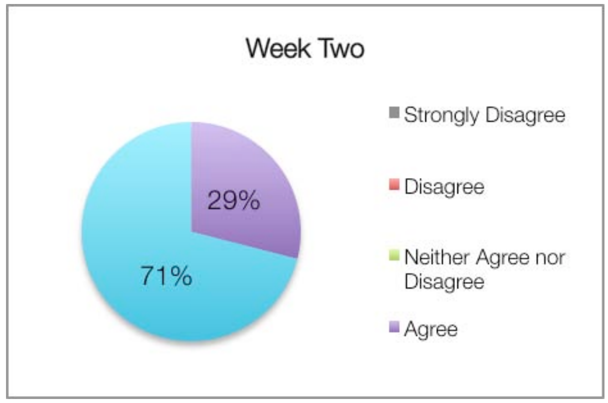
Over the past week I have found the contents of the lectures and other activities relevant.



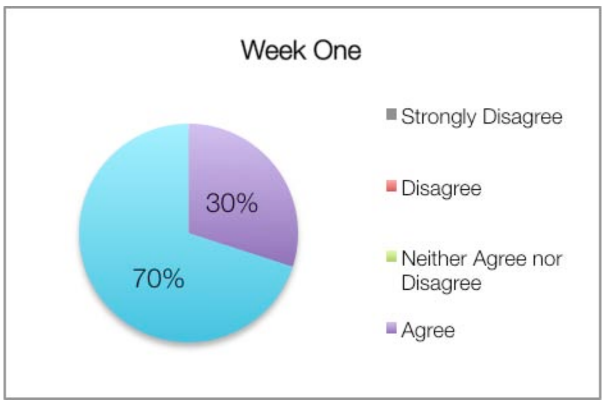


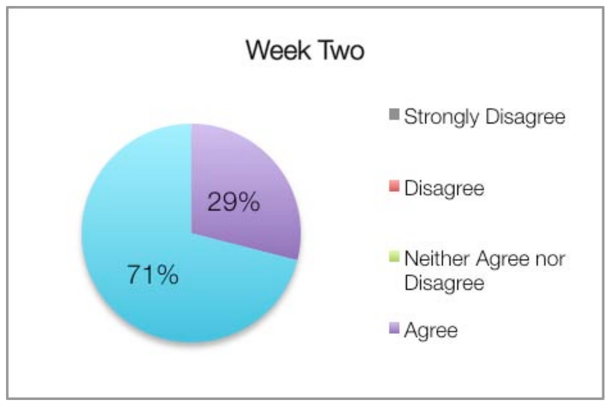
The lectures and activities of the past week have challenged me to think in new ways.



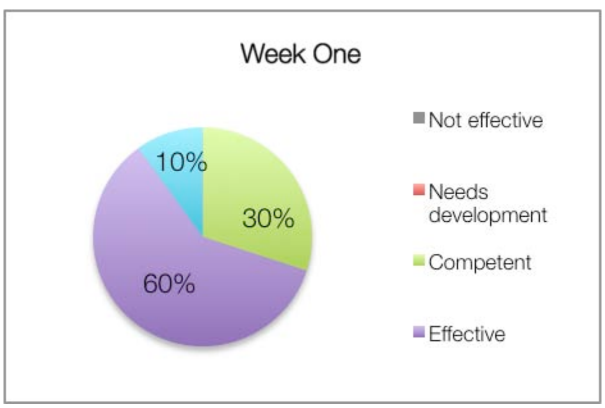


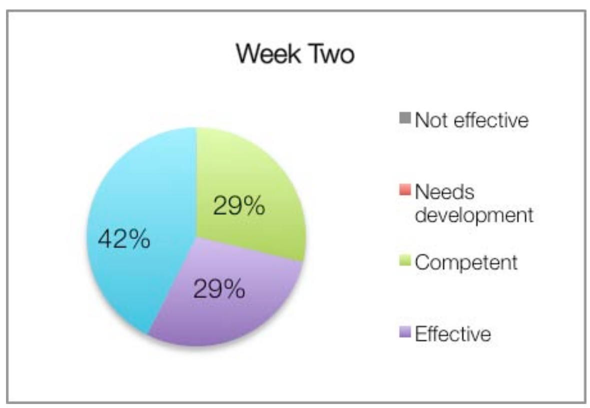
I expect to incorporate methods learned over the past week in my ongoing work.



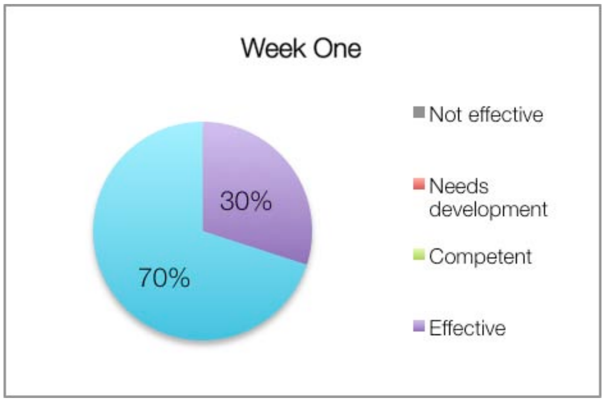


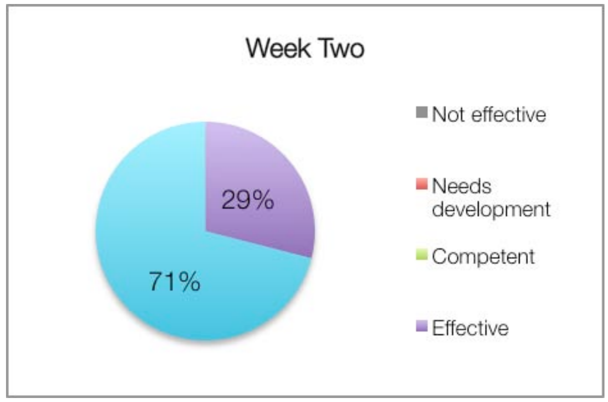
Effectiveness of the reading materials



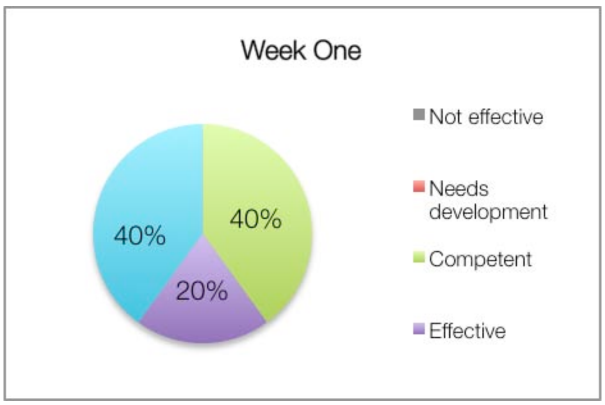


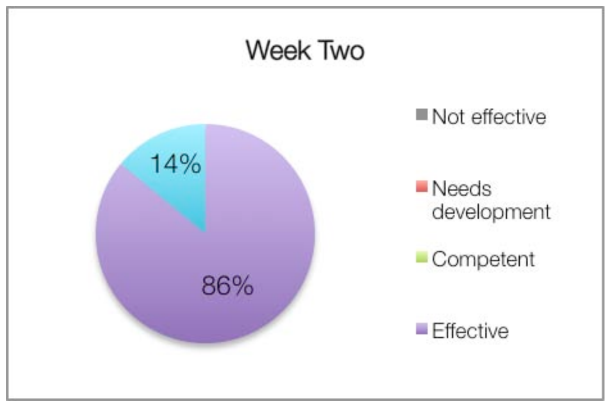
Effectiveness of the lectures



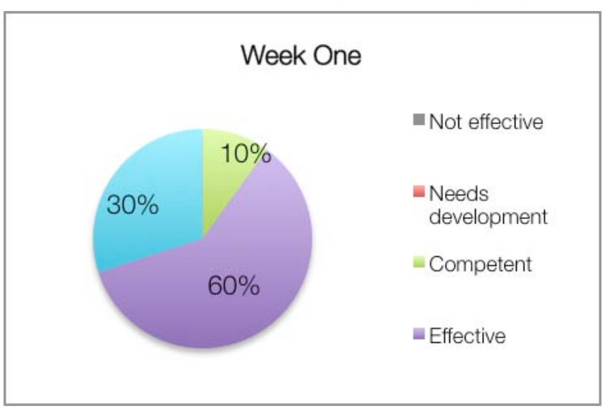


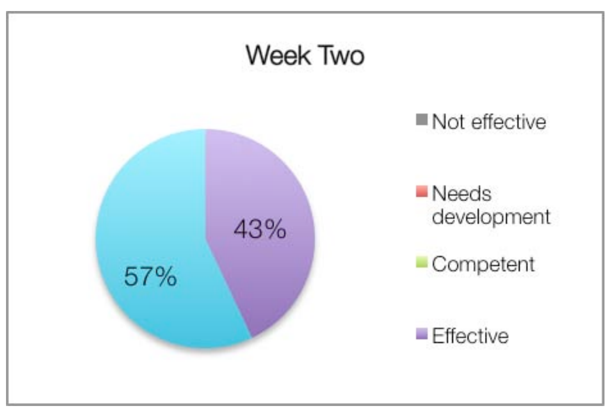
Effectiveness of the practical exercises



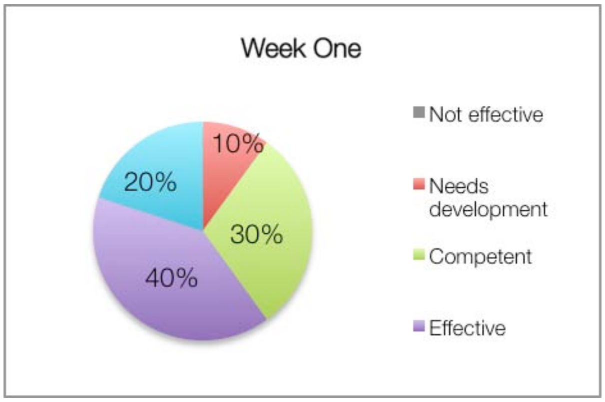


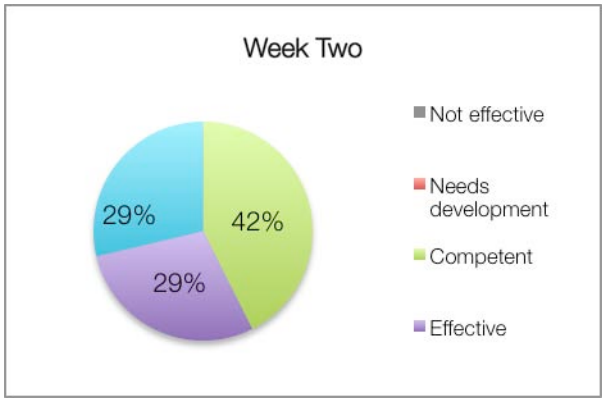
Effectiveness of the daily summary by participant



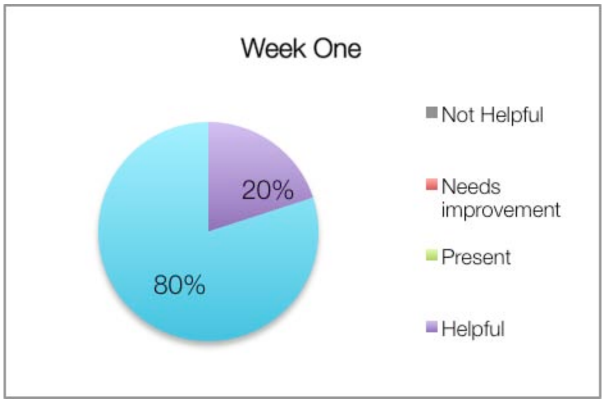


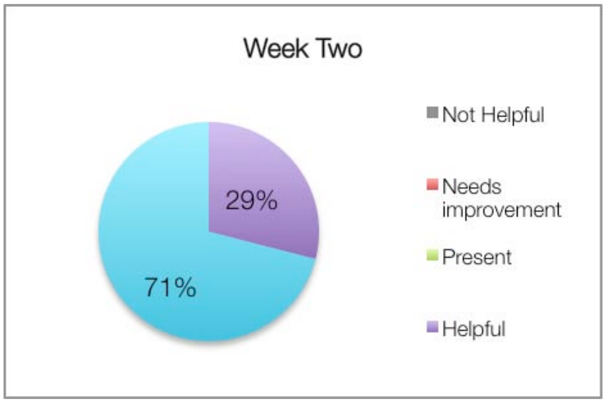
Effectiveness of daily quiz





Helpfulness of facilitators





End of Course Evaluation

Response Rate: On the last day of the Summer Institute, out of the ten participants, eight completed the End of Course Evaluation. For further details on the responses, please see Figure 3.

The End of Course Evaluation encompassed an extensive assessment of the Summer Institute as a whole, including among other aspects, the Course's objectives, practical sessions, additional activities, final projects, and global transferability of the Course. The participants had the opportunity to write down additional comments and suggestions to further clarify their answers regarding the delivery of the 2011 Summer Institute.

The participants strongly agreed that the Course Objectives were stated clearly, and with respect to these, their expectations were met or exceeded. In particular, one participant expressed that 'the course was very good at connecting ideas from different disciplines' and that 'it exceeded expectations'. Another participant considered that 'the two weeks are enough but all the knowledge gained is enormous and will allow me to expand my abilities in the world of health and climate'.

Regarding the Course Contents, the participants highly agreed that the materials were covered in a sufficient amount of depth, were made comprehensible and were greatly engaging. Some of the topics that the participants considered needed more coverage during the course include social science and policy application, interaction strategies with the public sector, as well as looking at other climate related phenomena such as air pollution, forest fires, and urban heat island effects. In terms of the Additional Course Activities, the participants greatly enjoyed the Weather Roulette game.

Most participants agreed that the course was enhanced by the practical sessions, although there were mixed opinions regarding whether or not there was a good balance between the sessions and the lectures. The Data Library received across the board ratings, as one participant pointed out, 'we should have more time to work through the problems by ourselves (or in small groups) rather than being told what to do. However, this might be difficult since the data library seems complicated to use'. The latter comment is one that is echoed by many participants. A second common issue was too much time was spent 'getting familiar with the buttons and struggling with the errors and did not fully understand the purpose of the exercises. When we come across errors that we cannot resolve, we need to wait for a long time for somebody to help but the lecturer continued to talk and we could not follow'.

Some of the participants (50%) considered that there was value in using their own data for the Final Project and found the Project guidelines helpful. The time allotted for preparing the Poster was considered merely enough. On the other hand, the majority of the participants considered the poster templates useful, and regarded that producing a poster and a 300-hundred word summary of their Final Projects highly valuable. One participant recommended specifying the necessity for country data prior to the beginning of the course.

Overall the Final Projects were received with great enthusiasm, as best expressed by the participants themselves:

"It is good chance to know what we have learned from the course, and practice by using it."

"I gained a lot from the poster project. It provided me with a platform to share my ongoing research with the facilitators and they were able to give me very valuable feedback."

"The exercise of the project is too important in this course. The project gave us the opportunity to talk about our topics of interest and about our country and experiences."

With respect to the Global Transferability of the Course Contents, the participants answered in open-ended questions regarding how useful the course contents were with respect to their ongoing work. The participants found the climatological topics and satellite data, as well as the coverage of fundamentals of epidemiology, most useful. For the most part, the participants found the contents of the course relevant to their geographical region and organization. The statistical analyses and the interaction with the facilitators for the poster projects were listed as being most valuable, while lectures on heat waves and vector borne disease dynamics were considered the least. The latter is due to varied fields of interest among the participants. Suggestions made by the participants on how the course could be changed to enhance their learning experience included extended time on the practical sessions and Data Library use, and promoting group discussion activities. Further, it was suggested extreme events and social science interactions to be included in future courses.

Finally, all the participants were positive about reproducing the course for their own organizations, anticipating to 'staying in contact to help out the data library with quality data from my country' and 'present a shortened version of this workshop for scientists and practitioners'. One participant expressed his/her interest in 'introducing the Data Library to my students [as] all the tools are simple to learn'. In addition, 100% of the participants commented that networking with other climate and public health officials was the 'best part of the course' and that 'It is more important to work together in each country with some coordination and same vision'.

Participants agreed that the Course Design was well structured, while the pace of the course received differing reviews, as well as the time allotted for the practical sessions. The length of the course, scheduling was deemed appropriate, as was the value for the reading materials and morning sessions. The daily quizzes and morning discussions were all considered helpful in understanding the content of the course and the Course Evaluations were recorded as suitably designed. A key suggestion regarding the design was to create a separate evaluation for each lecturer.

Out of the eight participants who completed the End of Course Evaluation, one had taken a similar course previously; yet found that 'this was by far the most useful'. The Course Delivery had overall positive remarks. The activities were considered by most participants to start and end on time, the course materials were highly appropriate, and the course facilities, including computer rooms and meeting spaces likewise. When asked to rate the availability of the IRI staff and facilitators, the majority agreed in their great availability for answering questions regarding the lectures and practical session, for networking and discussion, and last but not least, for questions regarding travel, accommodation and other personal matters.

In terms of the Logistics, the participants greatly enjoyed the quality of the food and praised the accommodation arrangements. The Celebrity Walk, the Nature Walk and the Manhattan Tour all received great reviews.

When asked whether they experienced any significant problems throughout the Course, such as language barriers or the course material being too challenging or not challenging enough, five out of the eight respondents said 'No'. One of the participants who responded 'Yes' commented that 'all the staff and my team classmate helped in these problems, with patience'.

These are some of the final testimonies made by the 2011 Summer Institute participants on the End Of Course Evaluations:

"Congrats to everyone at IRI for putting together such an outstanding course. I am honored to have been a participant."

"I will apply much of what I've learned directly to my ongoing research. The course has also caused me to rethink how to frame research questions so that they are relevant for policymakers."

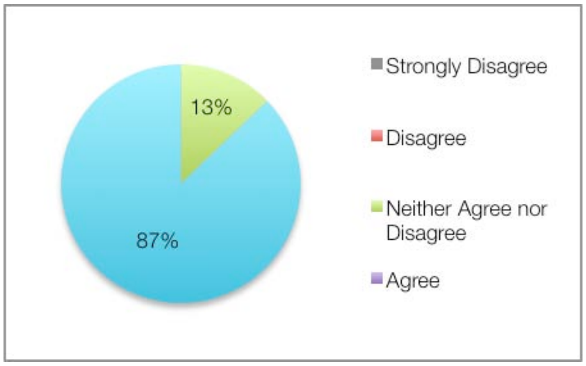
"I met SO many great and intelligent researchers that I never thought I would have met. I feel so lucky to be given the opportunity to talk with such inspirational and great people."

"I thank a lot of the committee the opportunity to participate in this summer institute and the excellent performance of the facilitators and support staff."

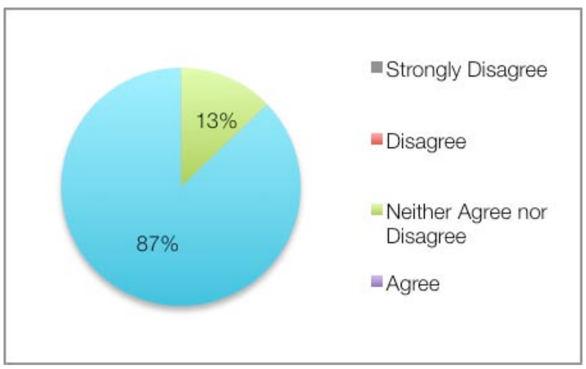
Figure 3: Participant end of course evaluation responses

Course Objectives

The objectives of the course were stated clearly.

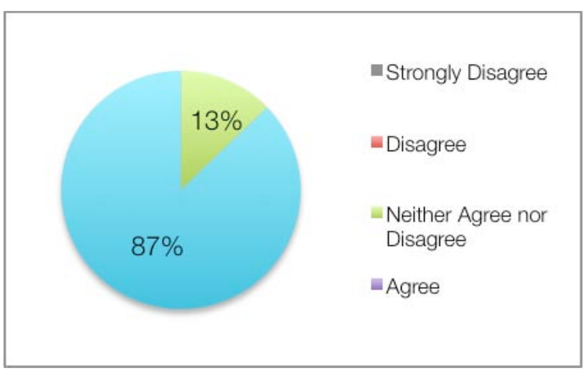


My expectations, with respect to the objectives of the course were met or exceeded.

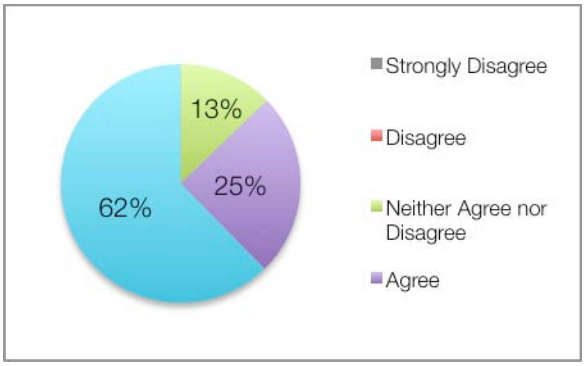


Course Contents

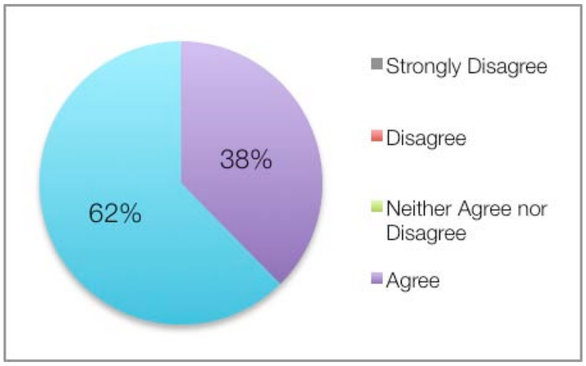
The contents of the course fulfilled my expectations.



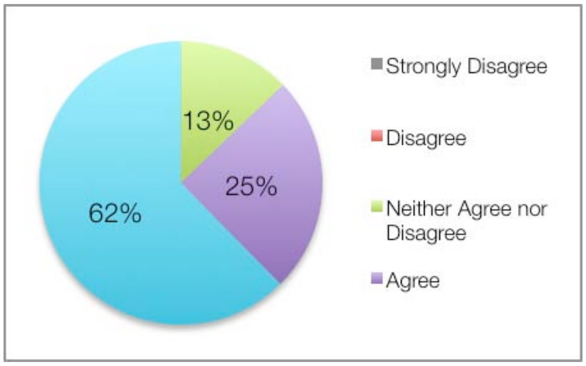
The course went into a sufficient amount of depth.



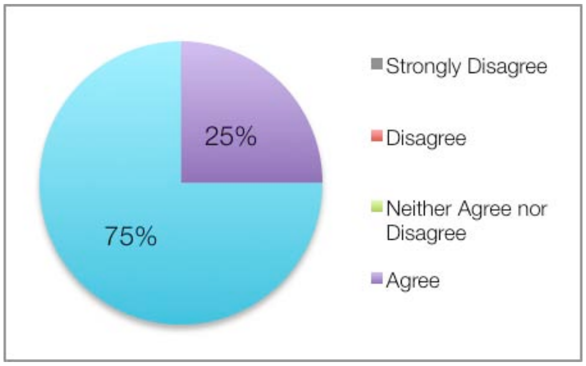
The course was delivered in a way that was easy to understand.



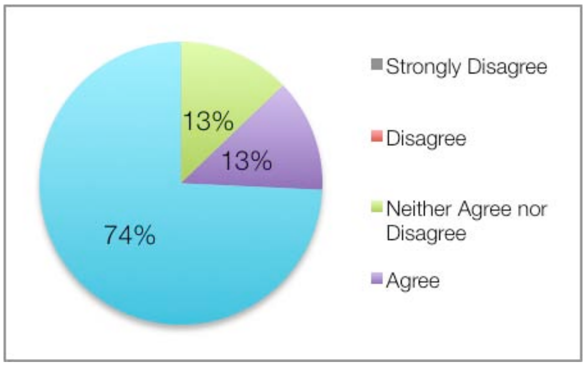
The contents of the course agreed with the objectives of the course.



I found the contents of the course engaging.

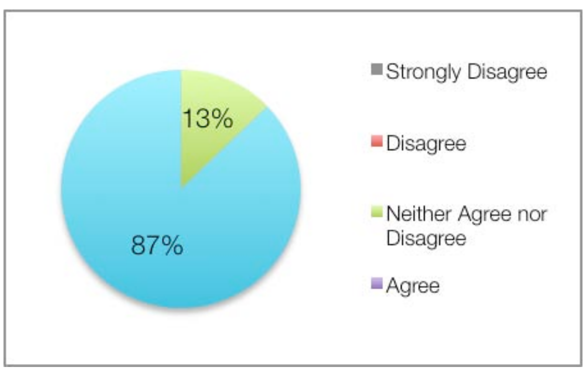


There was an agreement between the course objectives and the course contents.



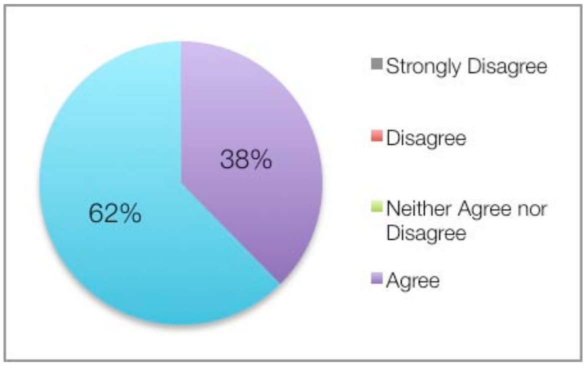
Additional Course Activities

I found the course was enhanced by the additional activities (such as lunchtime seminars, Weather Roulette).

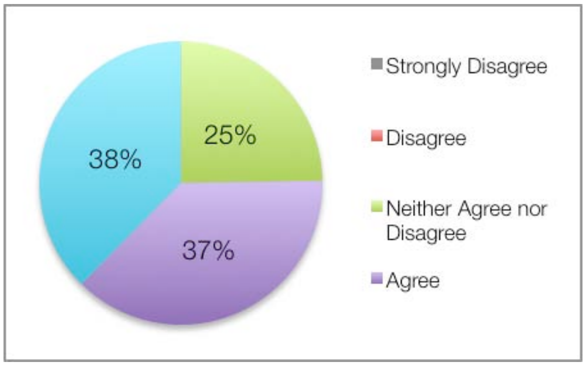


Practical Sessions

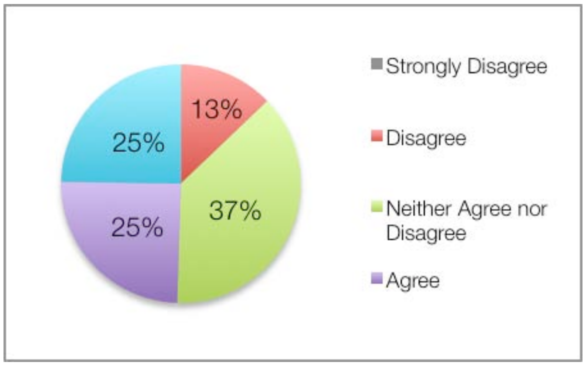
I found the course was enhanced by the practical sessions.



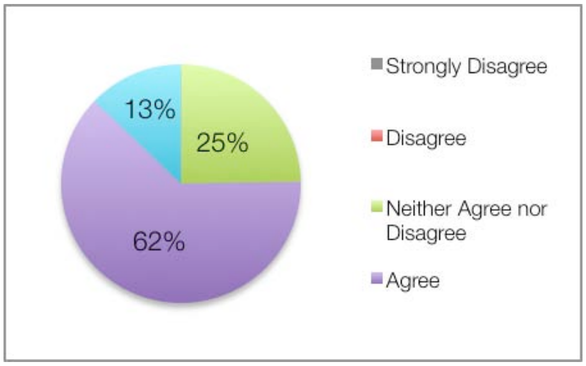
I thought there was a good balance between lectures and practical sessions.



I found the Data Library easy to use.

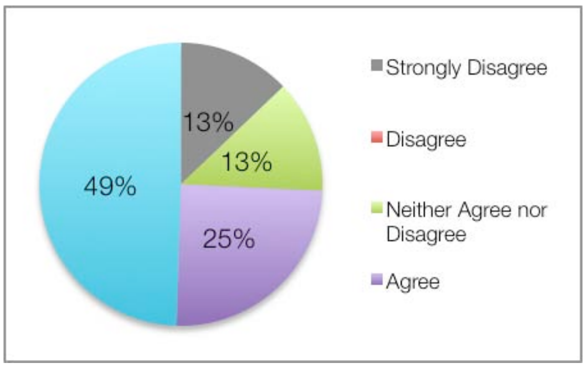


I found the practical sessions engaging.

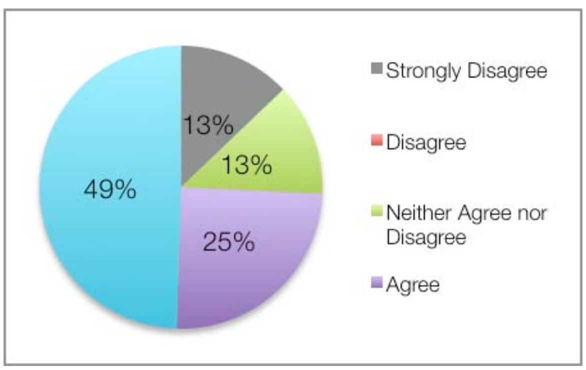


Final Project

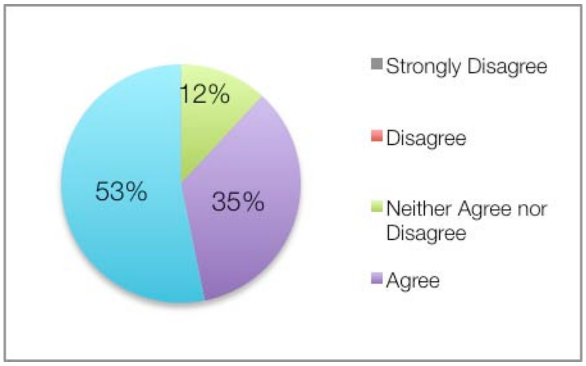
I found the option to use my own data for the project valuable.



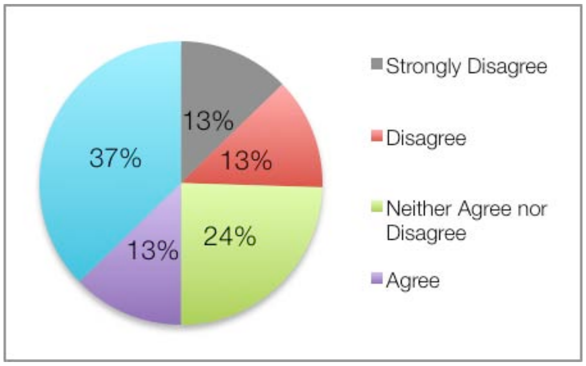
Prior to starting the course you were given the Project Guidelines. How useful did you find these guidelines?



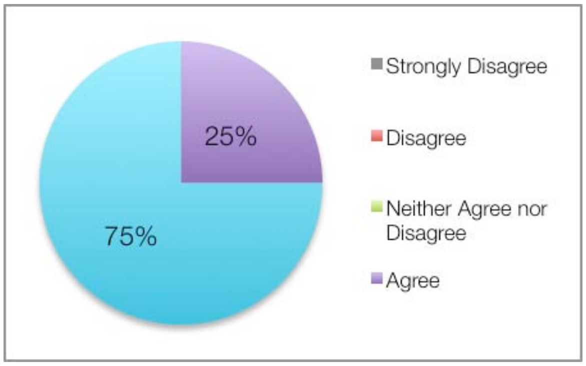
During the course you were given a template for the poster. How useful did you find this template?



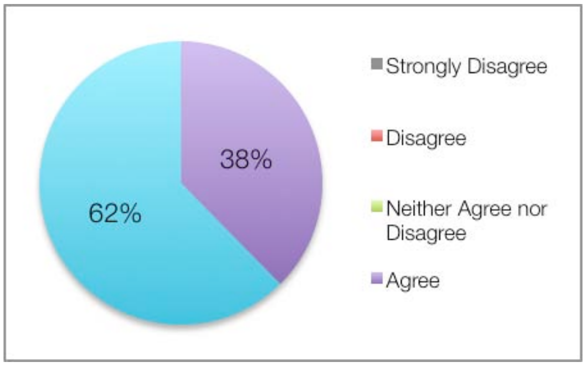
Adequate time was given to work on the project.



Producing a poster was a valuable exercise.

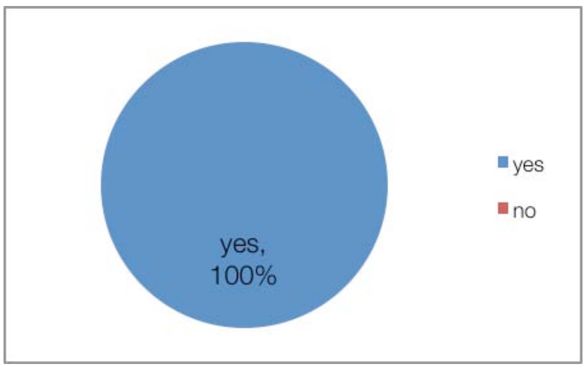


Producing a 300-word summary was a valuable exercise.

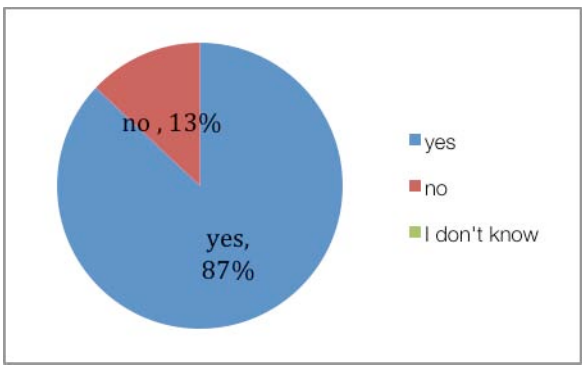


Global Transferability of the Course Contents

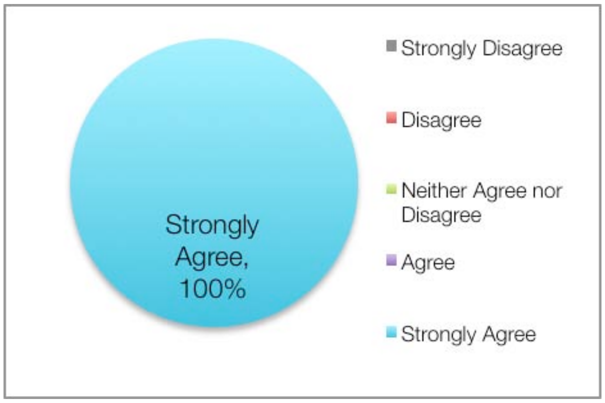
Do you think these aspects of this course could be incorporated into the training program of your organization?



Do you think you will change any of your working practices as a result of this course?

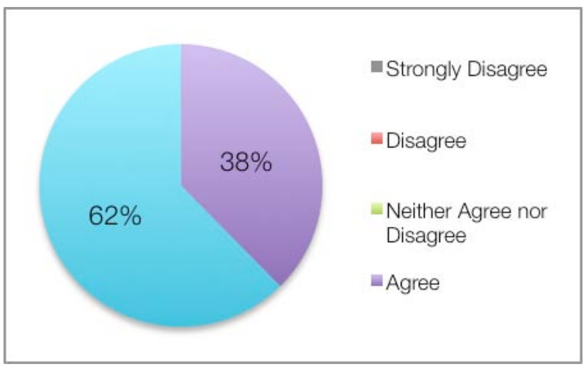


I think I have increased my network within the climate and health community by attending this course.

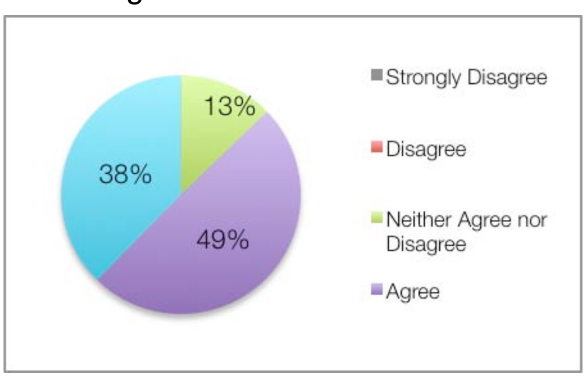


Course Design

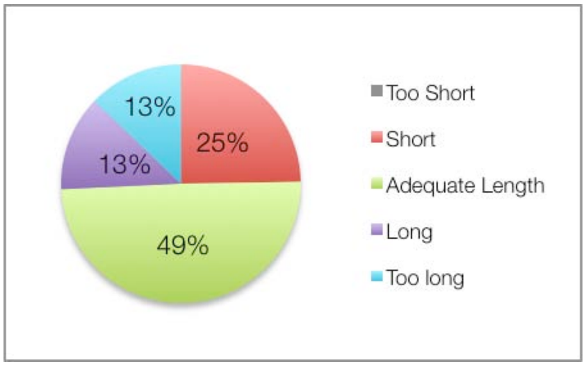
The course was well structured.



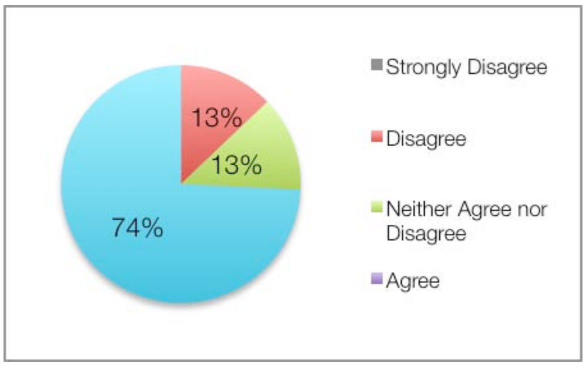
The design of the course allowed me to learn at my own pace.



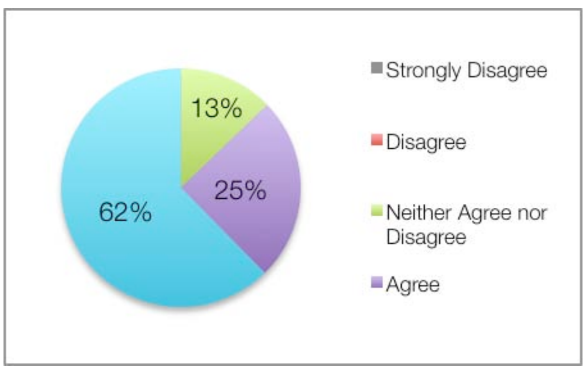
What is your opinion of the length of the course?



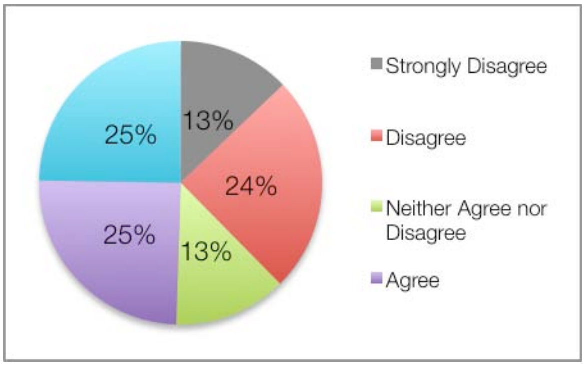
During the course I was given the opportunity to reinforce my understanding of the content.



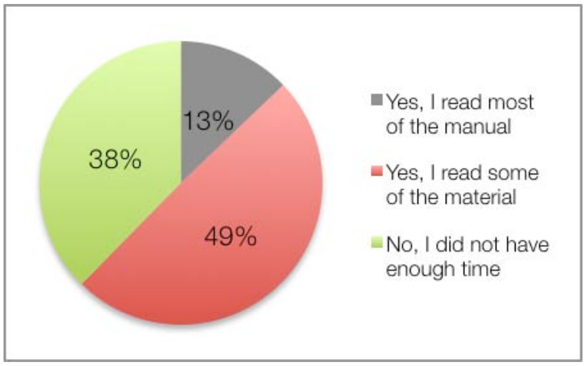
The scheduling of lectures, lunchtime seminars and practical sessions was intuitive and made sense.



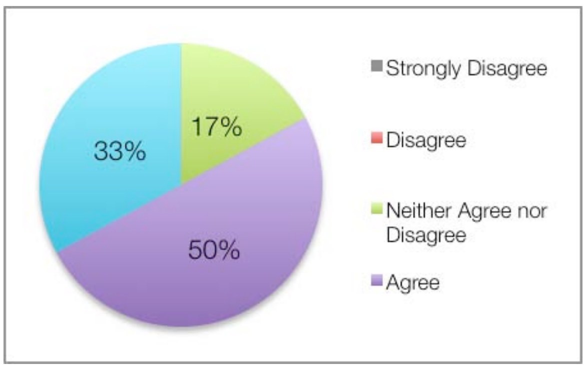
There was enough time to engage in practical hands-on work.



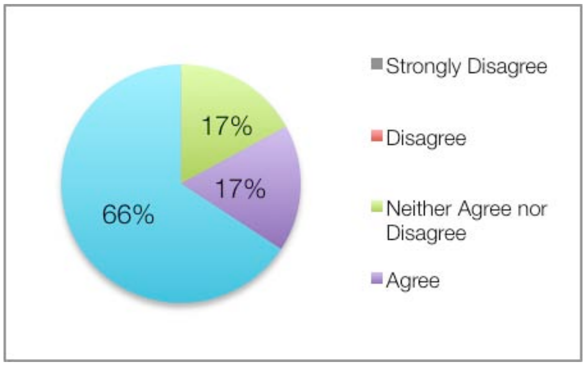
Did you have enough time to read the reading materials provided in the manual?



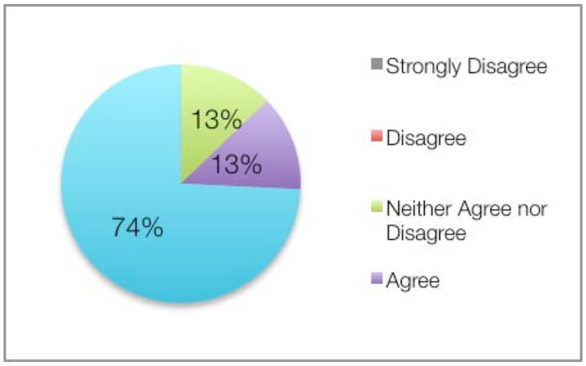
The reading materials added value to the presentations.



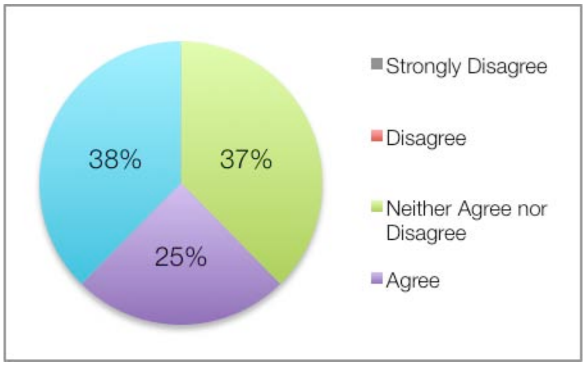
I would recommend the reading materials to others.



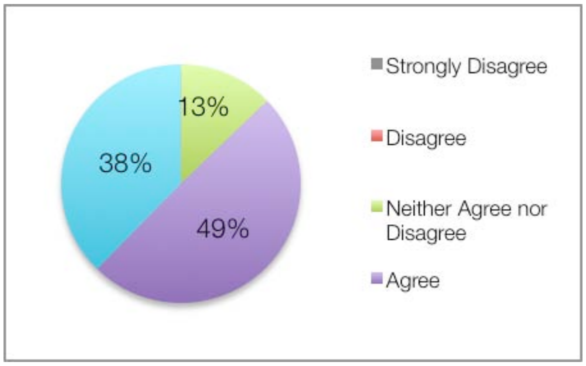
The morning review sessions (presented by a selected participant) were useful in helping me to understand the content of the course.



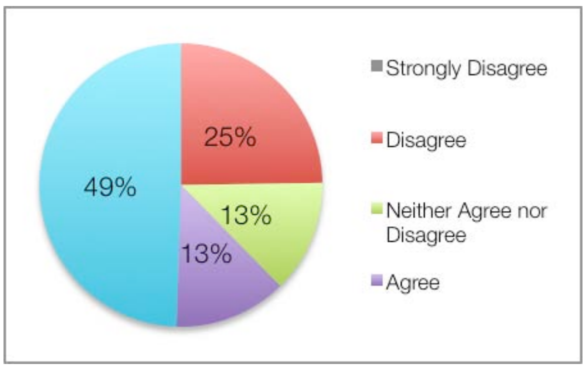
The morning quizzes were useful in helping me to understand the content of the course.



The morning discussions (lead by a facilitator from the previous day) were useful in helping me to understand the content of the course

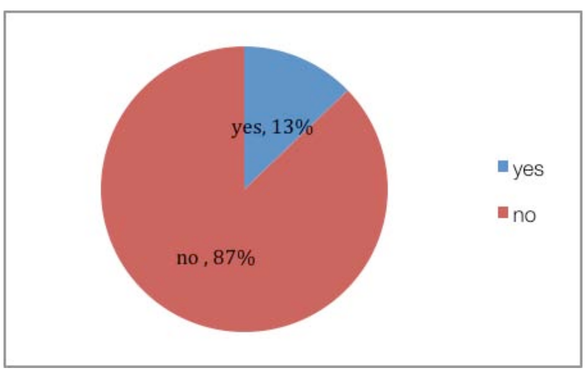


The course evaluation process was suitably designed.

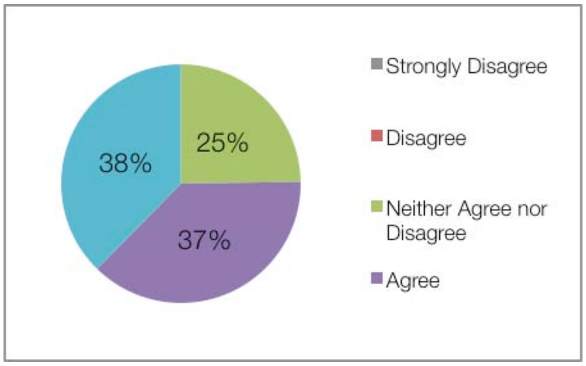


Course Delivery

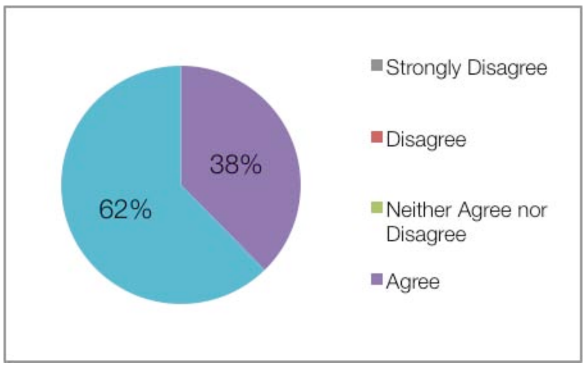
Have you taken a course like this before?



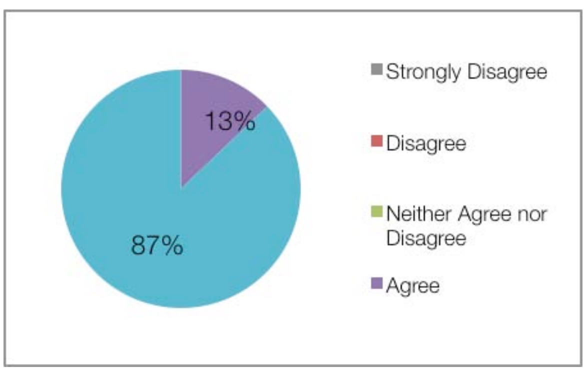
All activities began/finished on time.



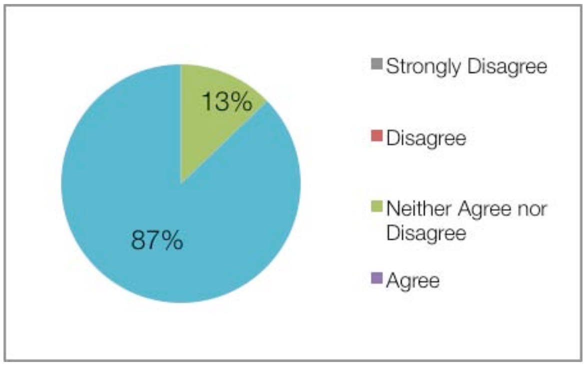
Course materials were appropriate and helped me to learn the course contents.



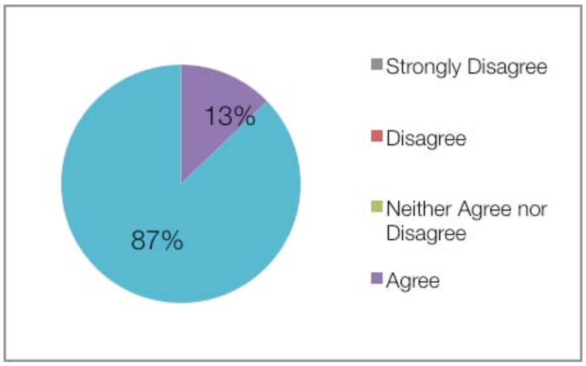
Course facilities (i.e. computers, meeting spaces) were appropriate for the course



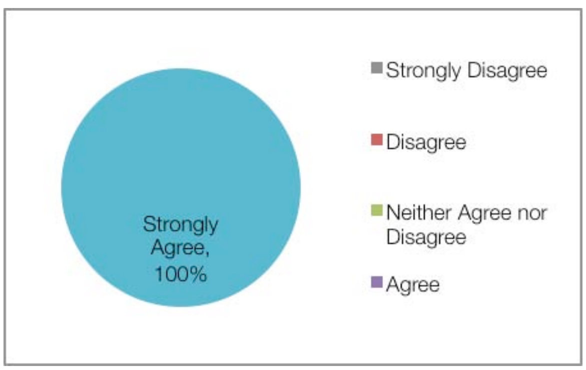
Course facilitators were available to answer questions when needed .



IRI researchers and staff were available for networking and discussion.

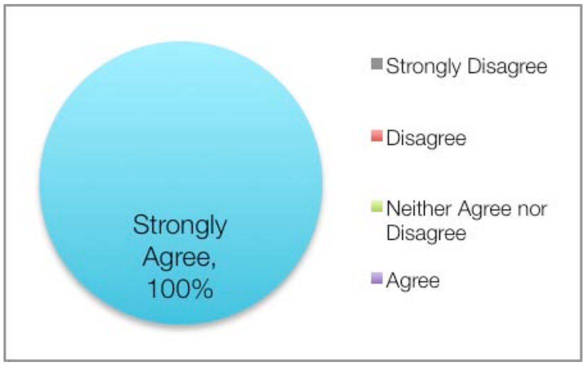


IRI staff/facilitators were helpful in addressing my questions regarding travel, accommodation and other personal matters.

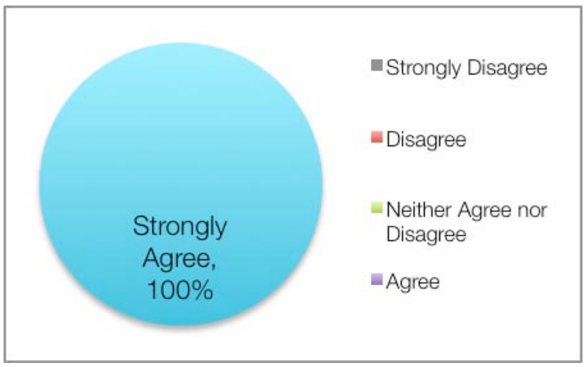


Course Logistics

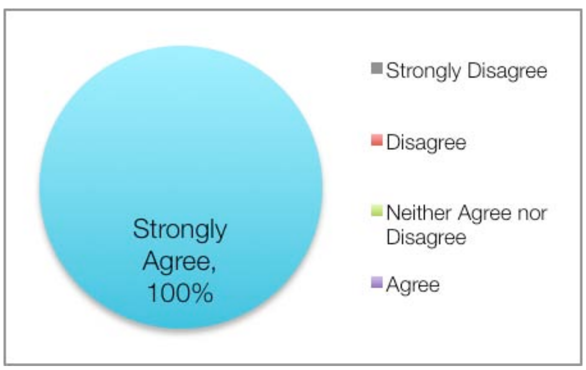
I enjoyed the food that was provided throughout the course.



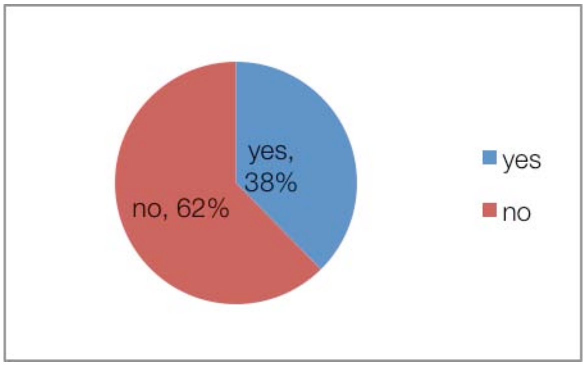
Suitable accommodation was provided for the course (i.e. the hotel facilities, location etc.)



The extra activities undertaken during the course (nature walk, celebrity walk, Manhattan Tour, etc) were successful.



Did you experience any significant problems during the course? i.e. was language a problem, was the course content/materials too challenging or not challenging enough?



Organizers Evaluation

Response Rates: of the four organizers invited to complete the End Of Course Evaluation, two responded. Of these, only one indicated that he/she was heavily involved in organizing and delivering the SI, while one indicated moderate involvement.

The Evaluation was sent to the four persons who organized and designed the curriculum of SI11. Both respondents agreed that the participant selection, the content of the curriculum and the overall coordination was excellent, whereas the scheduling, the interaction of the planning committee with the lecturers and/or support team and the technical support were satisfactory. SI11 strengths identified by one organizers is the 'passion and professionalism' of the team. The two areas of improvement identified by the organizers are the need to 'broaden the disaster content and the public health - agriculture link' and to 'include more group discussion in the curriculum and to have more facilitators involved in the development of the participants' project and related activities of the course' (see Figure 4).

The organizers stated that they had the opportunity to view the participants' Final Projects and considered 'very useful' the use of the participants' own data for the posters. The Final Projects received great reviews, and 'it was clear that the participants had learned a lot during their short stay'.

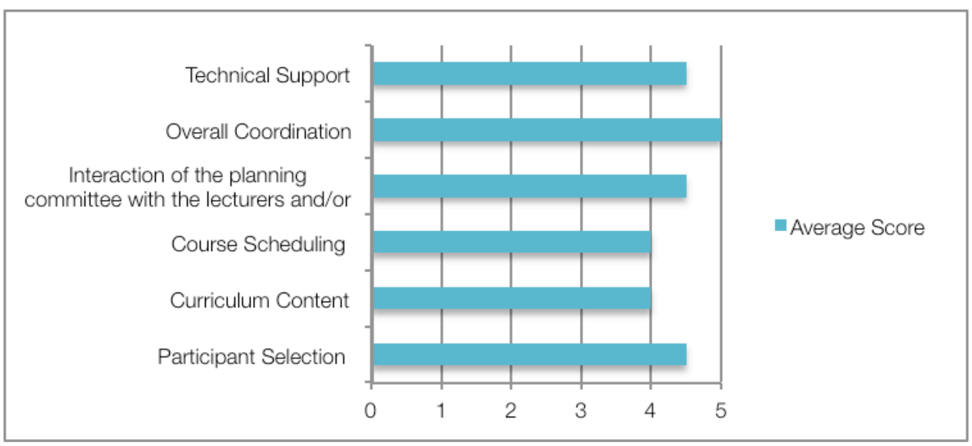
In regards to the morning summary and discussion sessions, the organizers deemed them as 'important', yet one organizer recommended instead of repeating the content of the previous day, 'to come up with how he/she will use the information received the day before in their own work'.

Most importantly, both organizers stated that the SI11 had provided them with new research project insights for opportunities for collaboration, commenting that many ideas to do 'collaborative research in Latin America and the Caribbean and [in] Asia', and in 'dengue work in Latin America, Urban heat issues in Asia and Yellow Fever in Africa'.

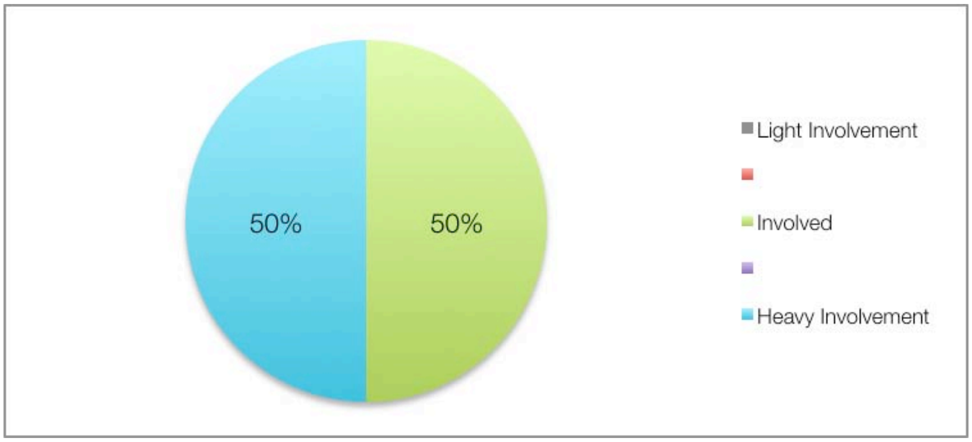
Overall, the organizers gave an 'excellent' feedback to the 2011 Summer Institute, and declared that the SI had challenged them to think in new ways, as best expressed by one of the organizers 'I think [the SI] is an excellent product of IRI - builds teamwork, develops new collaborations and research ideas and showcases the IRI as a research for society institute at its best'.

Figure 4: Organizer evaluation responses

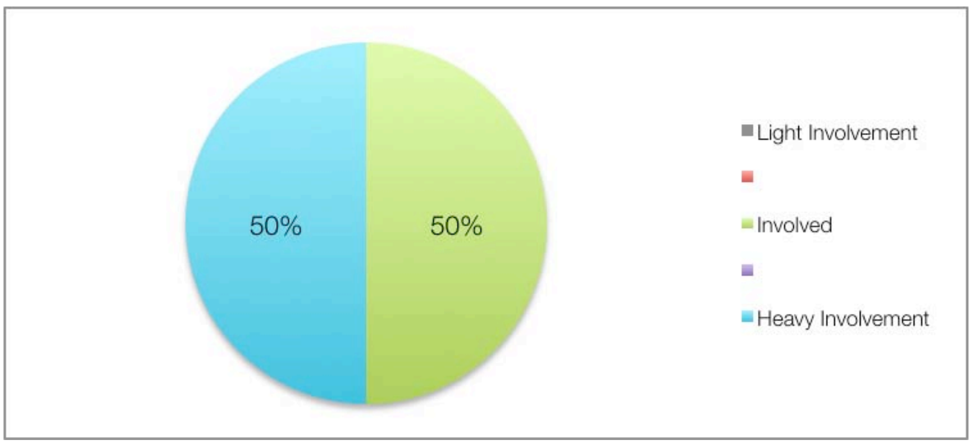
The objectives of the course matched my expectations of the course (5 represents the highest score).



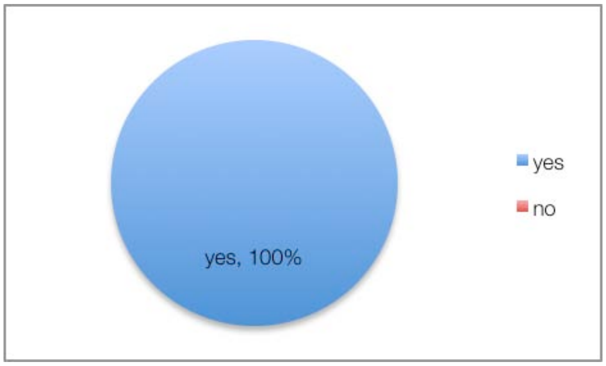
How would you rate the workload associated with the preparation of the Summer Institute (i.e. before it started)?



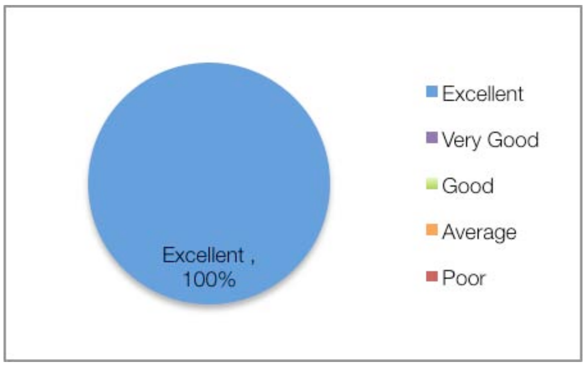
How would you rate the workload associated with the delivery of the Summer Institute (i.e. during the SI)?



Did the Summer Institute provide you with new research project insights or opportunities for collaboration?



How would you rate the overall Summer Institute 2011?



Facilitators Evaluation

Response Rate: Of the 28 facilitators invited to complete the Evaluation, 18 responded (66%). Of the respondents, twelve described themselves as core lecturers, six lead or assisted in a practical session, and two described their involvement as 'Other'. 63% of the facilitators indicated that he/she was involved in organizing the SI, whereas 38% was involved in delivering the SI.

The general 'excellent' performance of SI11 as considered by the facilitators, was credited to the selection of 'good participants' who showed 'great diversity and quality' and to the 'curriculum [which] was fairly balanced and well phased to allow the students to develop strong projects'. When rating their opinion on the participant selection, the content of the curriculum, the course scheduling, the interaction of the planning committee with the lecturers and/or support team, the overall coordination and technical support, the highest ratings were given by facilitators to the overall coordination and technical support . Of the 18 respondents, 81% believed that they received sufficient information regarding their role in the SI prior to its starting (Figure 5).

In terms of suggestions made by the facilitators regarding the design and scheduling of the course, ‘some additional materials in the curriculum’ might avoid the ‘slight overlap in the lectures’ as well as moving the ‘cluster analysis exercise… [to] the same day as the lecture’, so as to so satisfy ‘the need of all participants for projects … in the first week’. In terms of the participants’ expectations, one organizer thought that some ‘[were] lost in translation’ and noted the necessity to explain that the SI will offer new insights into the interaction of climate science and public health, but cannot aspire ‘to save their world at the end of the two weeks’.

All of the facilitators felt that the lectures and practical sessions matched the objectives of the SI, commenting that ‘most of the students were engaged and interested’ and had ‘received positive feedback from several individual students’, which was considered ‘very useful’. One facilitator emphasized that ‘some [participants] might be doubtful about the Data Library and data handling but it's good they understand data manipulations and statistics require being rigorous and patient’. The facilitators thought the use of the own participants’ data for the final projects as being ‘not necessary’ and could result in ‘unreasonable expectations and disappointment’, yet its use ‘probably [meant] more personal investment’ in the projects.

Seventy-five percent of the respondents recognized that the SI provided them with new research project insights and those opportunities for collaboration might include partnerships ‘with many Latin-American experts is likely to take place in the foreseeable future’. One facilitator emphasized the need for SI continuity following the end of the course, suggesting alumni SI such as ‘the trainings in Madagascar and Ethiopia… to insure that they keep on using climate information after the SI’ as it would be a ‘total failure if the story ends at the diplomas deliverance ceremony’.

Finally, the facilitators suggested that the future SI ‘attract more participants from Africa and may plan to organize [a SI] in a developing country’, and encourage ‘the participants to work in small groups and explore ideas' in order to prevent the participants from 'just listening to lectures or clicking through the Data Library exercises without really understanding'.

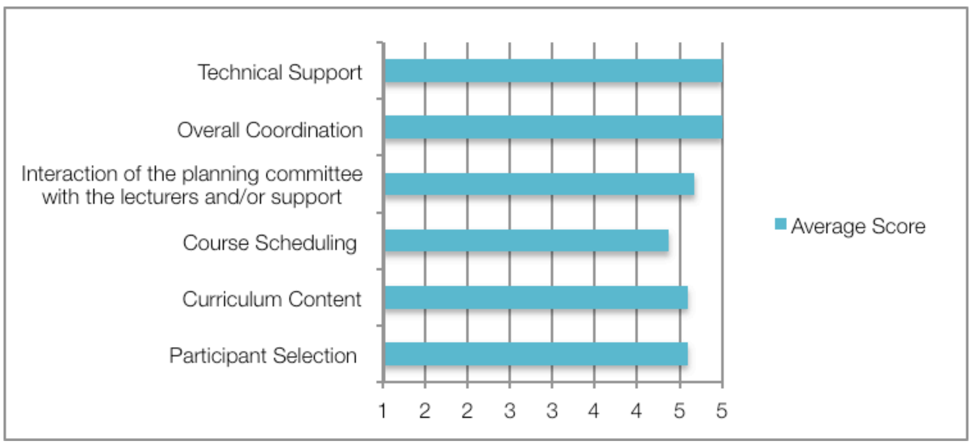
These are some of the concluding remarks made by the facilitators in the Evaluation:

"Congrats to the organizers on a highly successful SI2011! It was very efficiently organized, and the students were wonderful!"

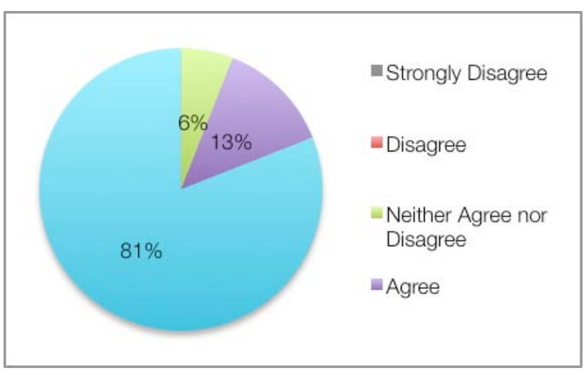
"To everybody who prepared the Summer Institute: Great Job!"

Figure 5: Facilitator evaluation responses

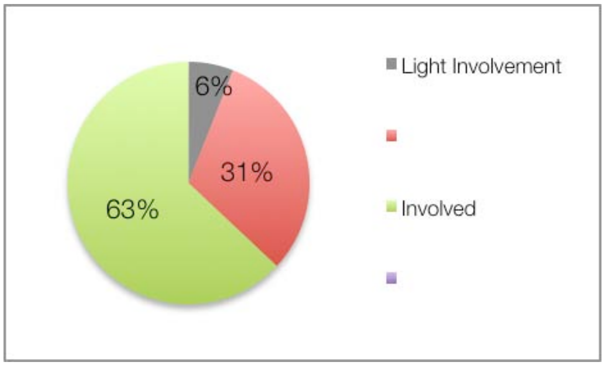
The objectives of the course matched my expectations of the course (5 represents the highest score)



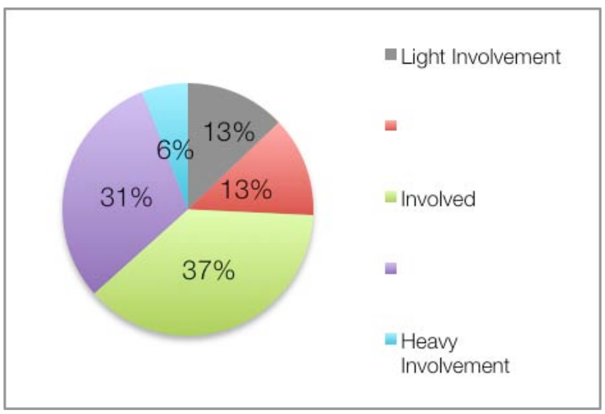
I received sufficient information regarding my role in the Summer Institute prior to the start of the course.



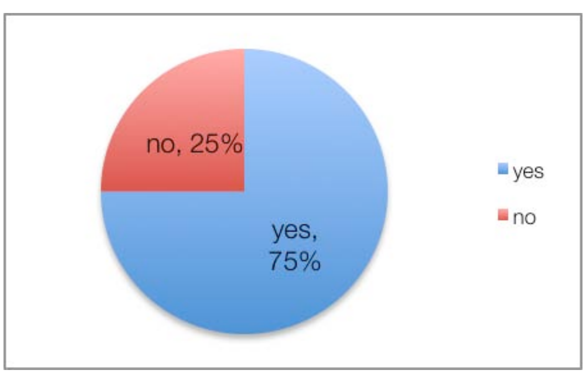
How would you rate the workload associated with the preparation of the Summer Institute (i.e. before it started)?



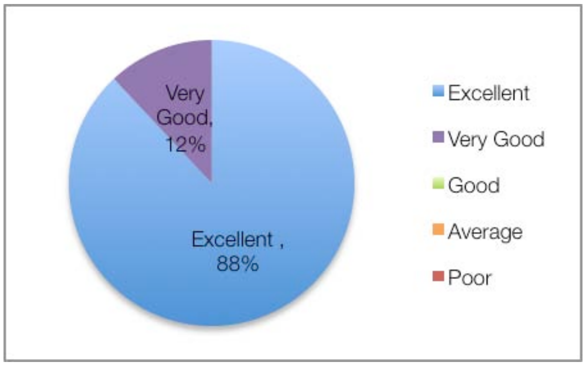
How would you rate the workload associated with the delivery of the Summer Institute (i.e. during the SI)?



Did the Summer Institute provide you with new research project insights or opportunities for collaboration?



How would you rate the overall Summer Institute 2011?



Support Staff Evaluation

Response Rate: The Evaluations was sent to 11 IRI professionals, responsible for administrative, IT or communication support. The response rate was 45% (5 respondents).

The Support Staff was asked to rate the following planning components out of 5, 5 being the highest score:
Guidelines from the planning committee for preparing their support; support from the planning committee before and during the delivery of the Summer Institute and overall coordination. The respondents gave positive feedback; even one member of staff considered it 'perhaps the best run SI' and another one noted that 'the printing of the [material] booklets was a major improvement… as they had a more professional approach and more compact' (see Figure 6).

In regards to the selection of the participants, respondents believed that 'the participants truly looked engaged and happy to be here' and that 'they seemed to be challenged enough to take their knowledge to the next level, and make connections with peers that they can take advantage of in the coming months and years. Another respondent hopes to 'further collaborate on work in Latin America and the Caribbean'.

Overall the SI was rated highly by the support staff. When asked to provide comments or suggestions for future SI, several respondents raised the issue of too limited time 'to go deeper into the subject matter' and that 'a network needs to be developed to keep the group in contact'.

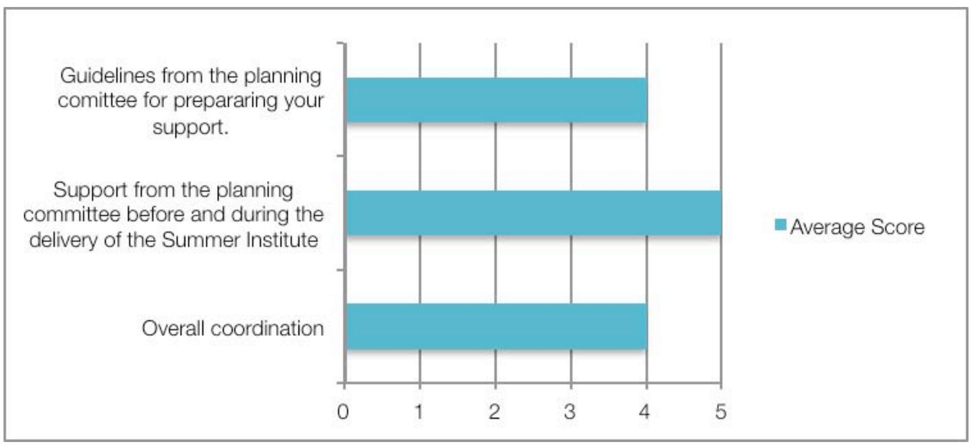
These are some selected comments left by the Support Staff regarding the 2011 Summer Institute:

"This is a well-oiled team; we got it to run as seamless as possible, with the assistance of staff."

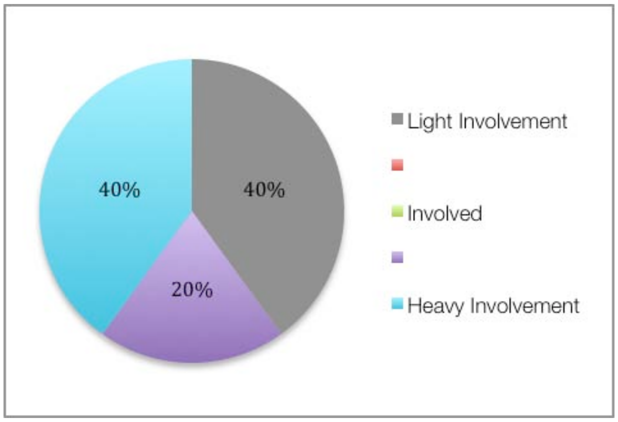
"I think the Summer Institute is a great initiative. The organizing team is very well coordinated and the lectures are interesting and informative. Bravo!"

Figure 6: Support staff evaluation responses

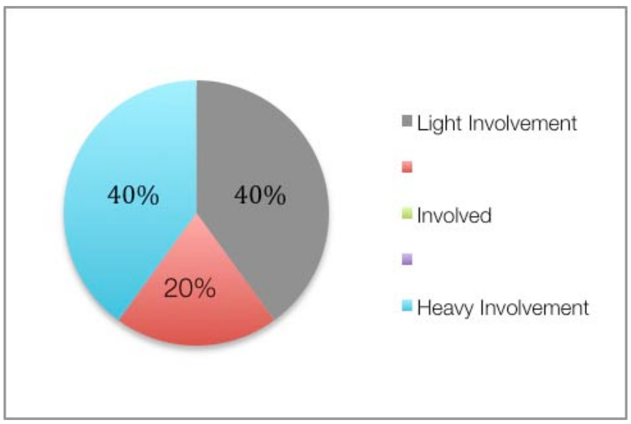
The objectives of the course met the expectations of the course



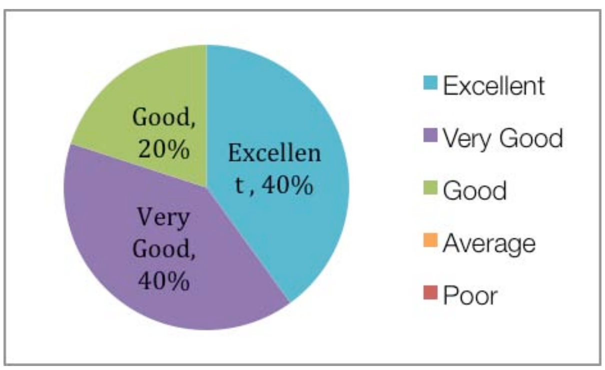
How would you rate the workload associated with the preparation of the Summer Institute (i.e. before it started)?



How would you rate the workload associated with the delivery of the Summer Institute (i.e. during the SI)?



How would you rate the overall Summer Institute 2011?



Daily Quiz Report

The participants of the 2011 Summer Institute were requested to complete a Daily Quiz, which covered the material of the lectures and practical sessions from the previous day. The Daily Quiz was scheduled for fifteen minutes before the start of the morning sessions and provided an assessment of the trainee comprehension and as a guide to future SI instruction. For more details on the daily questions and answers, please refer to Appendix 5.

Methods

The Daily Quiz was based on the previous day's lectures and practical sessions, and the respective facilitators created five to eight multiple-choice questions. The correct answers to the questions were sent to the participants immediately after the Daily Quiz, and the participants' responses were sent to the lecturers. The process was entirely anonymous and provided all participants with the opportunity to review the topics learned in the SI.

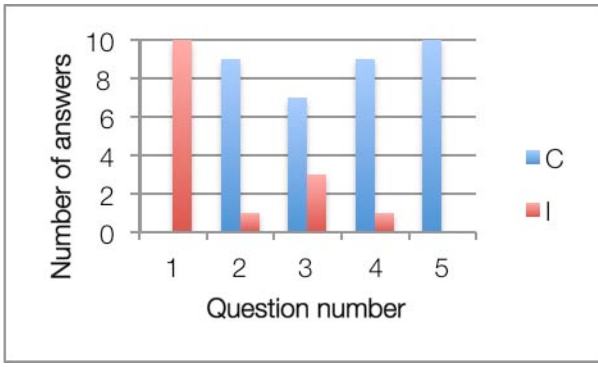
The participants' responses were tallied with Excel to determine how many correct and incorrect answers were selected for each question. Note that some questions had more than one right answer and that Day 10 of the course had no Daily Quiz.

Results

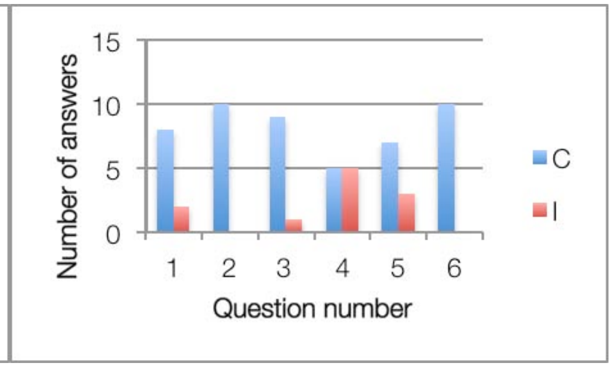
Week One

During the first week, the participants answered with accuracy for lectures with dataset analysis, calculation of monthly climatology, and the epidemiology of malaria, climate anomalies, GIS functions and poverty risk assessment. The bar charts below show the question number and the amount of questions that were correctly or incorrectly responded.

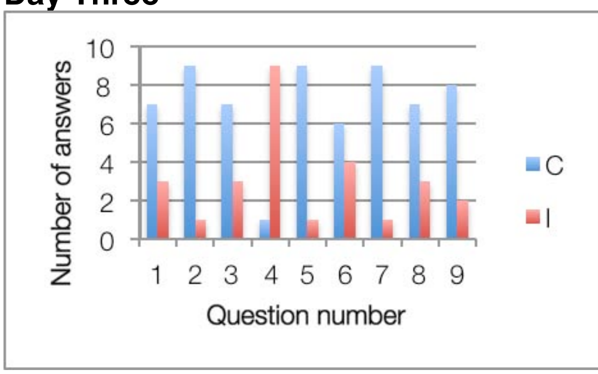
Day One



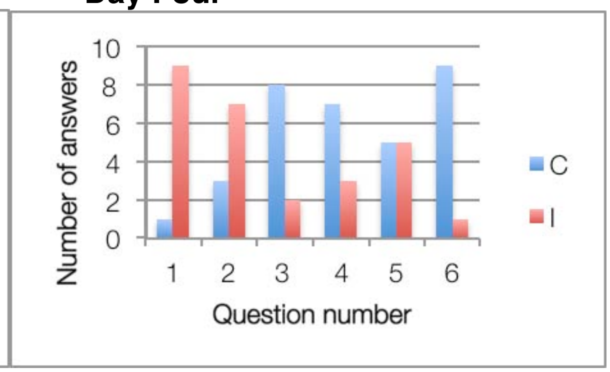
Day Two



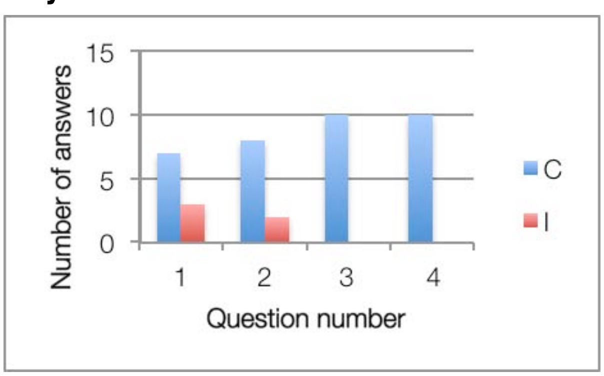
Day Three



Day Four



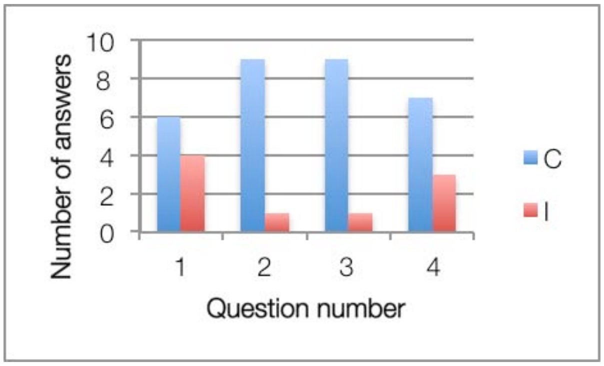
Day Five



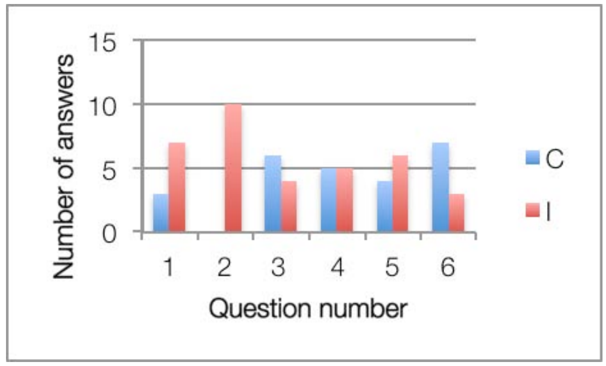
Week Two

The highest accuracy of responses was for the lectures that covered the following material: multi-model ensemble, ENSO, gridded analysis of climate for a region, and heat waves characteristics and factors. The bar charts below show the question number and the amount of questions that were correctly or incorrectly responded.

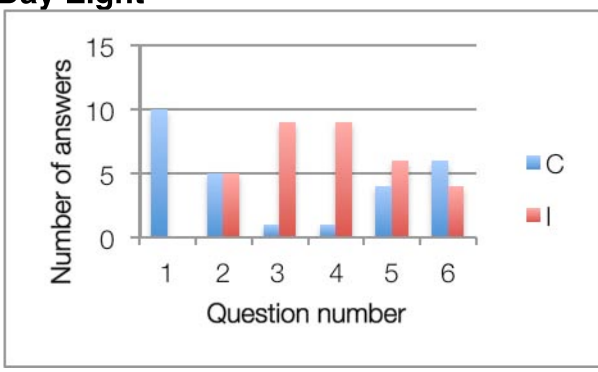
Day Six



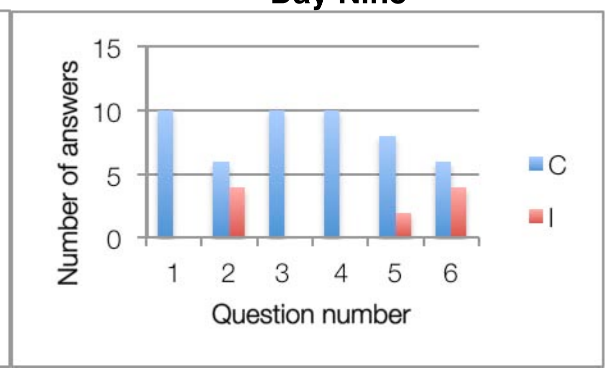
Day Seven



Day Eight



Day Nine

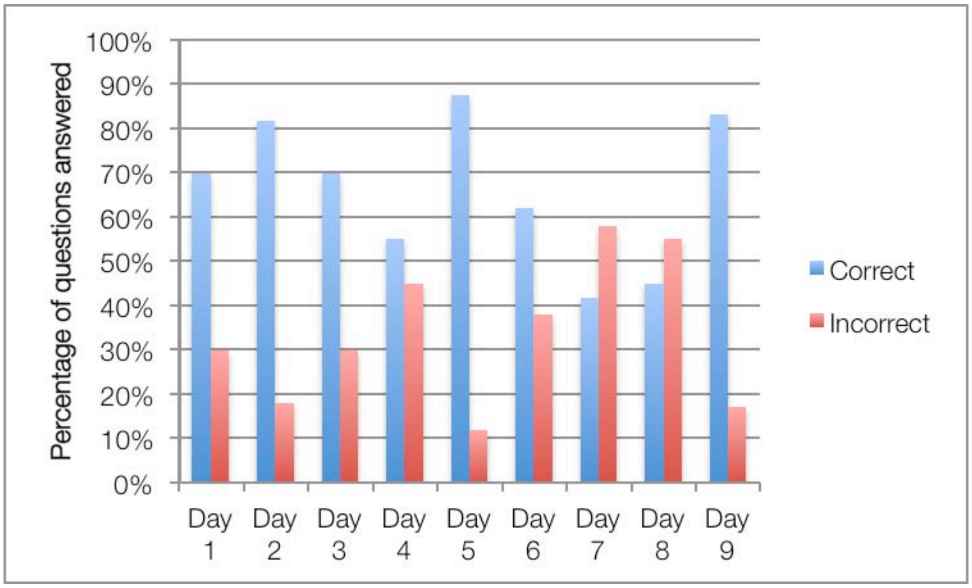


Discussion

Overall, the Daily Quiz was well received and generally well answered. There was an issue regarding the fairness of one question related to malaria epidemiology, as 'there is no point in memorizing the species names of Anopheles'. Further, due to language barriers, some participants had difficulties in understanding exactly what the questions were asking.

In this second year of implementation, the Daily Quiz proves to be an advantageous self-evaluation process for the participants and the facilitators, allowing participants to reinforce their understanding of the content reviewed during the SI. The bar graph below is a composite of all nine days in which the Daily Quiz was held.

Percentage of quiz questions in the Daily Quiz answered correctly or incorrectly.



Conclusions and Recommendations

On the whole, SI11 was deemed a great success by participants, organizers, facilitators and support staff. The participants felt challenged by the material included in the course and anticipated incorporating the methods learned in their ongoing work.

The most valued aspects of the course were considered to be the statistical analyses learned and the interaction with facilitators during the preparation of the poster projects and the final poster presentations.

The participants were unanimous that the opportunity to network with other climate and public health researcher and practitioners was the best part of the course.

The general 'excellent' performance of the SI11 was credited by the facilitators to the selection of good participants who showed great diversity and quality, and to the curriculum which was fairly balanced and well phased to allow the students to develop strong projects.

The organizers and support staff were highly commended for the efficiency with which the SI was operated. Overall perceptions given by the participants, organizers and facilitators at the end of the course included opportunities for future research collaborations and international training courses similar to the SI. To facilitate collaboration and networking, contact details for all participants, facilitators and support staff can be found in Appendix 8 of this document.

In addition to the praise the course received, a number of recommendations were made to help improve future courses. The morning summary and discussion sessions were considered important. However, it was recommended that instead of repeating the content of the previous day, the participants should present how the information received the day before would be used in their own work.

In general, the participants would have liked more time for discussion both with the facilitators and between themselves in the form of small group breakouts. In terms of the evaluation process, participants would have liked the opportunity to evaluate each lecturer independently, rather than rating all lecturers as a whole for a given day. The daily quiz received mixed reviews. The quiz is a fairly new feature of the Summer Institute and still needs some improvement in terms of material covered and format.

It was noted that there was some overlap between the lectures and it was suggested that more interaction amongst lecturers before the start of the course might remedy this.

Some participants felt that there was a lot of focus on infectious diseases and would have liked to have learned more about heat and pollution related public health issues such as non-communicable and chronic disease. In general, participants felt that it would be useful to go into greater depth in fewer topics.

For the practical sessions, the pace was too quick at times and participants did not always have time to absorb the meaning of the exercises. However, it was pointed out that the Data Library was complicated to use, which might hinder the ability to work independently though the practical exercises. In some instances, participants would have preferred to work with a partner.

A further suggestion was that a social scientist be included in future summer institutes as a facilitator. Participants felt that it would be useful to have a politician or someone responsible for implementing climate and public health policy as a summer institute facilitator, to challenge the ideas that are generated amongst the climate and public health community.

We shall leave the concluding remarks to the participants themselves:

“Life changing”

“It was a chance to meet people who we may collaborate with in the future. Both in the group and the IRI.”

“I’ve never had so much fun learning”

“I had a lot of ideas before but I didn't know what to do with them - I now feel I have the tools to do research, new students I can teach and engage other professors. I have experience building capacity and can share this with others.”

“The course gave me a chance to express myself”

“There is clear strength in the diversity of the group. What I have realized is we don't all need to be experts at the same thing - modelers, economists, communicators, public health specialists, meteorologists - but between us there is strength in moving forward along this path of increasing the collaboration between health and climate communities.”

“I think I made peace with researchers. I wish that most researchers were like people here who think more than papers. The dilemma now is I need to go back and talk to the researchers at home thinking in a new way.”

Appendix 1: Biographies

Participants

Gustavo Almeira
Meteorologist
National Weather Service - National Institute of Water
Argentina

A meteorologist who graduated from the University of Buenos Aires (UBA), Argentina, Gustavo is currently studying for a PhD in atmospheric science. His research interest is to investigate the relationships between meteorology and climate with health, specifically in establishing an Early Warning System for Heat and Cold Waves for the City of Buenos Aires. He collaborates at the National Weather Service (NWS) investigating on this area as well. His mission is to put in operations at the NWS the Early Warning System for heat and cold waves, joining efforts with the Ministry of Health He is also engaged in university teaching, as assistant teacher, in UBA, Department of Atmospheric Science.

Andry Rakotorahalahy
Data Manager
National Malaria Program
Ministry of Health
Madagascar

Andry holds a degree in applied computer science at the Antananarivo Polytechnic High School. He has been working as Informatics Engineer ever since he graduated. Since 2007, he has been charged with management of the malaria database at the Malaria program in the Ministry of Health. The main tasks in his work are to collect, analyze and store data on malaria from health facilities and partners. He also trains end users on the malaria database with the purpose of aligning all the users of the malaria data at state and national levels.

Paula Carvalho Pereda
PhD Student
University of Sao Paulo
Brazil

Paula is an economist with a master's degree in economic theory. In her dissertation, she estimated the relationship between people's nutrients intake and their income. In Brazil, obesity is increasing every year and this was the main motivation for her research. Presently, she is a PhD student at the University of São Paulo. Her thesis is trying to understand and to estimate the impact of climate changes on some specific diseases in Brazil.

Her experience in economics covers a range of areas including: consumer theory, econometrics, health economics, and climate change. She is an invited researcher at the Institute of Economic Research, University of Sao Paulo (FIPE-USP).

Emily Firth
Technical Officer, Epidemic Readiness and Interventions
World Health Organization
Geneva

Emily is a Technical Officer at the World Health Organization (WHO) in Geneva and provides project management support to the Epidemic Readiness and Interventions unit. With a background in environmental sciences, Emily contributes to the development of multi-disciplinary partnerships and projects for integrating environmental and health information to strengthen risk assessments and decision-making for diseases such as meningococcal meningitis, leptospirosis and yellow fever.

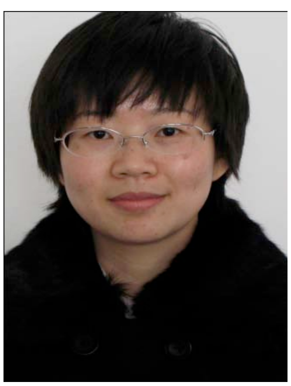
Upon completion of the M.A. in Climate and Society Program at Columbia University, Emily moved to Geneva in 2007 to work for the Group on Earth Observations (GEO) Secretariat and support the development of the Meningitis

Environmental Risk Information Technologies (MERIT) project.   Originally from Australia, Emily also sits on the Board of the International Environment Forum.

Monica Morraye
Professor
University of Franca
Brazil

Monica is a biologist with a master's degree and PhD in Ecology and Natural Resources from the Federal University of São Carlos. She teaches Environment and Health Promotion, the role of land use, land cover and climate changes on human health, using epidemiological data and mapping in the Health Promotion Department. Currently, she is part of the research team project "Early Warning System for Emerging Infectious Diseases in Southwestern Amazonia: technological innovation aiming at adaptation to the negative impacts of Global Climate Change on Human Health" financed by FAPESP (Fundação para o Amparo da Pesquisa).

LI Peng
Meteorologist
Shanghai Center for Urban Environmental Meteorology
China



Li Peng holds a bachelor's degree in Atmospheric Physics and Atmospheric Environment and a doctorate degree in Atmospheric Chemistry from Peking University. Since 2007, she has been working at the Shanghai Center for Urban Environmental Meteorology. Her work focuses on atmospheric chemistry research and air pollutant forecast such ozone. Since last year, she has been engaged in research on weather/climate and related diseases.

Anna Maria Stewart Ibarra
Ph. Candidate
Ecology
Syracuse University

Anna Marie is a PhD candidate in Ecology at the SUNY College of Environmental Science and Forestry and a Masters of Public Administration student at Syracuse University. Since 2007, she has been conducting research in dengue fever in collaboration with an international and interdisciplinary team of researchers and government officials in Ecuador. The objectives of this research are to develop and implement a climate-driven Early Warning System for dengue fever and malaria. As a visiting researcher at the Ministry of Health and the National Institute of Meteorology and Hydrology of Ecuador, she is currently conducting a 13-month field study to investigate the climatic and social factors that influence the risk of contracting dengue fever

Salua Osorio, MD
Coordinator of the National Adaptation Project
Human Health Component
National Institute of Health
Colombia

Salua is a medical doctor by training with a Masters in Public Health from John Hopkins University and other studies in the environmental field. She has eight years of work experience in environmental health and vector borne diseases, principally in surveillance and control programs. In the last five years, she has managed the health component of the Climate Change Adaptation Pilot Project in Colombia with the National Institute of Health, where she has gained a breadth and depth of experience in coordinating work with multidisciplinary groups, government agencies and international organizations. Her work has also helped her gain an understanding of the challenges of linking the exposure (climate change) to the effect (health event) and in translating the research results into practical tools for decision-making.

May Kei Liza To, MD
Principal Medical and Health Officer
Department of Health
Hong Kong

May graduated at the Faculty of Medicine of the Chinese University of Hong Kong in 1993. Afterwards she worked as a physician in internal medicine at the Hospital Authority of Hong Kong. Since 1997 she worked in the Department of Health, Government of the Hong Kong Special Administrative Region. Currently, she is working as the Principal Medical and Health Officer, responsible for environmental health and emergency response. She has specialist qualifications in public health medicine.

Currently she is a member of the Interdepartmental Coordinating Committee on Climate Change of the Department of Health. Her team provides professional advice on human health issues as they relate to governmental policies in environmental protection and climate change.

Jenifer Vanos
PhD Candidate
Environmental Sciences
University of Guelph
Canada

Jenifer is currently a PhD candidate at University of Guelph's School of Environmental Sciences in Ontario, Canada. She holds a bachelors degree in Environmental Sciences with a major in Earth and Atmospheric Sciences. Specific research interests lie in human biometeorology, urban heat islands, human comfort, outdoor recreational design, environmental stewardship and human health. She intends to develop a broad and highly integrated understanding of the relationship between humans and the climatic environment, linking to health and adaptation.

An active teaching assistant at the University for many meteorology and geography courses, Jenifer immerses herself in effective education of young minds and hopes to continue with research and teaching in the future.
She has also proudly representated her University as a varsity athlete for five years. Additionally, she is Vice President of the Graduate Student Committee and an active member of the EcoHealth organization.

Facilitators

Tony Barnston
Director, Forecasting Climate, Prediction, Outreach
IRI

Tony was an operational seasonal climate forecaster and developmental researcher in empirical prediction methodology at the Climate Prediction Center of NOAA for 17 years. He has authored atlases, reports and journal papers on weather and climate, the best known of which were on statistical diagnosis of large-scale circulation patterns and on empirical climate prediction. With his forecast staff, he ensures the production and routinely scheduled issuance of a range of IRI forecast products since 2000, including monthly forecasts of sea surface temperatures (including an ENSO outlook) and global precipitation and temperature.

Mark Becker
Associate Director, Geospatial Applications Division
CIESIN

Mark leads the Geospatial Applications Division at CIESIN, and is an adjunct faculty member at the Mailman School of Public Health. His primary interests are the development of GIS applications for public health programs, and improving urban and regional planning through geospatial technologies. At CIESIN he has partnered with numerous departments and programs at Columbia University to assist in the use of geospatial technologies: with the Columbia Center for Children's Environmental Health, looking at the effects of air pollution on children's health; with the Columbia Superfund Basic Research Program, developing GIS training programs in Bangladesh; and working with the Research Translation Core of the program to bring the findings and techniques of the project to a wider audience.

Michael Bell
Senior Staff Associate, Climate Monitoring and Dissemination
IRI

Michael studied meteorology at the University of Oklahoma and graduated with bachelor's and master's degrees in 1994 and 2001, respectively. His master's work involved the study of the decadal and interannual variability of West African rainfall disturbance lines. He joined the IRI in 2001. His research interests include rainfall variability in West Africa and, more generally, the contributions of weather variability to climate. Bell's responsibilities include contributing to the monthly publication of the IRI Climate Information Digest, support of the IRI Data Library and Map Room, and data acquisition and analysis in support of regional programs and projects.

John Balbus
Senior Advisor
NIEHS

John received his degree in Biochemistry from Harvard University, his M.D. from the University of Pennsylvania, and his M.P.H. from the Johns Hopkins School of Public Health. Currently he serves as a senior advisor to the Director on public health issues and as NIEHS liaison to its external constituencies, stakeholders, and advocacy groups. He also leads NIEHS efforts on climate change and human health. In this capacity he serves as HHS principal to the U.S. Global Change Research Program, for which he also co-chairs the Interagency Cross-Cutting Group on Climate Change and Human Health.

Dr. Balbus' background combines training and experience in clinical medicine with expertise in epidemiology, toxicology, and risk sciences. He has authored studies and lectures on global climate change and health, transportation-related air pollution, the toxic effects of chemicals, and regulatory approaches to protecting susceptible subpopulations.

Pietro Ceccato
Associate Research Scientist, Environmental Monitoring
IRI

Pietro trained originally as an agronomist and soil science scientist. He obtained a Master in Environmental Management using decision-support systems and worked as a research scientist at the Natural Resources Institute in United Kingdom. He worked at the European Commission Joint Research Centre (Ispra, Italy) and used this work to obtain his PhD in Remote Sensing (2001, University of Greenwich, UK). Pietro then joined the UN Food and Agriculture Organization (Rome, Italy) to develop an early warning system for Desert Locust monitoring. He joined the International Research Institute for Climate and Society in 2004. His current research activities include the development and integration of environmental remote sensing products into early warning systems for human health, pest management and fire risk.

John del Corral
Senior Staff Associate, Database, GIS
IRI

John is interested in the role of computers and computational science in the multi-disciplinary areas of geophysical research. This includes high performance computing, graphical techniques, geographical information systems, database technology, and learning the basic science in the areas of research. John is currently in the Climate Monitoring and Dissemination Division at the IRI. He is actively involved in the establishment and maintenance of a mirror site of the IRI Data Library in Taiwan. He has also built a geographical gazetteer database for IRI institute-wide use. This database incorporates OpenGIS geometries for representing political and geographic objects. John also participates in the current and future design and content delivery of the IRI website. He received his computer science degree from the University of Colorado.

Rémi Cousin
Staff Associate, Data Library
IRI

Rémi received his degree from l'Ecole Nationale Supérieure des Mines de Nancy in engineering with majors in geo-sciences, in 2005. After specializing in physical oceanography through internships in l'Institut de Recherche pour le Développement and Mercator-Océan, Toulouse, France, and Universidad de Concepción in Chile, he worked for Collecte Localisation Satellite, a subsidiary of CNES, as a consultant at Mercator-Océan to develop user friendly tools to run and post-process Mercator ocean models dedicated to operational oceanography. Rémi then worked at the Jet Propulsion Laboratory (JPL), Pasadena, California, to develop a public outreach and education website on ocean salinity in the context of the co-developed NASA satellite mission Aquarius, and to conduct research to support the activities of the OurOcean group, focusing on regional ocean models. Since 2008, Rémi has been a member of IRI Data Library to develop new functionalities and enable climate information communication and dissemination to end-users.

Ashley Curtis
Staff Associate
IRI

Ashley joined the IRI in 2008, after completing her master's degree in Environmental Science and Policy at Clark University. Her master's thesis investigated neural network modeling methods for describing animal species distributions. She previously worked at Columbia University's Tree-Ring Laboratory, where she collected, processed, and analyzed tree-ring data used to understand past climate and environmental history. She also worked with a wildlife conservation group in the Philippines for several years as a Peace Corps volunteer. She earned her bachelors degree in Biology from Bard College.

At IRI, she coordinates the Climate Program and contributes to research, education, and outreach efforts. She is also actively involved with IRI's partnership with the International Federation of the Red Cross and Red Crescent Societies (IFRC). She communicates and contextualizes climate and forecast information that humanitarian decision makers can then use to improve preparedness for weather and climate related disasters

Rachel Lowe
Visiting Scientist
ICTP

Rachel is currently a Visiting Scientist at ICTP, working on the EU FP7 project "QWeCI - Quantifying Weather and Climate Impacts on Health in Developing Countries". Rachel graduated from the University of East Anglia in 2004 with a First Class Honours BSc in Meteorology and Oceanography with a year in Europe. She spent one year at the University of Granada in Spain reading Environmental Science. In 2006-07 she completed an MSc with distinction in Geophysical Hazards at University College London where she received a Graduate Masters Award. From 2007-10 Rachel was a PhD student at the College of Engineering, Mathematics and Physical Sciences, University of Exeter (PhD Thesis: Spatio-temporal modelling of climate-sensitive disease risk: towards an early warning system for dengue in Brazil). She was also Network Facilitator for the Leverhulme Trust funded project EUROBRISA.

Wayne Elliott
Head of Health Forecasting
Met Office

Wayne is currently Head of the Health Programme at the Met Office in Exeter, having worked for the organization for 25 years. The work of the health forecasting team involves understanding how weather and other aspects of the environment impact people's health, then using this knowledge to inform individuals and organizations about the risk.

Through the development of health forecasts, the aim is to keep people well and to maximize the effectiveness of healthcare resources. Originally, Wayne trained as a meteorologist, working at many locations across the UK and the world, to provide a range of weather and climate services for customers. As part of this, he presented the weather on BBC television before moving to become a senior lecturer at the Met Office College. In 2003, he became the Chief Press Officer at the Met Office managing the PR and media affairs for the organization.

Dia-Eldin A. Elnaiem
Associate Professor of Applied Zoology
University of Maryland

Dia-Eldin currently works in the Department of Natural Sciences at the University of Maryland. His previous work was at the Oak Ridge Associated Universities at the National Institutes of Health where he conducted research on biology of phlebotomine sand flies and transmission and epidemiology of leishmaniasis. He spent 15 years as a professor at the University of Khartoum in Sudan, where he taught courses on medical entomology, parasitology and basic zoology and conducted research on the epidemiology of leishmaniasis and malaria. He received his Ph.D. in Medical Entomology from the Liverpool School of Tropical Medicine.

Patricia Graves
Epidemiologist
Carter Center Malaria Control Program

She joined The Carter Center in January 2007. As program epidemiologist, she provides scientific support to the Center's Malaria Control Program. She has 25 years experience in applied research and project management in vector-borne disease epidemiology and control, including 11 years advising aid agencies and national governments in Asia, the Pacific, and Africa. She contributed key knowledge to malaria transmission dynamics during a large malaria entomological research project in Papua New Guinea, which she directed. Her recent significant contributions include the use of evidence and information to assess and improve the effectiveness of control measures for malaria and filariasis.

She received her BA from Cambridge University, her doctorate in science from the London School of Hygiene and Tropical Medicine and her MPH from the University of Colorado Health Sciences Center.

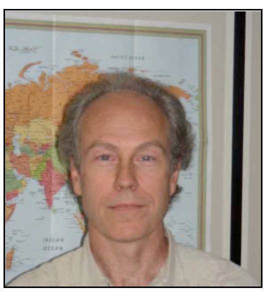
Patrick Kinney
Associate Professor of Environmental Health Sciences
Columbia University, Mailman School of Public Health

Patrick's teaching and research address issues at the intersection of global environmental change, human health, and policy, with an emphasis on the public health impacts of climate change and air pollution. He has carried out numerous studies examining the human health effects of air pollution. He developed a new interdisciplinary research and teaching program at Columbia examining the potential impacts of climate change on human health. Dr. Kinney was the first to show that climate change could worsen urban smog problems in the U.S., with attendent adverse health impacts. He earned his PhD at the Harvard School of Public Health.

Kim Knowlton
Assistant Clinical Professor of Environmental Health Sciences
Columbia University, Mailman School of Public Health

Kim is Senior Scientist on NRDC's Global Warming and Health Project. She works with the Health and Environment Program on communicating the health impacts of global warming, and also on advocating for public health strategies to prepare for and prevent these impacts. Her research has looked at heat- and ozone-related mortality and illnesses as well as possible connections between climate, pollen, allergies and asthma. She attended Cornell University and Hunter College/CUNY, and received a doctorate in public health from Columbia University, where she was a postdoctoral research scientist before joining NRDC, and where she is currently Assistant Clinical Professor in the Department of Environmental Health Sciences.

Richard Luce
Resident Advisor, Ethiopia Field Epidemiology and Laboratory Training Program
Center for Disease Control and Prevention, Ethiopia



Richard completed his BA degree at Southern Methodist University and attended veterinary school at North Carolina State University. He completed a clinical internship in large animal medicine and surgery at Texas A&M University. He holds an MA in International Affairs from Columbia University and an MPhil in veterinary science (epidemiology) from the University of Cambridge. He completed the U.S. Centers for Disease Control and Prevention's (CDC) Epidemic Intelligence Service program as well as the CDC's Preventive Medicine Fellowship program. He has worked for as an epidemiologist for the Wyoming Department of Health, the CDC Dengue Fever Branch in Puerto Rico and most recently as the Resident Advisor to Ethiopian Field Epidemiology and Laboratory Training Program.

Bradfield Lyon
Research Scientist, Climate Diagnostics, Drought
IRI

Brad received his Ph.D. in meteorology from MIT and joined the IRI in 1999. His research activities are focused on observational and modeling diagnostic studies of climate variability, primarily on time scales associated with seasonal to interannual variability but also including climate change. He is particularly interested in investigating causal mechanisms, regional manifestations, prediction, and impacts of drought. While active in climate diagnostic research, he also serves as a liaison and coordinator for climate research studies in the Philippines and Vietnam. With a focus on observational studies of climate variations he participates in monthly updates of "real time" global climate variations including the status and evolution of ENSO. He is involved in a number of IRI's climate risk management projects and contributes to training and capacity building activities conducted at the IRI and in countries of IRI regional partners.

Gilma Mantilla
M.D. Senior Staff Associate, Public Health
IRI

Gilma is a graduate of Columbia University (Climate and Society MA, 2008), Rosario University, Colombia (Epidemiology 1998), Javeriana University, Colombia (Master in Health Management, 1993) and Escuela Colombiana de Medicina (Physician Surgeon, 1988).

Before joining IRI, she was Colombia's Public Health Surveillance and Control Deputy Manager at the National Health Institute where she worked mainly to establish policies, plans, programs and projects in public health associated with the surveillance and control of infectious diseases; to redesign the National Infectious Diseases Surveillance System and to support operational research on issues like epidemics, outbreaks and disasters. In the IRI she is working to establish tools and protocols for creation, integration and dissemination of knowledge and information related with climate and public health.

Simon Mason
Research Scientist, Forecasting, Prediction Research
IRI

Simon has been involved in seasonal climate forecasting research and operations since the early 1990s. He has extensive experience in the production of seasonal climate forecasts in contexts such as the Regional Climate Outlook Forums, and works closely with the World Meteorological Organization to promote the definition and adoption of forecasting and verification standards through engagement in the relevant WMO Expert Teams and through the WMO CLIPS Capacity Building Workshops. Mason's primary areas of research include development of methods for diagnosing the quality of forecasts ("forecast verification"), and for recalibrating ensemble predictions. As part of the IRI's outreach and collaboration with other partners, Mason has been heavily involved in capacity building activities, including leading the development and support of the Climate Predictability Tool.

Judy Omumbo
Associate Research Scientist, Epidemiology, Disease Risk Modeling
IRI

Judy is an Associate Research Scientist at the International Research Institute for Climate and Society (IRI). Her scholarly work has been mainly on GIS-based mapping of malaria in East Africa using climate data and empirical malariometric data. Her current work is on developing risk maps of climate sensitive diseases in Africa including Rift Valley fever, meningitis and malaria. She is a graduate of Oxford University (PhD, 2004), Hebrew University, Jerusalem (Master in Public Health 1993) and the University of Nairobi (Bachelor of Dental Surgery 1987).

Daniel Ruiz Carrascal
Graduate Research Assistant, PhD student
IRI

Daniel is participating in the development of one of the components of the National Integrated Dengue and Malaria Surveillance and Control System, an initiative that has been proposed to mitigate the possible adverse effects of climate change on human health in his home country of Colombia. He is also interested in the potential impacts of climate change on high mountain ecosystems.
He is a graduate of Columbia University (M.A., Climate and Society, 2007) and the National University of Colombia (M.S., Water Resources, 2002, and B.S., Civil Engineering, 1997.)

Andy Robertson
Research Scientist, Predictability, Downscaling
IRI

Andy graduated from the University of Leeds, U.K., with a B.Sc. in mathematics and geography, and he also received an M.Sc. from Imperial College, London in atmospheric physics and dynamics, and a Ph.D. in atmospheric dynamics from the University of Reading in 1984. His research interests include regional climate variability, predictability and change, probabilistic daily rainfall modeling, predictability of weather-within-climate, climate downscaling methodologies, and tailoring of climate information for use in conjunction with sectoral models for climate risk management. Robertson currently leads the downscaling division within IRI's Climate Program, and is the climate nodal person for IRI's Asia-Pacific regional program. His work is focused on bringing climate information into regional projects that seek to demonstrate the value of "climate risk management," through targeted research, tool development, and training/outreach.

Jeffrey Shaman
Assistant Professor of Environmental Health Sciences
Columbia University, Mailman School of Public Health

Jeffrey research includes investigations of large-scale climate dynamics, tropical meteorology, the hydrologic cycle, medical entomology, mosquito ecology, infectious disease, and climate and disease forecast. Presently, he studies ENSO teleconnections, in particular the effect of ENSO on the North African-Asian jet. This has led to the study of Rossby wave dynamics, atmospheric jet waveguides, the coupled South Asian monsoon-ENSO system, extratropical precipitation, and Atlantic-basin tropical cyclogenesis. In addition, he investigates how hydrologic variability affects mosquito ecology and mosquito-borne disease transmission, and the environmental determinants of influenza transmission and seasonality.

Madeleine Thomson
Senior Research Scientist, Climate Information for Public Health
IRI

Madeleine is a Senior Research Scientist at the International Research Institute for Climate and Society with over eight years of service in the management team as Director of Impacts Research, Chair of the Africa Regional Programme and Senior advisor to the PAHO-WHO Collaborating Centre for malaria and other climate sensitive diseases.
She has over 25 years of operational research experience (6 resident in West Africa) focused on large-scale, climate-sensitive, health Interventions in developing countries (especially Africa). She also has an extensive engagement in policy processes re the development of effective demand for climate information, creation of international summer institute on use of climate information in public health decision-making.

Sylwia Trzaska
Associate Research Scientist, Climate Variability, Atlantic
IRI

Sylwia has been with the IRI since 2002. Her research interests include climate variability in the tropical Atlantic on the regional scale including Southern America and Africa with special focus on tropical areas, including Nordeste, Sahel and Southern Africa. She is also interested in observed, reanalysed and model data analysis on seasonal to decadal time-scales model sensitivity studies to boundary condition modifications, and decadal modifications of the major teleconnections in the tropical Atlantic region. She received her PhD from Université de Bourgogne.

Support Staff

Ann Binder
Manager, Staff and Operations
IRI

Ann Binder prepares budgets and sub-contracts in support of IRI and its projects. She assembles and consolidates all income streams and affiliated program budgets into a coherent single financial plan to serve the IRI, it's funding agencies, and collaborative business resources. She coordinates human resources for the IRI and assembles information, documents, and hiring plans in coordination with appropriate divisions of Lamont-Doherty Earth Observatory and Columbia. She also works with governmental organizations that facilitate visitor and post-doctoral programs.

Michael Dervin
System Analyst, Systems Administration
IRI

Michael has been working at the IRI for about 2 years. He has been a member of the Computing Support team at the IRI and he is responsible for many of the computer operational services at the IRI. He also provides guidance for data storage systems and software tools.

Francesco Fiondella
Communications Officer, Office of the Director-General
IRI

Before coming to the IRI, Francesco worked as an editor in the Wall Street Journal's news graphics department and moonlighted as a science/health reporter for the paper as well. He has also freelanced for a variety of publications, including Discover, The Scientist and Reuters Health. Francesco earned his undergraduate degree in environmental science at Brown University, and his masters degrees in earth and environmental science and in journalism from Columbia. Francesco promotes the IRI's innovative work primarily by writing features for the Institute's home page and engaging with journalists, partner organizations and members of the general public. He designs and edits institutional reports, presentations, and flyers. He also maintains the Institute's media page and news-related email list.

Rise Fullon
Program Coordinator
IRI

Rise is responsible for analyzing and organizing current and pending project/activities data to maintain some of IRI's knowledge databases. She interacts with staff for contributions and content development for IRI's internal newsletter as well as various internal and external project reporting requirements.

Thea Murillo
Administrative Assistant
IRI

Thea has been with the IRI since July 2007. She provides daily administrative support for the IRI staff. This work includes events coordination, arranging travel accommodations, and the handling of various projects. Her degree is in early childhood education.

Barbara Platzer
Africa Regional Program Coordinator
IRI

Born in Nairobi, a UN kid, Barbara has a long-standing interest in Africa. Prior to joining the IRI, she served as Assistant Director for the Risk Analysis Group of the Columbia Business School and has been working at Columbia University since 2004. She holds a Masters of International Affairs from the University of Chicago and a Bachelor of Arts in International Relations from Brown University. Barbara serves as coordinator of the Africa Regional Program at the IRI, contributing to the operational and strategic objectives of the Program, its Committee members and more broadly the institute. Barbara serves as a point of contact for Africa regional activities within the IRI, to Earth Institute and Columbia University officials, as well as to external partners.

Jason Rodriguez
Production Aide, Communications/Graphic Design
IRI

Jason Rodriguez is a graphic designer specializing in web layout design, xhtml, css, and traditional print design. His past experience includes his work as a Production Assistant for JTP Creative in NYC organizing photo shoots and creating casting websites. He also was owner director of Residue Gallery, a contemporary arts space in Jersey City, NJ. Jason earned his BA in Computer Arts and Design from Oneonta University (SUNY). In the role of Production Aide, Jason is responsible for assisting communications officer, Francesco

Fiondella, with layout, design, and production on a variety of print and web features promoting the IRI's innovative work.

Jeffery Turmelle
IT Director
IRI

Jeffrey Turmelle received his B.S. degree in Computer Science from the University of Lowell, MA in 1987 and a Masters of Technology Management from Columbia University in 2007. Jeffrey worked in graphics research for the University of Lowell's Graphics Research Laboratory before getting involved in Image Processing at a small startup: Paragon Imaging. He then became involved in large-scale development working on medical applications for Sony Electronics. In 1996 he joined Lamont-Doherty Earth Observatory to become the Data Reduction Manager on the R/V Maurice Ewing (Columbia University's Research Vessel). Since 2001, Jeffrey has been a member of the Computing Support team at the IRI and is responsible for many of the computer services at the IRI, including email, directory services and web services. Currently he is the IT Director.

Cathy Vaughan
Project Coordinator
IRI

Cathy Vaughan is a project coordinator at the IRI. She holds master's degrees in International Relations (Yale 2007) and Climate and Society (Columbia 2008). Cathy has worked for organizations including the Global Roundtable on Climate Change, the Mission of Dominica to the United Nations, and the Austin Chronicle; from 2003 until 2005, Cathy served with the US Peace Corps in Zambia. She is the author of Climate Change: A Reference Handbook, published earlier this year.

Sandy Vitelli
Administrative Assistant, Administrative Support
IRI

Sandy provides day-to-day administrative support for the organization. She handles special projects with staff and visitors, organizing professional conferences and meetings. She coordinates events, arranges travel accommodations, and manages reimbursements related to expenses and the dissemination of reports. She also ensures overall effectiveness and efficiency, while interacting with diversified groups within and outside the IRI.

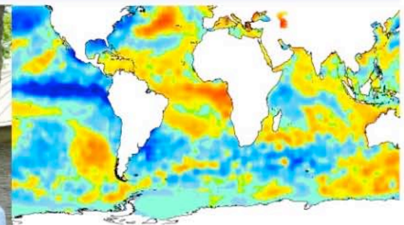
Luciana Mendiola
Millennium Villages Project
Earth Institute

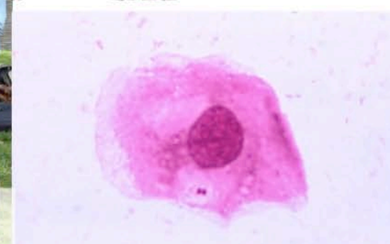
She earned a double bachelor degree in Evolutionary, Ecological and Organismal Biology and in Biological Anthropology from Vanderbilt University in 2008. In 2010, she graduated from Columbia University with a Masters of Arts from the Climate and Society program, and acted as a Support Staff member during the 2010 Summer Institute. Luciana then interned at the Social Security Fund in Costa Rica, where she began to develop the first Early Warning System for the country based on climate variables for two diseases, malaria and dengue. Currently, she is part of a research team that aims to create a model for malaria in the Millennium Villages in Africa.

Appendix 2: Course Advertisement

CLIMATE INFORMATION FOR PUBLIC HEALTH

SUMMER INSTITUTE 2011





Clockwise from left: Participants, facilitators from SI2010. F. Fiondella/IRI; Microscopic image of Neisseria meningitidis, a bacteria best known for its role in meningitis; An IRI Data library image of a la Niña SST anomaly

WITH THE WORLD'S ATTENTION

focused on mechanisms for adaptation to climate variability and change, it is essential, not only for public health communities, but also for planners in central government, to understand the role climate plays in driving disease burden and impacting economic growth. Public health often emerges as the final common pathway for all impacts of climate variability and change on both individuals and society.

As a contribution to this process, The International Research Institute for Climate and Society, in partnership with the Center for International Earth Science Information Network (CIESIN) and the Mailman School of Public Health initiated this two-week course in 2008. Building on the response of our 2008 – 2009 -2010 alumni, and partners, we are pleased to announce The Summer Institute 2011 course on 'Climate Information for Public Health' will be held May 16 – May 27, 2011 at the Earth Institute, Columbia University, Lamont Campus located in Palisades, New York.

The International Research Institute for Climate and Society (IRI)/Earth Institute at Columbia University is the premier global research and capacity building institution focused on the use of climate information for improved risk management in public health. In 2004 the IRI was designated a Pan-American Health Organization - World Health Organization (PAHO-WHO) Collaborating Centre for climate-sensitive diseases and has active international partnerships for malaria, meningococcal meningitis, Rift Valley Fever and health conditions associated with flood, drought and disasters.

COURSE DATES

May 16 – 27, 2011

VENUE

The Earth Institute, Columbia University Lamont Campus located at:
61 Route 9W, Monell Building, Palisades, New York.

DEADLINES

Application deadline is:
February 11, 2011

Online registration and payment deadlines are: **March 30, 2011**

Early registration is recommended.

COST

The cost of the course is **US$ 7,950.00** *(includes tuition, hotel, meals, ground transportation, and training materials -- does NOT include airfare, visa or health insurance).* **Limited Full Scholarships are available.**

CLIMATE INFORMATION FOR PUBLIC HEALTH

SUMMER INSTITUTE 2011

Participants and facilitators from SI2010 gather for the poster session. J. Rodriguez/IRI

Overview of the course

This two week course will provided a balance of concepts and methods from the health and climate communities using an approach deeply oriented toward methodology, gathering and using evidence for decision-making in order for the participants to get in-depth knowledge and skills in decision-making for health-care planning of climate sensitive diseases. **The course will be conducted entirely in English.**

The course will help participants (i) understand the role climate plays in driving the infectious disease burden and public health outcomes, (ii) use new tools for accessing climate and epidemiological data, for analyzing and mapping using the IRI Data Library and other Geographic information Systems (GIS) and (iii) understand management and data integration as an opportunity to improve the decision making process in public health

Who Should Attend?

This course targets professionals who play a research role in the operational decision making or public health-care planning, evaluation, surveillance or control of climate sensitive diseases.

The course is limited to 12 participants

Visit us on the web at:
http://iri.columbia.edu/education/ciph11

LEARNING OUTCOMES

- » Recognize the role climate plays in driving the infectious disease burden and public health outcomes
- » Understand management and data integration as an opportunity to improve the decision making process in Public Health
- » Realize the timescales, the benefits and limitations of different climate and environmental data sources including remotely sensed data, meteorological data and climate predictions
- » Use new tools for accessing climate and epidemiological data, for analyzing and mapping through the IRI Data Library and GIS

FOR MORE INFORMATION

Reach us via e-mail:
ciph@iri.columbia.edu

The International Research Institute for Climate and Society,
The Earth Institute at
Columbia University, Lamont Campus
61 Route 9W, Monell Building
Palisades, NY 10964-8000 USA

The International Research Institute for Climate and Society

Columbia University MAILMAN SCHOOL OF PUBLIC HEALTH

CIESIN Columbia University

Appendix 3: Application Form

Application Form

May 16 – May 27, 2011

General Information

Family Name:	First Name:
Institution/Organization:	
Occupation:	
Nationality:	
Date of Birth (mm/dd/yyyy):	Sex:
Address for correspondence:	
City:	
Country:	Postal Code:
Telephone:	Fax:
Mobile:	Email:

Application for two-week training course: May 16 – May 27, 2011

I would like to participate at the two-week training course.

I will have funding resources to cover the cost of attendance* plus air travel: ___Yes ___No

If yes, please provide details on funding resources:

On behalf of my institution, I commit to partner in the development of similar trainings in my home-country: ___Yes ___No

I am willing to facilitate future trainings on Climate Information for Public Health using my experience of the Summer Institute: ___Yes ___No

My institution will provide me with a dataset** that I will use during the practical sessions of the Summer Institute: ___Yes ___No

If yes, please provide details on this dataset:

**A limited amount of scholarships are available for applicants*

***This dataset is to be used only by the participant and only for the purpose and duration of the training.*

Profile of the applicant				
Language skills				
Mother tongue(s):				
English proficiency:	Speaking:	Basic	Good	Very good
	Reading:	Basic	Good	Very good
	Writing:	Basic	Good	Very good
Computer skills				
Knowledge of:	Excel®:	Basic	Good	Very good
	SAS®:	Basic	Good	Very good
	Stata®:	Basic	Good	Very good
	SPSS®:	Basic	Good	Very good
	R®:	Basic	Good	Very good
	MathLab®:	Basic	Good	Very good
	Other (Specify):	Basic	Good	Very good
Prior knowledge on health and climate				
Do you have a degree in health?			Yes	No
If yes, specify:				
If no, detail your experience in public health:				
Do you have a degree in climate/meteorological science?			Yes	No
If yes, specify:				
If no, detail your experience in climate/meteorological science?				

In addition to this application form, please provide the following documents:
Short Curriculum Vitae (CV) of maximum 2 pages, including a recent photo (jpg format).

Brief statement on how this course will benefit you, your organization and the broader community (300 words maximum)
Support letter from your institution acknowledging its commitment to partner in the development of similar trainings in your country

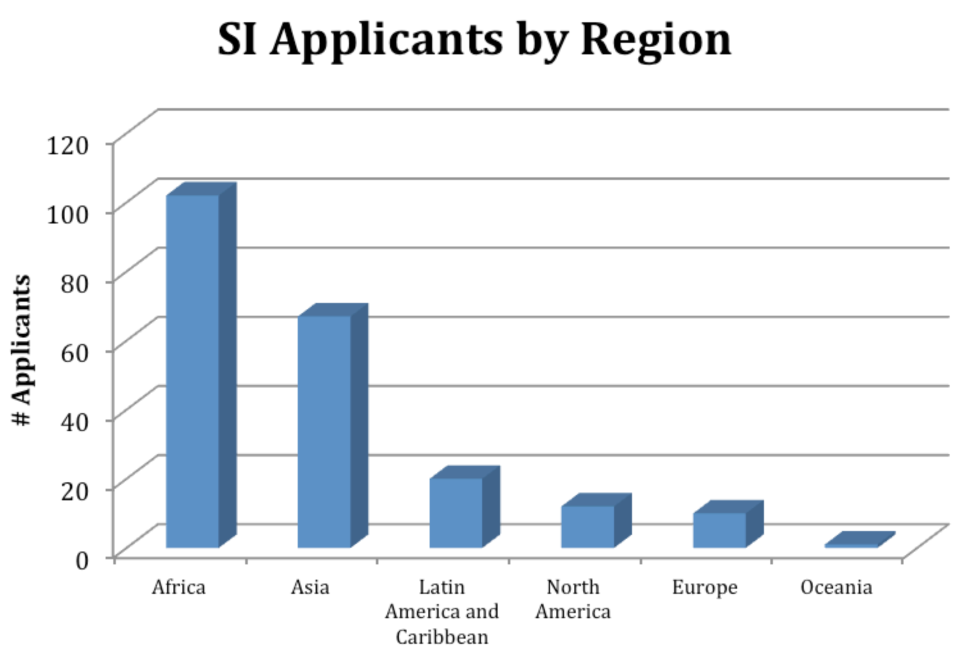
If you have any further questions , please contact:
Dr. Gilma MANTILLA,
International Research Institute for Climate and Society
Address: The Earth Institute, Columbia University, Lamont Campus, 61 Route 9W, Monell Building, Palisades, NY 10964-8000, USA
Tel.: +1 845 680 4485 ; Fax: + 1 845 680 4864 ; Email: mantilla@iri.columbia.edu

Signature: Date:

Appendix 4: Application Report

The International Research Institute received a total of 212 applications for its 2011 Climate Information for Public Health Action Summer Institute. As in years past, the applicants represented a very diverse set of nations from 6 different continents. The break down by region was as follows:

Africa – 102 Applicants (48%)
Asia – 67 Applicants (32%)
Latin America/Caribbean – 20 Applicants (9%)
North America – 12 Applicants (6%)
Europe – 10 Applicants (5%)
Oceania – 1 Applicant (< 1%)



Africa

There were 41 applicants representing Africa from a total of 13 countries. The greatest number of applicants was from Ethiopia (22) and Nigeria (3). The most represented occupations were researchers (10), program management (8), professors (5), and public health (5).

African Countries

Countries Represented	Number of Applicants
Ethiopia	22
Nigeria	3
Cameroon	2
Ghana	2
Kenya	2
Morocco	2
Uganda	2
Burkina Faso	1
Madagascar	1
Mali	1
Senegal	1
South Africa	1
Sudan	1

Applicant Professions (Africa)

Position Title	Number of Applicants
Researcher/Scientist	10
Program Manager/Director/Officer/Leader	8
Teacher/Professor/Lecturer	5
Health Professional/Public Health	5
Student/Resident	3
Information/Data Management/GIS Professional	3
Project Officer/Coordinator/Manager	3
Meteorologist	2
Government (Non-Specific)	1
Other	1

Applicants (Africa)

Last Name	First Name	Organization	Occupation
Abubakar	Babagana	Al Akhawayn University	Social Scientist
Akano	Dawit	University of Yaounde I	Ph.D Student and Associate Teaching and Research
Andry	Rakotorahalahy	Malaria Control Program. Minister of Health	Data Manager

Anteneh	Aderaw	Amhara Regional Health Bureau	Head, Centers of Regional Health Research
Asamoah	Akwasi	Harari Regional Health Bureau	Health Management Information System Specialist
Ayana	Desalegn Admassu	Bahir Dar Regional Health Research Laboratory Center	Quality Officer and Researcher
Bahita	Ashenafi Asefa	Haramaya University	Lecturer
Bassey	Victor	Hawassa University	Lecturer
Bergigui	Fouad	Malaria Research and Training Center	Research Assistant
Beyene	Belay	Hanz Healthplus Services	Public Health
Biratu	Dawit	Hopital Regional de Ziguinchor	Medical Doctor in Environmental Health
Delbiso	Tefera Darge	Faculty of Renewable Natural Resources, Knust	Researcher
Ejekki	Fatima	Kanuri Development Association	Public Servant
Fadeyibi	Opeyemi	Youth Watch	Executive Director
Kateregga	Dennis	African Youth Initiative on Climate Change	Regional Coordinator for North Africa
Kibet	Moses	Makerere University and Ministry of Health	Public Health Specialists (MPH Trainee), Veterinarian
Limo	Hilary	Training and Research Institute for Demography	Chief of the Cluster Population and Environment
Mahamadou	Ouedraogo	Center for National Health Development in Ethiopia / Millennium Village Project	Data Manager
Mekonnen	Moges Kassa	Tigray Health Bureau	Governmental
Mekonnen	Walelgne	Climate and Health Working Group/Anti Malaria Association	Project Coordinator
Mohammed	Seid	Obafemi Awolowo University, Ile-Ife, Nigeria	Teaching and Research
Ndoye	Medina	North West University	Lecturer
Negussu	Nebiyu	Center for National Health Development in Ethiopia, Earth Institute at Columbia University	Malaria Officer
Nyakarahuka	Luke	Ethiopian Health and Nutrition Research Institute	Researcher
Osman	Maha Elhadi	Ethiopian Health and Nutrition Research Institute	Researcher
Owoutou	Ondoua	Ethiopian Health and Nutrition Research Institute	Assistant Researcher
Oyunga	Mary	Hawassa University, Ethiopia and Bergen University, Norway	Lecturer and PhD Student
Quist Yaw Kwadje	Simon	Somali National Regional Health Bureau	Health System Research Case Team
Raga	Million	Amhara Regional Health Bureau	Field Epidemiology Resident
Roger	Feumba	Anti-Malaria Association	Malaria Project Officer
Seda	Tadesse	Addis Ababa University and Federal MoH	Ethiopia-FELTP Resident
Semunegus	Paulos	Ghana Health Service/African Field Epidemiology & Laboratory Network	Public Health Practitioner

Shumbullo	Eskindir	Kenya Agriculture Research Institute	Research Scientist
Tadese	Tadele Mekonen	National Meteorological Agency	Meteorologist
Taye	Genetu	Department of Meteorology	Monitor of Agro-pastoral Season
Tegegne	Mer'Awi Aragaw	Oromia Regional Health Bureau	Malaria Expert
Tekay	Teame Zegeye	Oromia Regional Health Bureau	CDC Department Head and Surveillance Team Leader
Tesfaye	Yihenew	Oromia Regional Health Bureau	Public Health Officer
Traore	Zoumana Isaac	Tigray Regional Bureau	Surveillance Officer
Tsaedu	Musie Araya	National Malaria Program Ministry of Health	Data Manager
Walle	Fisseha	Ministry of Public Health & Sanitation	Public Health Officer

Asia

There were 22 applicants representing Asia from a total of 8 countries. The greatest number of applicants was from India (10) and Bangladesh (4). The most represented occupations were researchers (10), program management (8), professors (5), and public health (5).

Asian Countries

Countries Represented	Number of Applicants
India	10
Bangladesh	4
China	2
Indonesia	2
Hong Kong	1
Iran	1
Nepal	1
Philippines	1

Applicant Professions (Asia)

Position Title	Number of Applicants
Program Manager/Director/Officer/Leader	8
Teacher/Professor/Lecturer	4
Researcher/Scientist	3
Meteorologist	2

Civil Service	1
Consultant	1
Government (Non-Specific)	1
Other	1
Student/Resident	1

Applicants (Asia)

Last Name	First Name	Organization	Occupation
Arkalgud Mylara Setty	Ramesh	Karnataka Science and Technology Academy	Senior Scientific Officer
Chandra Sekhar	Matli	Department of Population Sciences, University of Dhaka	Assistant Professor
Das	Kailash Chandra	Institute for Electronic Governance	Academic
Guha Mazumdar	Papiya	Indira Gandhi Medical College & Hospital, Shimla, Himachal Pradesh, India	Assistant Professor (Epidemiology & Community Medicine)
Haque	Md Aminul Haque	I.R.of Iran Meteorological Organization	National Climate Center - Climatological Research Institute
Huang	Baohua	University of the Philippines Los Banos	Asst. Professor
Islam	Mohammad	Roots and Shoots Nepal	Program Officer
Joshi	Pawan	Heidelberg University,	PhD Student at Heidelberg University
Koirala	Rupak	Jahangirnagar University	Lecturer
Paras	Floribel	River Research Institute	Research Assistant
Patel	Sangram Kishor	UIC Environment and Development Center	Teacher/Development Worker
Peng	Li	Shanghai Center for Urban Environmental Meteorology	Meteorologist
Rachmad	SriHartini	International Institute of Health Management Research	Assistant Professor
Rahman	Md. Mosiur	AMRITA	Service
Saifuzzaman	Md	Sigma Research and Consulting	Social Scientist
Samadi Naghab	Sina	International Institute for Population Sciences	Teaching and Research
Singh	Balraj	BPS Statistics Indonesia	Researcher on Social Demography
Singh	Gyaneshwar	Ministry of Health - Center for Health Promotion	Government Official (Coordinator of Media and Technology of Health Promotion)
Syayadi	Ivo	TERI University, New Delhi	Associate Professor
To	May Kei Liza	Health Department Hong Kong	Medical Director
Venkata Somayajulu	Ulimiri	Shanghai Center for Urban Environmental Meteorology	Meteorologist
Vinayaga Murthy	Parasuraman	Department of Health	Principal Medical and Health Officer

Latin America and the Caribbean (LAC)

There were 8 applicants representing Latin America and the Caribbean from a total of 4 countries. The greatest number of applicants was from Brazil (4). The most represented occupations were public health (2) and students (2).

LAC Countries

Countries Represented	Number of Applicants
Brazil	4
Ecuador	1
Colombia	1
Argentina	1
Peru	1

Applicant Professions (LAC)

Position Title	Number of Applicants
Health Professional/Public Health	2
Student/Resident	2
Engineer	1
Meteorologist	1
Program Manager/Director/Officer/Leader	1
Teacher/Professor/Lecturer	1

Applicants (LAC)

Last Name	First Name	Organization	Occupation
Almeira	Gustavo Javier	Argentine National Weather Service - National Institute of Water	Meteorologist
Carvalho Pereda	Paula	University of Sao Paulo	PhD Student
Dos Santos	Jose Guilherme	National Institute of Meteorology and Hydrology - Ecuador	Environmental Engineer
Erazo	Bolivar	Ministry of Health	Field Epidemiology Training Program
Ferreira	Patricia	Direccion General de Epidemiologia	Physician and epidemiologist
Morraye	Monica	University of Franca	University Professor
Munayco	Cesar	Center for the Earth System Science / National Institute for Space Research	PhD Student
Osorio	Salua	National Institute of Health	INAP Coordinator

North America

There were 6 applicants representing North America from a total of 2 countries.

North American Countries

Countries Represented	Number of Applicants
United States	4
Canada	2

Applicant Professions (North America)

Position Title	Number of Applicants
Student/Resident	5
Program Manager/Director/Officer/Leader	1

Applicants (North America)

Last Name	First Name	Organization	Occupation
Dai	Fan	International Youth and Student Movement for the United Nations (ISMUN)	President / CEO
Hadi	Nomana Intekhab	Carnegie Mellon University	Graduate Student
Oshota	Oluwole	Wilfrid Laurier University	Student
Stewart Ibarra	Anna Maria	SUNY ESF & Syracuse University; Ministry of Health of Ecuador, National Institute of Meteorology and Hydrology of Ecuador, Universidad de Especialidades Espiritu Santo	PhD/MPA Candidate, Visiting Researcher
Vanos	Jennifer	University of Guelph	PHd Candidate

Europe

There were 3 applicants representing Europe from one country each.

European Countries

Countries Represented	Number of Applicants
Belgium	1
Germany	1
Switzerland	1

Applicant Professions (Europe)

Position Title	Number of Applicants
Program Manager/Director/Officer/Leader	1
Project Officer/Coordinator/Manager	1
Teacher/Professor/Lecturer	1

Applicants (Europe)

Last Name	First Name	Organization	Occupation
Aboubacarbiro	Kouyate	Rufus Giwa Polytechnic	Lecturing (Biometeorology and Environment)
Firth	Emily	World Health Organization	Technical Officer, Epidemic Readiness and Interventions
Omonijo	Akinyemi Gabriel	CERE/CRDI, Ministry of Mines and Geology	Research Project Coordinator

Oceania

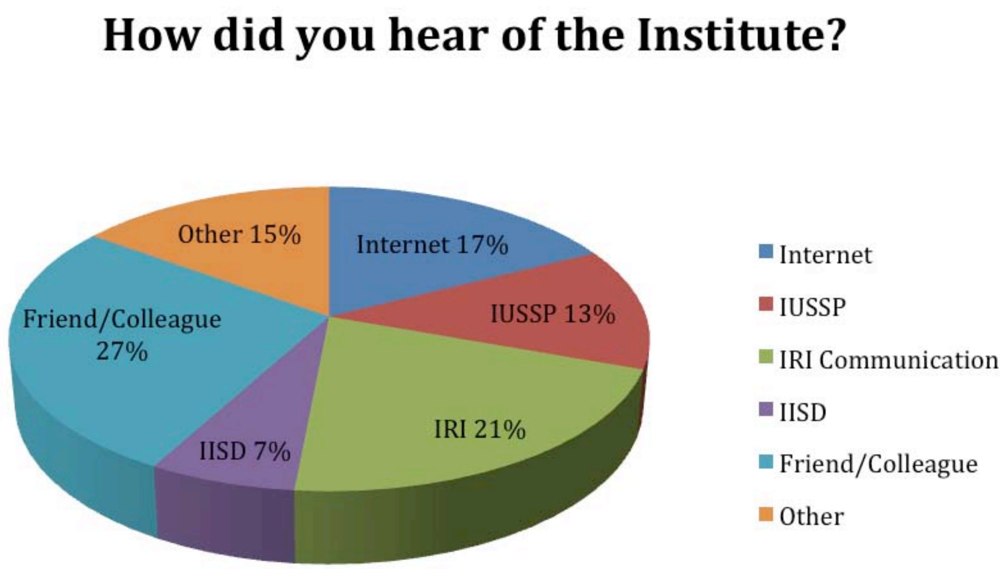
There was 1 applicant representing Oceania, a project officer from Australia.

Applicant Professions (Oceania)

Position Title	Number of Applicants
Project Officer/Coordinator/Manager	1

Applicants (Oceania)

Last Name	First Name	Organization	Occupation
Mitchell	Thomas	Victorian Department of Health	Senior Policy and Project Officer



As in previous years, the applicants indicated a variety of methods in obtaining information to apply for the Summer Institute. The most common means was through a friend or colleague (27%), many of whom had attended previous sessions of the Institute. Direct IRI communication was another important method (21%), either through CIPHAN e-mails or trainings held in the applicants' respective countries. However, other global organizations, including IUSSP (13%) and IISD (7%), also proved to be invaluable in helping to dispense information about the Institute to their members. Another sizeable percentage of applicants (17%) used the Internet to learn about the Summer Institute, while the remaining applicants (15%) found out primarily through their respective organizations, or had attended other climate and public health conferences. Overall, these data indicate that the IRI is well-established within the global community, and that its network continues to grow on a yearly basis.

Applicant Occupations

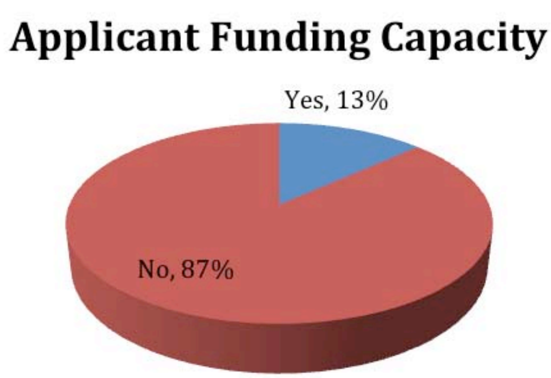
Regarding occupations, the pool of applicants represented a wide range of fields. The most commonly indicated type of occupation was research (22%), followed then closely by teaching (19%); there were many applicants that participate in both of these fields.

Following this, program managers and officers from all levels of organizations applied in large numbers (17%). Students, the majority PhD candidates, followed (12%), along with those in public health (7%), data management (4%), and meteorology (4%). The remaining occupations represented are included in the table below:

Position Title	Number of Applicants
Researcher/Scientist	46
Teacher/Professor/Lecturer	41
Program Manager/Director/Officer/Leader	36
Student/Resident	26
Health Professional/Public Health	15
Information/Data Management/GIS Professional	9
Meteorologist	8
Project Officer/Coordinator/Manager	7
Engineer	6
Civil Service	4
Government (Non-Specific)	4
Program Advisor/Assistant	2
Consultant	2
Journalist	1
Other	4

Applicant Funding Capacity

The majority of applicants lacked the capability to fund themselves entirely (87 %), while 13%, or 28 of the applicants, did have this type of funding available to them.



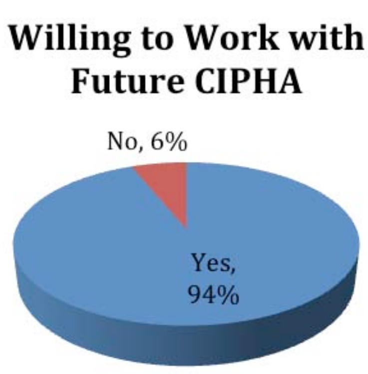
Even of those indicating a lack of funding, a number of applicants said that they would personally try to seek out scholarships, hold fundraisers, etc. in order to raise money for tuition. For those fully funded, the following is a list of some of the indicated sources:

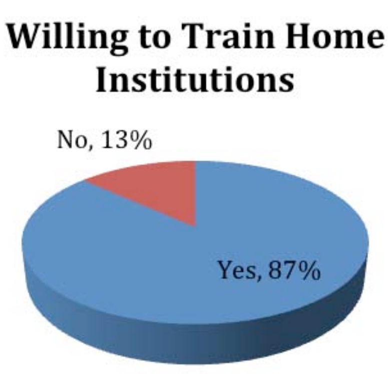
China Scholarship Council
Global Fund, The (Le Fond Mondial)
Health and Climate Foundation, Shanghai, China
Tigray Health Bureau in Ethiopia
Ugandan Ministry of Water and Environment
UNICEF
UNISAF in Ethiopia

Applicants' Commitment

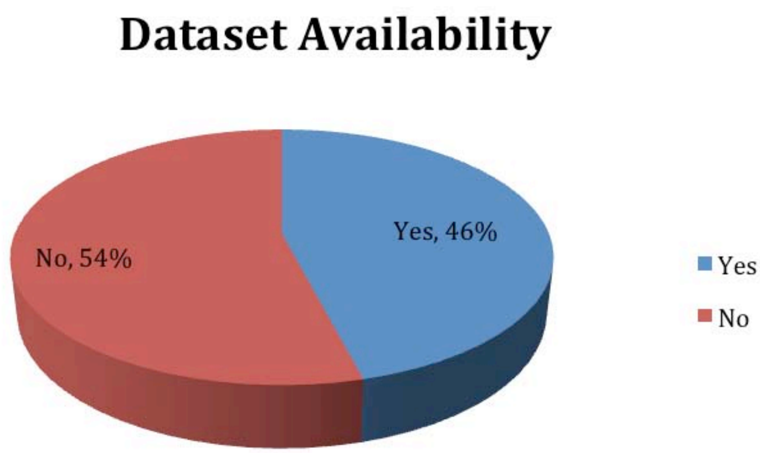
The applicants responded with overwhelming enthusiasm with regards to willingness to facilitating future trainings. 94% of the applicants would like to be part of future trainings associated with Climate Information for Public Health Action, while 87% were willing to carry out similar trainings in their home institutions.

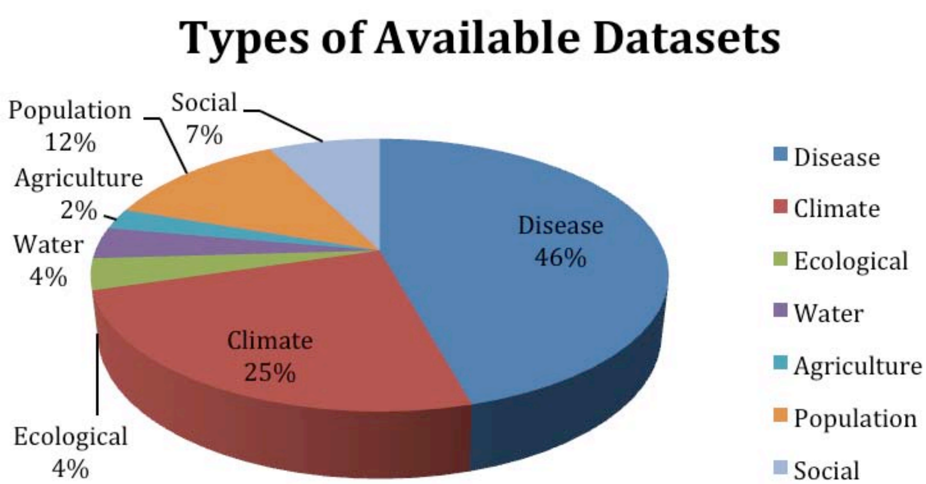
Data





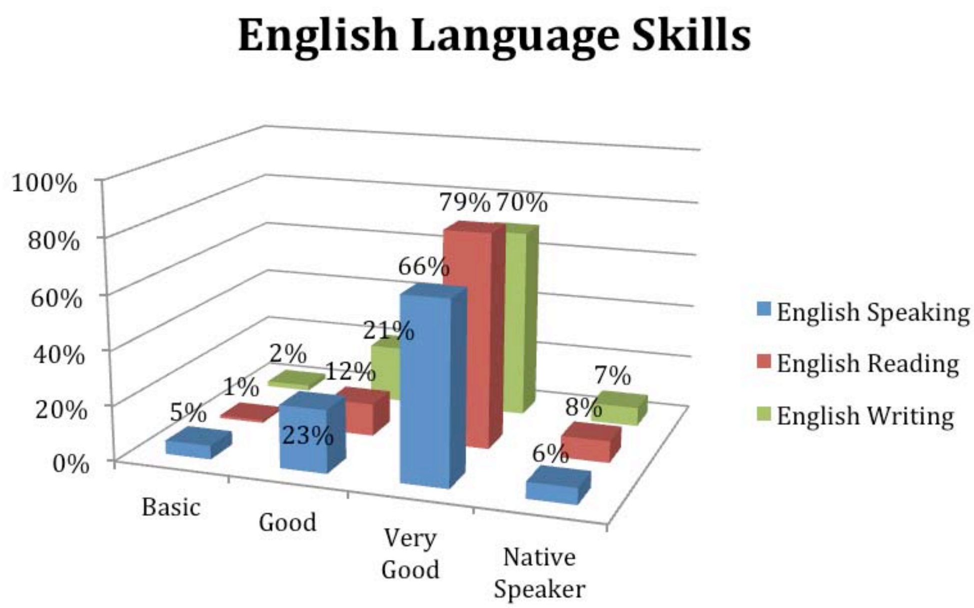
Nearly half of the applicants had applicable datasets (97, 46%) for usage during the Summer Institute. Certainly, most of these datasets apply directly to the teachings of the Institute, such as disease incidences and climatic data. However, other datasets encompass a wide range of disciplines that have potential applications in public health, such as resource management, demographic data, and air quality. A breakdown of all of the types of available datasets is provided below:





English Language

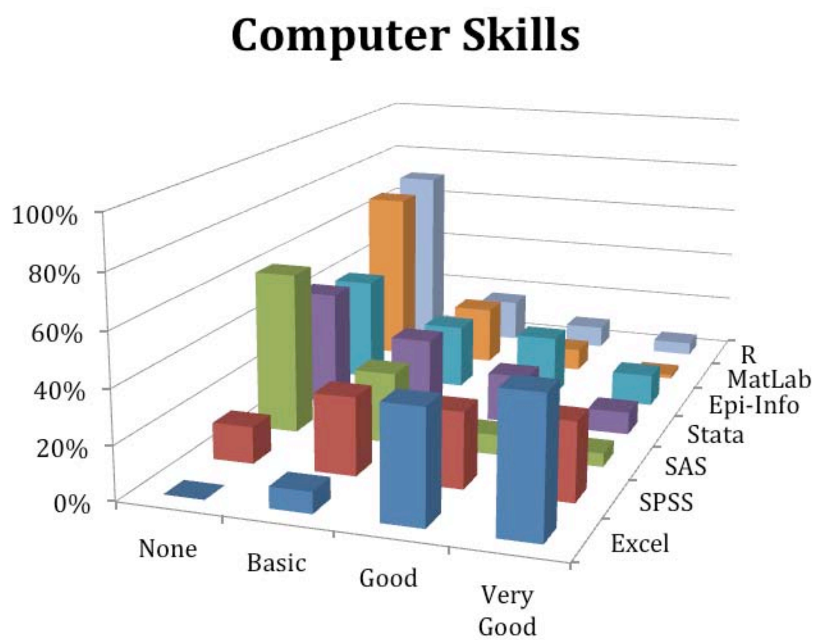
The majority of applicants declared having at least “Very Good” proficiency across all 3 English language skills.



Computer Skills

Overall, there is a basic collective understanding by the applicants of all the relevant software packages to the Summer Institute, which indicates a variety of computer skills. 92% of the applicants indicated to having at least a “Good” understanding of Excel, while there was a majority of applicants having at least a “Basic” understanding for most of the other software. Additional software skills listed by the applicants are found under the cumulative graph.

Skill Level	Excel	SPSS	SAS	Stata	Epi-Info	MatLab	R
None	0%	14%	61%	44%	40%	68%	70%
Basic	8%	29%	27%	29%	25%	23%	16%
Good	42%	28%	8%	19%	24%	9%	8%
Very Good	50%	29%	5%	9%	12%	2%	5%

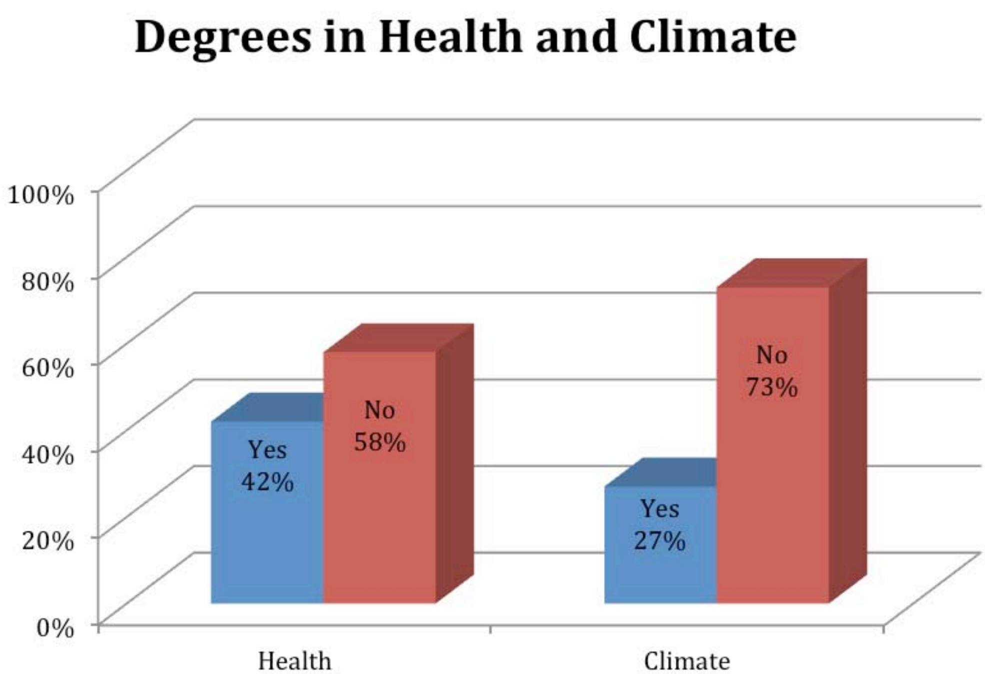


Other Computer Skills:

ArcGIS	Arcview	C (C++)	CLIMASE
CPT	Epidat	Genstats	Geoda
GrADS	HealthMapper	INSTA+	LarsWG
LINUX	MS Office	MM5	NCL
PRECIS	Prism	RegCM	SDSM
Spectra	Stella	WRF	

Education

With regards to educational background, the applicant pool both featured those with degrees in a health-related discipline (89, 42%) and degrees in climatic studies (58, 27%).



Appendix 5: Daily Quiz Questions and Answers

Answer the following questions by circling the correct answer(s).

Day One: Monday May 16 2011

Climate Risk Management in Health

The best statement to define climate risk management is:

a. Climate Risk Management is a term referring to how do you approach a climate-sensitive decision, making it increasingly seen as the way of dealing with climate variability on the one hand, and climate change on the other.
b. Approach to climate-sensitive decision making that is increasingly seen as the way forward in dealing with climate variability'
c. Climate Risk Management (CRM) is a term is used for a large and growing body of work, bridging the climate change adaptation and development sectors,
d. Only a is correct

Answer: d

Overview of the Data Library

Which of the following would you most likely use the "Data Selection" page in the IRI Data Library to do?

a. Create a table of precipitation data
b. Specify longitude, latitude, and time ranges of the data you want
c. Download a file of data in the GeoTIFF file format
d. Visualize an animation of temperature data

Answer: b.

Which of the following is NOT a good description of the relationship between the IRI Data Library and Map Room?

a. Maps and analyses in the Map Room often use data from the IRI Data Library
b. Analyses in the Map Room often use Data Library functions
c. You can sometimes click on a map in the Map Room to access the data used in the map
d. All time series plots in the Map Room are from a source other than the IRI Data Library

Answer: d.

Data Quality Control Questions, John del Corral

What is data?

a. At least 100 numbers
b. A spreadsheet
c. Quantities with complete documentation
d. A peer reviewed scientific paper
e. None of the above

Answer: c

What is needed for complete analysis of data, especially with other datasets?

a. Matlab
b. Time and location of datapoints
c. Units described in MKS
d. Use lowercase for variable names
e. a and c are correct

Answer: b

Day Two: Tuesday May 17 2011

Introduction to Climate and Climate information

Why is ENSO a coupled phenomenon?

a. Because its name refers to two phenomena: 'El Nino' and 'Southern Oscillation'
b. Because it affects climate in remote locations
c. Because there are two phases: El Nino and La Nina
d. Because it involves interactions between atmosphere and the ocean

Answer: d

Why there is a distinction between data and information?

a. Because they come from different sources
b. Because data are on paper and information on the internet
c. Because data is an array of numbers and information results from processing those numbers for a particular goal
d. Because data are collected by machines and information requires human processing

Answer: c

Core Concepts in Public Health and Epidemiology

In the definition of epidemiology, the terms "distribution" and "determinants" taken together refer to:

a. Frequency, pattern, and causes of health events
b. Dissemination of information to those who need to know
c. Knowledge, attitudes, and practices related to health
d. Public health services and resources

Answer: a

Which of the following is an epidemiological measure of risk?

a. The parasite ratio
b. The point prevalence
c. The incidence rate
d. The risk ratio

Answer: c

Summarizing Climate and Health Data Using Descriptive Statistics

Which of the following is a characteristic of the calculation of the mean?

a. An unweighted mean is the same as the arithmetic average of a set of numbers
b. The mean can be greatly affected by extreme values (is not resistant to outliers)
c. The mean is NOT the only way to characterize the central tendency of a set of numbers
d. All of the above

Answer: d

Which of the following describes the calculation of a "monthly climatology"?

a. The multiple-year long-term mean of monthly values calculated independently for each month of the year
b. The 30-year average of all daily values in a dataset
c. The monthly difference between monthly values and their long-term mean
d. All of the above

Answer: a

Day Three: Wednesday May 18 2011

Climate Vector- Borne Disease Dynamics

Ambient temperature affects:

a. Parasite development rates in vectors
b. Parasite development rates in humans
c. Vector development rates in humans
d. None of the above
e. All of the above

Answer: a

Malaria Vector Distribution and Rainfall

Malaria is spread by:

a. Worms
b. Bacteria
c. Mosquito bite
d. Female anopheline mosquitoes

Answer: d

The geographical distribution of the following mosquitoes is determined largely by rainfall

a. Anopheles melas
b. Anopheles gambiae
c. Anopheles arabiensis

d. Plasmodium falciparum
e. Only b and c are correct

Answer: e

The following vectors prefer to rest outdoors after taking a blood meal

a. Anopheles funestus
b. Anopheles gambiae
c. Anopheles arabiensis
d. Anopheles merus

Answer: a

Malaria Climate Suitability Map

The following climate variables impact on the development of the malaria parasite and vector

a. Precipitation, temperature, humidity
b. Rainfall, temperature, wind direction and humidity
c. Temperature
d. Number of rainy days

Answer: a

Malaria transmission in sub-saharan Africa shows variability in the following time scales:

a. Inter-annual
b. Daily
c. Monthly
d. Decadal

e. a , b and c are correct

Answer: e

Principles of Trends and Time Series

An “anomaly” in the context of climate time series is

a. A very large value in the time series
b. The result of global warming
c. The departure of a quantity at a particular time from its long-term average
d. None of the above

Answer: c

The long-term trend in a time series can be estimated by

a. Using a linear regression “straight line fit”
b. Using a low-pass filter, such as a moving average
c. None of the above
d. a and b are correct

Answer: d

IFRC-IRI Partnership to save lives

A seasonal rain forecast indicates there is high confidence that the next 3 months will be unusually wet in your region. Which of the following actions may be appropriate for information at this timescale?

a. A last minute evacuation
b. Finalize contingency plans, and refresh or increase stocks
c. Long-term resource management and infrastructure decisions
d. Utilize tools that combine the rain forecast with hydrology for flood risk mapping

e. Only b and d are correct

Answer: e

Day Four: Thursday May 19 2011

Remote Sensing

Which channel is more sensitive to vegetation water content?

a. Short Wave Infrared (SWIR)
b. Near Infrared (NIR)
c. Red
d. Blue

Answer: a

Which of these wavelengths are used to estimate rainfall?

a. Visible
b. Thermal Infrared
c. Passive Microwave
d. All of the above

Answer: d

Which of these wavelengths are used to estimate temperature?

a. Visible
b. Thermal Infrared
c. Passive Microwave
d. All of the above

Answer: b

What is the highest spatial resolution available free of charge?

a. Ikonos at 45 cm
b. MODIS at 250m
c. SPOT-VGT at 1km
d. NOAA AVHRR at 8km

Answer: b

Which of this satellite can provide an image every 30 minutes of the same region of the world?

a. METEOSAT
b. TERRA
c. SPOT
d. NOAA

Answer: a

Cluster Analysis

A "cluster” in the method of cluster analysis denotes

a. Events that always occur geographically close together
b. A group of relatively similar cases or observations
c. The opposite of a scatter plot
d. All of the above

Answer: b

Day Five: Friday May 21 2011

Using GPS, GIS and Google Maps for Public Health

What are the basic considerations when planning to collect GPS data?

a. Level of Accuracy required
b. Knowing what Datum and Projection system to set the unit
c. Schedule data collection time for optimal arrangement of satellites (DOP values)
d. All of the above
e. None of the above

Answer: d

The typical level of accuracy for a small hand-held GPSA unit is:

a. 100 meters
b. 0.5 to 1 meter
c. 10 to 15 meters
d. 1 kilometer

Answer: c

Poverty & Natural Hazards Mapping

The exercise showed that people living in extreme poverty are:

a. More exposed to natural hazards
b. Less exposed to natural hazards
c. Are equal to other income classes in their level of exposure
d. No discernable difference

Answer: a

To obtain summary statistics of information in one layer based on the regions interaction with another region we would use what GIS Analysis function?

a. Create a summary table
b. Run the Zonal Statistics function
c. Export to SAS or other statistics program
d. Use the intersect function

Answer: b

Day Six: Monday May 232011

Understanding Predictions and Projections in Climate

What is the rationale behind Climate Projections?

a. There is an intrinsic evolution of the ocean currents that affects the atmosphere thus the winds and rainfall patterns
b. Changes in the composition of the atmosphere affect the Energy balance of the atmosphere and at the surface of the Earth thus ocean and atmospheric circulation
c. Wide-spread combustion of fossil fuels for transportation, domestic cooking and heating releases heat to the atmosphere thus produces an increase in the temperature
d. As new technologies are being developed it is projected that less and less people will feel climate as a constraint for their activities

Answer: b

What is more important when using a multi-model ensemble?

a. That all the models produce the same answer –this ensures that the answer is correct
b. To remove outliers from the distribution – they are wrong
c. To develop methods that allow using in some way the information contained in the whole distribution of values produced
d. To only keep the models that have been right in the past

Answer: c

Linking ENSO with Society

How often does El Niño occur, and how often does La Niña occur?

a. They both occur about once every 2 years, alternating back and forth from one year to the next
b. El Niño occurs about once every 2 years, and La Nina occurs about once every 8 years
c. They both occur approximately every 2 to 7 years
d. El Niño usually occurs once each year, and La Niña promptly follows during the next season.

Answer: c

Which of the following are likely impacts of a moderate to strong El Niño on society?

a. Greater stress on the anchovy fishing industry in Peru
b. Increased risk of forest fire outbreaks in Indonesia
c. Tendency for more tropical cyclone damage to the Caribbean islands, Mexico and the US

d. Increase Bleaching of corals in the tropical Pacific and other tropical oceans
e. Only a, b and d are correct

Answer: e

Day Seven: Tuesday May 24 2011

Climate Change, War and Disease

Climate change is expected to influence the epidemiology of kala azar by:

a. Affecting the vector populations
b. Affecting *Leishmania* strains
c. Socioeconomic status of human populations and their exposure to the disease
d. All of the above is correct
e. Only a and c are correct

Answer: d

Within the study areas covered in the lecture, Climate change is expected to result in an:

a. An overall increase in the incidence of kala azar
b. An overall decrease in the incidence of kala azar
c. Either an increase or a decrease in the incidence of kala azar, depending on a complex interaction of environmental and socio-economic factors
d. No effects on kala azar
e. Unknown effects on ka lazar incidence in Sudan

Answer: e

Malaria Early Warning and Early Response

The major advantage of seasonal climate forecasting over case surveillance in malaria early warning system is due to its:

a. Timeliness
b. Accuracy
c. Cost effectiveness
d. None of the above

Answer: a

If seasonal forecasts can warn of increased risk of malaria epidemics several months in advance – what is the advantage of environmental/meteorological monitoring?

a. Accuracy
b. Cost effectiveness
c. Confirmation of forecast warning
d. None of the above

Answer: c

Spatio-temporal modeling of climate-sensitive disease risk: towards an early warning system for dengue in Brazil

Which of the following probability distributions are suitable for modeling counts of disease cases?

a. Normal distribution
b. Poisson distribution
c. Negative binomial distribution

d. All of the above
e. Only b and c are correct

Answer: e

Epidemic Detection and Monitoring using Thresholds

What do you need to know to define an epidemic?

a. The time period
b. The area
c. The normal number of cases
d. The case definition
e. All of the above

Answer: e

Day Eight: Wednesday May 25 2011

Temperature Trend In the Highlands of Kenya

Consider a gridded analysis of temperature derived from irregularly spaced station observations. From the list below, select all that should be a concern to someone considering using data from a single grid point in analyzing temperature variability at that location:

a. If the spatial resolution of the grid may be less than the distance between some stations, thus the grid point values may be based solely on interpolation.
b. If over the time period covered by gridded data set there may have been a different number of stations used in its construction.

c. If the latitude of the grid point selected is between 30 deg. N and 40 deg. N.
d. If the data set has no documentation available on how it was constructed.

Answer: a, b and d

When looking at a time history of surface air temperature data it is important to know when an observing station was moved just 100 m from its original location because:

a. The station name may have changed as well
b. The weather instruments may have been damaged during the move
c. Even seemingly slight changes in location can affect temperature readings
d. All of the above

Answer: d

Meningitis Environmental Risk Information Technology (MERIT)

When does meningococcal meningitis transmission occur in the Sahel?

a. In the rainy season
b. In the dry season
c. Throughout the year

Answer: c

How might dust contribute to the occurrence of meningococcal meningitis epidemics?

a. By transporting the bacteria from one person to another
b. By aggravating the nose and throat and allowing the bacteria to cross into the blood stream
c. Through its impact on temperature

Answer: c

Integrated Malaria Surveillance and Control System for Malaria in Colombia

What is the main purpose of system dynamics?

a. To elucidate principles that can be applied to all types of systems in all fields of research
b. To provide elements for a deep understanding of the dynamics of a complex variable
c. To understand the behavior of complex systems in which feedback mechanisms and time delays play a significant role
d. None of the above

Answer: c

Why malaria process-based models are useful?

a. They provide insights into the complexity of malaria transmission and allow us to pose and answer "what if" questions
b. They allow us to estimate the timing and severity of malaria outbreaks, and help us to analyze the key variables behind their onset
c. They help us to investigate current decision-making processes and provide quantitative goals for effective interventions To elucidate principles that can be applied to all types of systems in all fields of research
d. All of the above

Answer: d

Day Nine: Thursday May 26 2011

Climate Change and Public Health,

Which of the following are important roles for public health professionals in addressing the challenges of climate change?

a. Conduct or support research to enhance the science base to understand health impacts of climate change
b. Identify the most vulnerable populations
c. Communicate with the public about health risks and ways to reduce them
d. Track diseases and trends related to climate change
e. All of the above

Answer: e

One key principle of the new Interagency Working Group on Climate Change and Health is:

a. Primary focus on the positive health effects of climate change
b. Primary focus on moving all climate change and health science into the Department of Health and Human Services
c. Connecting researchers on climate change and health with public health professionals to create an “end to end” science program
d. Ensuring that datasets relevant to climate change and human health are difficult to access Mortality from heat waves is increasing in the United States
e. None of the above

Answer: c

Heat Waves in the USA from the Climate Perspective

It is difficult to come up with a single definition of a heat wave because (circle all that apply):

a. Average temperature conditions can vary greatly from one region to another making it difficult to select an absolute temperature threshold (e.g., 35C) as a criterion
b. It is not clear how many consecutive days temperatures need to remain above a given level to be considered a heat wave
c. Heat waves are not of interest to some people
d. The ability of the body to cool depends on humidity as well as temperature.

Answer: a, b and d

Local factors that can influence the physical characteristics of heat waves include the following (circle all that apply):

a. The urban "heat island"
b. Proximity to a large water body
c. Types of building materials and land surface condition at the location (e.g., cement structures, pavement, bare soil, etc.)
d. Proximity to a restaurant serving very spicy food

Answer: a, b and c

Heat Waves and Public Health: a U.S Case Study

Circle two key findings of the California heat wave morbidity study.

a. The Central Coast region, which has relatively cooler temperatures relative to other parts of the state, had by far the highest Rate Ratios of heat-related Emergency Room visits
b. Children 0-4 years old, as well as the elderly, had high Rate Ratios of ED visits for some causes;
c. There were 1,600 excess Emergency Department visits and almost 1,200 additional hospitalizations across the state during the two-week heat wave; there have been very few prior morbidity studies during such large-scale heat waves, so this was useful information
d. There were significant increases in respiratory hospitalization rates during the 2006 heat wave in California, relative to rates typical of 2003-2005 summers.

Answer: a and b

Which choice lists three of the four basic elements of Climate-Health Adaptation plans?

a. Establish a reference period, account for possible mortality displacement, set up buddy systems
b. Identify vulnerabilities, track diseases and environmental changes, design with climate change in mind;
c. Deal with urban heat islands, find local heat stress thresholds, plant street trees to provide shade
d. Educate and conduct outreach on climate-health impacts to the public; policymakers; and vulnerable communities

Answer: b

Appendix 6: Participant Posters

HEAT WAVE E.W.S. IN BUENOS AIRES, ARGENTINA

Gustavo Javier ALMEIRA

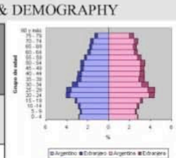
NATIONAL WEATHER SERVICE (ARGENTINA)

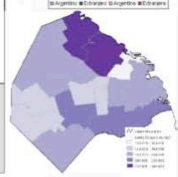
Introduction-Background

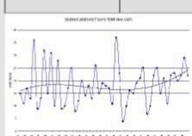
Around 3.000.000 people live in Buenos Aires city, the most populated city in Argentina. Every summer citizens endure high temperatures (> 30°C) and heat waves. These heat waves have variable duration, which can go from 2 to 15 consecutives days, and average duration period of 4-7 days.

BUENOS AIRES´S CLIMATE & DEMOGRAPHY

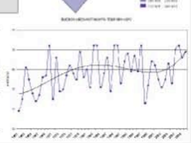
AVERAGE TEMPERATURES IN BUENOS AIRES	
MEAN	24°C
MEAN MAX TEMP (EXTREME)	29°C (43,3°C)
MEAN MIN TEMP (EXTREME)	19,5°C (5,6°C)







HOT DAYS

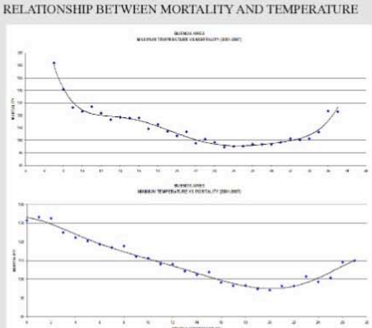


HOT NIGHTS

GOAL: Design and develop a Heat Wave EWS in the city of Buenos Aires, to reduce mortality and improve population health.

AIM: Discuss the new approach and evaluation of Heat Wave EWS in Buenos Aires, operating in an experimental mode at the National Weather Service.

RELATIONSHIP BETWEEN MORTALITY AND TEMPERATURE



Threshold temperatures: T MAX= 32°C, T MIN= 20°C
Consequently a HEAT WAVE can be defined when at least 3 days exceed these threshold temperatures.

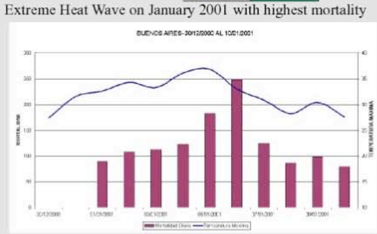
Levels of EWS

0	GREEN
1	YELLOW
2	ORANGE
3	RED

Example of Heat Wave 2010

20/12/2010	
21/12/2010	
22/12/2010	
23/12/2010	
24/12/2010	
25/12/2010	
26/12/2010	
27/12/2010	
28/12/2010	
29/12/2010	
30/12/2010	

Extreme Heat Wave on January 2001 with highest mortality



Future Works

The ideas I have developed from participating in the 2011 Summer Institute include:

-Redefine heat waves with duration of 48 hours (early warning / false alarms).

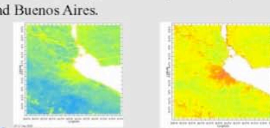
-Thorough examination of death certificates during heat waves events (age, sex, address, etc).

-Inclusion of demographic data: identify vulnerable populations using most recent census.

-Strengthen relations with the Ministry of Health and emergency services and obtain emergency dispatch data.

-Include humidity as a variable in an early warning system to predict heat waves.

-Use of MODIS images for the spatial study of heat waves around Buenos Aires.



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Yellow Fever risk assessment in Cameroon Ecological variables

Emily Firth
Global Alert and Response, World Health Organization

Introduction

Under the Yellow Fever Initiative, a multidisciplinary risk assessment will be conducted in south-west Cameroon in mid-2011. The study will assess yellow fever (YF) viral circulation and epidemic potential and will lead to detailed recommendations regarding a preventive vaccination campaign proposed by the Ministry of Health in Cameroon.

Based on the design of recent YF risk assessments conducted in the African region, the SW Cameroon study will for the first time take into consideration a number of ecological variables. This additional component will inform both the planning phase of the study and create a more detailed picture of the underlying environmental and demographic conditions to help interpret the findings.

In this light, we outline here a number of available tools and data sources that could be utilised to explore the ecological and demographic variables as a means to enhance the risk assessment analyses.

Methods

The YF risk assessment is multidisciplinary in design, with a primary objective to survey the human, non-human primate, and mosquito (*Aedes aegypti* - largely recognized as the major vector of YF virus in Africa) populations to determine the level of YF viral activity within two distinct ecological zones in the area of interest.

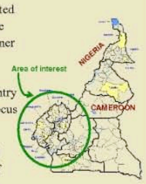
In order to investigate the ecological variables which influence the disease transmission in SW Cameroon, this project aims to :

1. Create an interactive large-scale climate suitability map for YF viral circulation in Africa; and
2. Provide guidance on accessing high resolution spatial and temporal data specific to the environmental and demographic conditions at each of the sites selected for serosurvey sampling in the study.

Figure 1. Area of interest for yellow fever risk assessment

In 2010, 16 cases of YF IGM+ cases were reported in Cameroon (in districts shaded in yellow). The majority of cases occurred in the south-west corner of the country bordering with Nigeria – an area which was not included in a mass vaccination campaign which targeted a large part of the country in 2007. Four provinces in this region are the focus of the current study.

The region has been divided into two ecological zones based on vegetation coverage and level of rainfall. Two sampling sites per ecological zone have been randomly selected for the survey sites.



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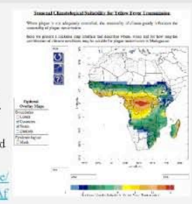
Kamgang et al. (2010) 'Geographic and ecological distribution of the dengue and chikungunya virus vectors *Aedes aegypti* and *Aedes albopictus* in three major Cameroonian towns', Medical and Veterinary Entomology **24**, 132-141

Results

Yellow Fever climate suitability map

Figure 2. Seasonal Climatological Suitability for Yellow Fever Transmission

The figure to the right demonstrates how we can develop a 'big picture' overview of the possible presence of the YF virus and *Aedes aegypti* vector in an area and will be useful in the planning phase of risk assessments and study sites locations.
See http://iridl.ldeo.columbia.edu/home/.remic/.maproom/.Health/.Regional/.Africa/.Yellow_Fever/.CSYFT/



This interactive tool developed in the IRI Data Library allows the user to zoom into an area of interest and gain an understanding of the number of months suitable for yellow fever transmission, taking into consideration pre-defined temperature, humidity and rainfall thresholds suitable for the YF virus and mosquito presence. Note: the tool is currently under development and is based on estimated and unsubstantiated thresholds for demonstration purposes only, and will be adjusted accordingly on further study.

Environmental and population data at survey sites

High resolution data and satellite images related to the ecological and demographic conditions around the survey study sites. These can be downloaded as datasets, time series, or images to be used as layers in GIS mapping. The proposed data sources available through the IRI Data Library are as follows:

Population density **– CIESIN Socioeconomic Data and Applications Center**

Rainfall **– TRMM Daily Precipitation Estimates. Resolution: 0.25x0.25km**

Temperature **– MODIS Land surface temperature (night temperature)**

Vegetation density **– USGS LandDAAC MODIS version_005 WAF NDVI**

At each of the four study sites in the SW Cameroon assessment, *in situ* data related to these and additional ecological variables will be collected and analysed alongside the satellite images and time series of vegetation, population density, rainfall and humidity.

Conclusions

The inclusion of the ecological variables in the risk assessment promises to strengthen the SW Cameroon yellow fever risk assessment. These results will be discussed at an expert consultation organized by WHO later in 2011, during which time the relevance and value of the information put forward here will be discussed in further detail with a view to being used in future risk assessments in the African region.

Acknowledgements

Many thanks to the team at the IRI and fellow participants on the climate-health course for their time and ideas shared so generously.

Hantaviruses in Brazil 2002-2009: Land Use and Land Cover Changes

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Universidade de Franca

Introduction

Hantaviruses are zoonotic disease agents responsible for two syndromes: Hemorrhagic Fever with Renal Syndrome endemic in Asia and Europe and Hantavirus Pulmonary Syndrome endemic in Americas. The aim of this study was to identify the months of highest incidence of hantavirus infection and correlate with the biomes and the land use and land cover changes of each Brazilian state.

Methods

The data of hantaviruses cases were obtained from the Information System of Notification Diseases and land use and land cover changes and biomes data of the Brazilian Institute of Geography and Statistics.

Results

From 2002 to 2009 were reported 986 hantaviruses cases in Brazil (Figure 01), with probable site of infection confirmed (mortality rate 38%).

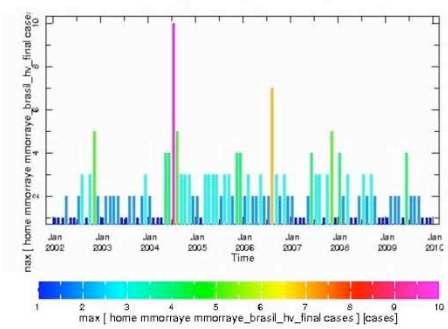

Figure 01: Number of hantaviruses cases in Brazil per year from 2002-2009.

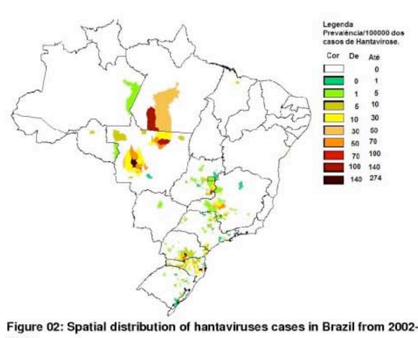

Figure 02: Spatial distribution of hantaviruses cases in Brazil from 2002-2009.

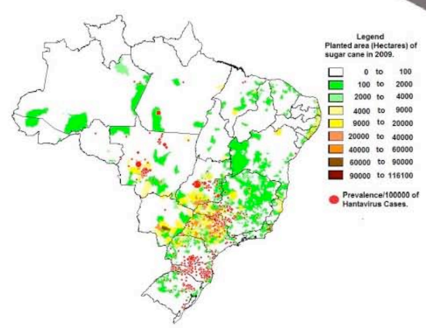

Figure 3: Spatial distribuition of sugar cane crop in 2009 and the prevalence/100,000 of Hantavirus cases from 2002 to 2009 in Brazil.

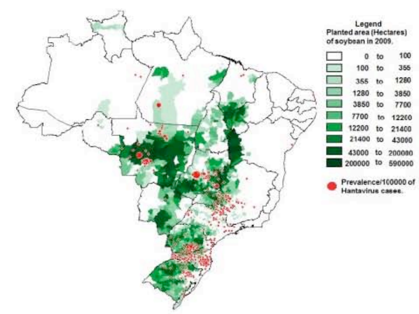

Figure 4: Spatial distribuition of soybean crop in 2009 and the prevalence/100,000 of Hantavirus cases from 2002 to 2009 in Brazil.

Conclusions

The data showed that transmission of Hantavírus infection occurs in two types of land use and land cover, one related to agricultural areas with intensive fragmentation of forest areas semi-deciduous or cerrado and another related to deforestation and irregular occupation in the wild environment of the Atlantic Forest.

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Temporal Distribution of malaria diagnosis in San Jose del Guaviare in Colombia

SALUA OSORIO-MRAD

Instituto Nacional de Salud-Colombia

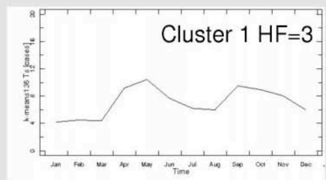
Introduction

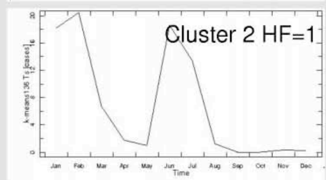
Successful malaria vector control depends on landscape conditions and location of the population. The landscape of Colombia is particularly difficult given the variety of ecological systems. An alternative approach is to focus the attention in prompt diagnosis and treatment. This strategy could be improved if the health authorities had information about when the peak malaria season will commence and where, in order to assure the capacity of the health facilities to diagnose malaria in a timely fashion. At the end local health authorities will be able to effectively allocate logistic and financial resources in time and space.

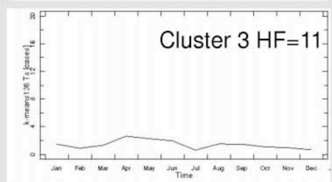
On the other hand, given the difficulties about downscaling the location of malaria transmission, health facility could be used as proxy for estimating the local areas where malaria transmission occurs.

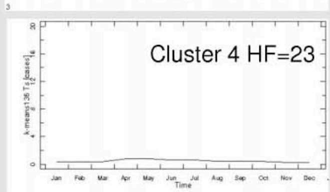
Methods

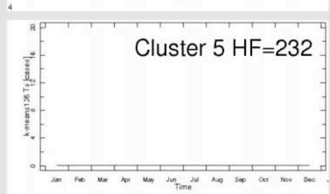
Malaria data (monthly cases 2008-2010) from the National Surveillance System from Colombia was used. Given the previous evidence about seasonality in malaria transmission (INAP[1]), San Jose del Guaviare was the chosen municipality. A cluster analyses was performed using health facility (HF) as the spatial unit. Five cluster classes were chosen and the IRI Data Library was use to perform the analysis.











Results

It seems that cluster number 1 has some seasonality and follows the pattern of the rainy season in San Jose del Guaviare with a peak in May and October. In the second cluster, the peaks occur three months earlier than the first cluster. Cluster number 3 has some seasonality at the same time of cluster number one. Cluster number 4 and 5 have very low cases throughout the year.

Conclusions

Health authorities should allocate financial and logistic resources for cluster number 1, 2 and 3 and ensure that the health facilities are well equipped ahead of the peak malaria seasons. The next step is to perform a spatial analysis of to represent the seasonal movement of populations between and within the municipalities in Colombia.

References

1. INAP Informe final 2009 componente salud

I would like to acknowledge Michael Bell, John del Corral and Rachel Lowe

The Economic Implications of Climate Variation on Dengue in Brazil

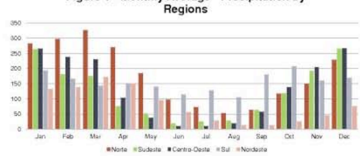
Paula Carvalho Pereda

Economics Department, São Paulo University*

Introduction

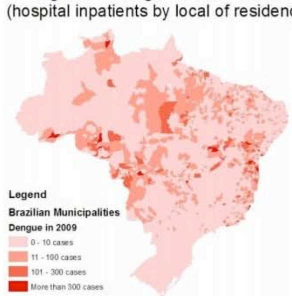
Dengue fever is the most important vector-borne disease in the Americas. The disease is transmitted by the *Aedes aegypti* female mosquitos to human, which leads to rapid transmission rates of dengue in urban areas. In Brazil, 3 million cases of dengue were notified from 2001-2009, mostly between January and May (warm and wet climate). Figure 1 illustrates the seasonality of monthly precipitation in Brazil by regions:

Figure 1 - Monthly Average - Precipitation by Regions



Aim: understand the climate variation relationship with dengue incidence, using an economic approach to address the impacts estimation. The results will be helpful to understand climate-dengue relationships, as well as the analysis of public cost-benefit of possible ways of addressing the problem in vulnerable areas (prevention actions versus diagnosis and treatment).

Figure 2 - Dengue Cases - 2009 (hospital inpatients by local of residence)



Methods

This methodology is based on Grossman (1972). The basic idea is to consider health as an *investment good* for people, i.e, each person produces a state of health in each period of time. This can depreciate by aging, or behavioral and environmental issues.

The equilibrium function of the model captures the relationship between the state of health and the 'health' goods inputs, as well as the impact of the depreciation factors on health (climatic factors). The equation for dengue cases are :

$$
\begin{aligned}
lnH_{it} = \ln(pop_{it}) + b_0 + b_1 \ln wage_{it} + b_2 Educ_{it} \\
+ b_3 t + B_4 Climate_{it} + B_5 Seasonal_{it} \\
+ B_6 SocioEconomic_{it} + \varepsilon_{it}
\end{aligned}
$$

t = 2001,…,2009; and i =1,…,5564 (municipalities in Brazil);
H: Hospital inpatients with dengue
$b's$ and $B's$ are parameters of the model;
$Climate$ variables include information about the 2-month lagged precipitation, average temperature and relative humidity.

Climate factors were chosen based on the specific conditions the mosquitos need to survive (warm and humid environment).

Results

The Generalized Linear Model was chosen to estimate the model, using a Poisson distribution for the dengue cases in Brazil by municipalities for the period from 2000 until 2009 (Lowe et al., 2010). The climate effects on dengue relative risk were estimated by vulnerable areas in Brazil. The climate effect is higher for the most vulnerable areas (see Fig 3)

Figure 3a- Relative risk for a 1°C increase in average temperature

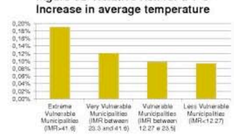
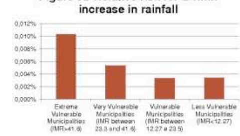


Figure 3b-Relative risk for a 1mm increase in rainfall

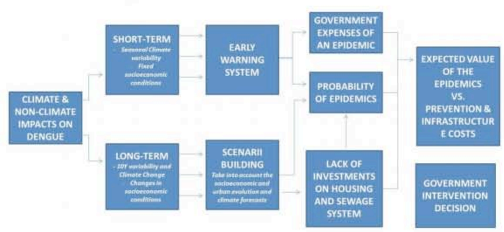


Final Considerations

The results indicate that climate covariates play a statistically significant role in dengue cases and that is important to account for other factors (poverty measures, urban density, and other regional specificities). The statistical model can be refined by using random/fixed effects estimation and by considering auto-regressive factors.

This economical and statistical modeling approach could be useful for decision makers as it provides the information for cost-benefit analysis (see Figure 4). For example, comparing the different government actions to address the problem of dengue epidemics in Brazil.

Figure 4: Flowchart for cost benefit analyses:



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2. Lowe, R., Bailey T., Stephenson D. B., et al. (2010), Spatio-temporal modelling of climate-sensitive disease risk: Towards an early warning system for dengue in Brazil, Computers and Geosciences.

Rede CLIMA

*I would like to thank all the IRI Summer Institute 2011 facilitators, specially Rachel Lowe, Pietro Ceccato, Gilma Mantilla and Michael Bell, and Professor Denisard Alves and Eduardo Haddad. I am grateful for the financial support from CNPQ and Instituto Nacional de Ciência e Tecnologia para Mudanças Climáticas/Rede CLIMA.

RELATION BETWEEN MALARIA CASES AND CLIMATE INFORMATION IN MADAGASCAR DISTRICT OF ANTSIRABE II

Andry RAKOTORAHALAHY

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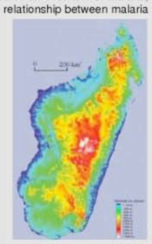
INTRODUCTION

Malaria is a public health problem in Madagascar. For an overview of malaria, we decided to do a study on the district Antsirabe the relationship between malaria and various climate

Climatic context of Madagascar:



The eastern part is characterized by heavy rainfall throughout the year. It's a hot and humid area.
The west is a hot area and period of rain will the month from November to April
In the southern part of the island which is a semi-desert area, the r ain only lasts two to three months during the year and during a cyclone.
The central highlands is an area of high altitude and cold in winter.

Different epidemiological patterns of malaria transmission in Madagascar are described, resulting from the location and variety of climates observed in this country.
The distribution of malaria in Madagascar is characterized by its heterogeneity, the result of regional variations in terms of rainfall, temperature and altitude
Two main types of transmission are distinguished:
- Regions of stable malaria (coastal)
- Regions of epidemic risk (Central Highlands and South)

Four distinct epidemiological features are clearly defined in terms of duration and intensity of transmission.

Malaria epidemiological context in Madagascar

-***Equatorial facies:*** This facie is characterized by a strong and durable transmission throughout the year. (Endemic area)

-***Tropical Facial:*** It is characterized by a long seasonal transmission during the rainy season, more than 6 months per year at the outset of stable malaria. (Endemic area)

- ***Facies sub-desert:*** Transmission episodic and short (less than 4 months) in the south coincides with the rain season. (Epidemic area)

- ***Facies Highlands:*** The transmission is from November to April (during periods of rain) (Epidemic area).

Implementation strategies for the fight against malaria.

- Free distribution of bednets ITN
(more than eight million nets distributed)
- Indoor Residual Spraying
(ten million people protected).
- Diagnostic
- Case managment in health facilities and community level.
Intermittent Preventive Traitment for pregnant women.
- Epidemiological surveillance in epidemic prone areas (Central Highlands and southern subdesert).

THE DATA USED IN THE STUDY

- Malaria monthly data for Antsirabe II (1993-20100 by National Malaria Program).
- Rainfall monthly data estimates from TRMM data (1998-2010).
- Temperature anomalies monthly from CAMS. (1993-2010).
- NDVI from NOAA AVHRR 8km of revolution, since 1981 (1993-2006)

METHODS

The methods used is time series of anomalies of the three parameters (Rainfall, temperature and NDVI).

RESULTS

The climate information (rainfall, temperature and NDVI) were used to monitor their relationship with malaria cases on the district of Antsirabe II.

This district is located in the central highlands, where malaria transmission is low and varies depending on the conditions of development of mosquitoes.

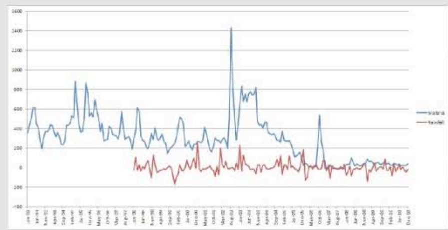


Fig 4: Time series comparing malaria data and rainfall anomalies

In Antsirabe District, rainfall does not seem to have an effect on the general trends of malaria between 1995 to 2001 and between 2003 and 2010. Despite, two peaks of malaria occur in 2002 and 2007, rainfall is not directly related to malaria. Antsirabe II is located in the highlands and do not have many breeding sides .
The two increases in 2002 and 2007 might be due to over factors that have to be investigated (population movement, changes in control procedures).

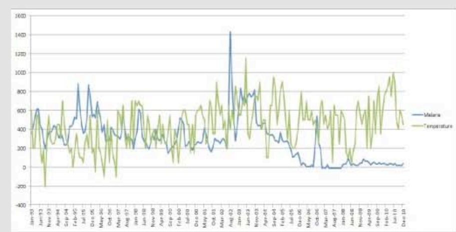


Fig 5: Time series malaria data and temperature anomalies

Similarly to the rainfall, it is difficult to see relationship between malaria and temperature. We observe that between 2004 and 2008, temperature decreased and between 2008 and 2010, temperature increased while the malaria cases decreased and remained low at the exception of 2006. The increase of temperature after 2008 had no influence on the malaria cases. This probably indicates that control measures have been efficient.

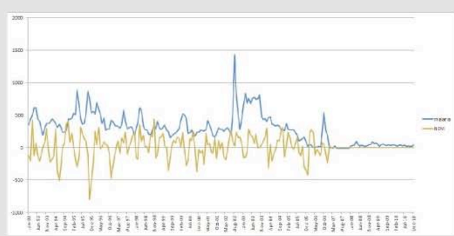


Fig 6: Time series malaria data and NDVI anomalies

Vegetation index (NDVI) does not show a relationship with malaria trends. Vegetation in this district is characterized by a grass savannah

CONCLUSION AND FUTURE WORK

It appears that climatic and environmental factors have not influenced the trends of malaria in Antsirabe. Nevertheless, we can observe that control strategies have had an impact on the reduction of malaria. We are planning to conduct this study to all the other districts in Madagascar to better understand where climatic conditions are impacting malaria and where control measures are impacting malaria in order to develop a forecasting model that could be operationally used.

Use of sea-surface temperature for a dengue fever early warning system in Ecuador

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Introduction

Dengue fever, a mosquito-borne viral disease, is one of the most important emerging diseases in Ecuador (Fig. 1).

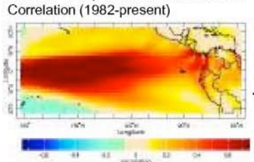
Fig. 1. Dengue Incidence 1998-2007
(100,000 people/year)

Climate influences dengue transmission (1). Greater rainfall can increase the availability of mosquito breeding sites. Warmer temperatures increase rates of larval development, viral replication, and mosquito biting.

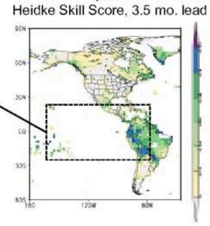
Motivation: Pacific sea surface temperature (SST, Niño 3.4) is highly correlated with temperature in coastal Ecuador (Fig 2a). Seasonal temperature forecasts show some skill for December-January-February (DJF), the time period prior to peak dengue transmission (Fig 2b). These forecasts could be used in an Early Warning System for dengue in Ecuador.

Objective: Explore the historical associations between dengue cases, local climate, and Pacific SST in Machala, Ecuador.

Fig. 2
A. Jan. Temperature and Niño 3.4
Correlation (1982-present)



B. DJF Temperature Forecast
Heidke Skill Score, 3.5 mo. lead



Methods

Exploratory analyses were performed using the following datasets:

Annual anomalies of reported cases of dengue fever in Machala (Ministry of Health, 1993-2010),

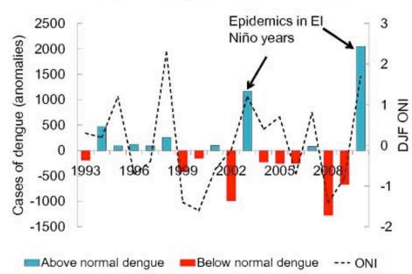
3 month running mean DJF Pacific SST anomalies in the Nino 3.4 region (Oceanic Nino Index – ONI) (NOAA, 1985-2011).

Anomalies of mean DJF daily precipitation, min/max/mean air temperature, and relative humidity from a meteorological station in Machala (INAMHI, 1985-2011)

Results

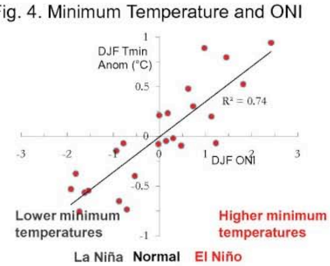
Years with an above normal incidence of dengue fever were associated with El Niño events and years with below normal incidence of dengue were associated with La Niña events.

Fig. 3. Dengue Cases and ONI



Higher than normal minimum temperatures were observed during El Nino years, and lower than normal minimum temperatures were observed during La Nina years (Fig. 4).

Fig. 4. Minimum Temperature and ONI



Conclusions

These results support previous studies that demonstrated linkages between SST and dengue transmission (1,2).

Previous studies also found minimum temperature to be an important driver of dengue due to effects on mosquito development and behavior (3).

Future research will explore other local climate variables and non-climatic confounding factors.

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Thanks to the IRI Summer Institute, The National Meteorological and Hydrologic Institute of Ecuador, the Ministry of Health of Ecuador, and the Fulbright Commission

Climate trend analysis for heat wave warning and emergency dispatch calls in Toronto, Canada

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Introduction

Current climate projections anticipate heat waves to increase in intensity and frequency[1] with climatically diverse regions reporting heightened heat mortality and morbidity due to lack of acclimation. Heat is suggested to remain the most important extreme weather-related killer in the United States;[2] hence, Heat Health Warning Systems (HHWS) have been developed using location and time specific synoptic climatology,[3] including acclimation. Stagnant air masses during heat waves have a synergistic effect with air pollution.

Toronto (43°39'N, 79°23W)

- Largest Canadian city – 2.64mill people, aging population
- Urbanization increasing, magnified urban heat island (UHI)
- More frequent and intense extreme heat events likely
- Two types of hot air masses related to heat mortality – Dry Tropical (**DT**) and Moist Tropical (**MT**) – shown to increase heat related mortality by **4.2%** and **4.0%**, respectively[3]

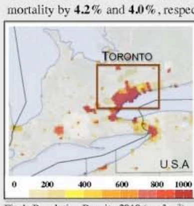

Fig 1: Population Density 2010 (per/km^2) in the Greater Toronto Area[6]

- Spatial Synoptic Classification (SSC)[4] takes into account health being affected by several weather variables (dew point, pressure, wind speed and direction, cloud cover, and cumulative heat days)[5]
- an **MT++** air mass indicates amplified apparent temperatures above normal **MT** conditions during morning and afternoon[3]
- Toronto experienced and MT++ heat wave from Jul 5 – 8, 2010[4]

Objectives

1) Determine 30 yr trends in DT and MT air masses in Toronto.
2) Assess observed versus predicted emergency calls for days during and around an MT++ heat wave from Jul 5 – 8, 2010.
3) Evaluate the daily temporal relationship of emergency calls and mean apparent temperature (T_a).

Methods

Emergency dispatch calls for Jun 28 – Jul 15, 2010 were obtained from the Toronto Emergency Dispatch Services.[7] Prediction of emergency response calls was calculated using a multiple linear equation [1] developed specifically for the city of Toronto.[8]

$$CALLS = 444.9 - 11DAY + 3.1(T_{a17}) \qquad [1]$$

where DAY = 0 (weekday) or 1 (weekend), and T_{a17} is the apparent temperature at 1700hr.

Based on SSC,[4] 30 years (1980 – 2010) of daily summer air mass types for Toronto were evaluated using linear trend analysis, followed by statistical comparison with mean summertime urban temperatures obtained from the Toronto Island Airport.

Results

Trends in extreme heat air masses for Toronto are displayed in Fig 2, showing a weak but positive linear trend.

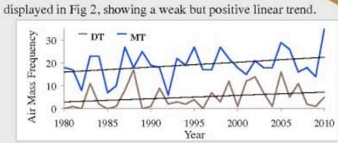

Fig 2: 30 year trend of DT and MT air mass frequency during Toronto summers

A moderate yet statistically significant agreement (r=0.668, p<0.01) of observed and predicted emergency dispatch calls was found (Fig 3). Predictions were overestimated on 72% of the days; however, the mean deviation from observed was 26 calls.

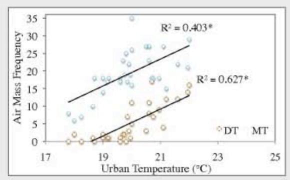

Fig 3: Linear regression of MT and DT air masses with summer temperatures in Toronto's urban area over a 30 year period, both displaying significance with temperature (p<0.05).

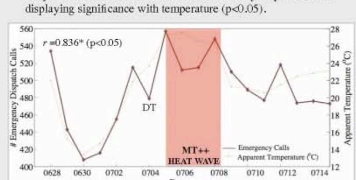

Fig 4: Temporal trend of daily dispatch calls with mean apparent temperature

A total of 8799 emergency calls were received from Jun 28 – Jul 15, 2010. The mean number of calls (489) is lower than mean calls received in the summers of 1999-2002.[8] Fig 4 displays the temporal daily relationship of T_a with emergency calls.

Conclusions

Results indicate ambulance calls significantly increase during extreme heat days, with future trends of oppressively warm days increasing. Hence, investing in accurate and advanced HHWS's are essential for emergency preparedness and protecting vulnerable populations. From this study, increases in DT and MT air masses are shown to relate to an amplified UHI, yet climate change is an important factor to consider, particularly in the future. Predicted temperature increase with climate change, plus an 8.5% increase in population, will both exacerbate the UHI effect. Therefore, there is a need for decision makers to focus on both climate change and UHI mitigation to lessen the frequency of such air masses. Effective bioclimatic design in urban areas can incorporate natural cooling through specific 'cool' building design and increased urban parks ('Park Cool Islands') with ample trees and greenspace.

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Losing Winter

Temperature trends and extremes of Beijing over a 35-year period.

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Learning objective

To study the temperature trends and temperature extremes of Beijing in 35 years from 1971 to 2005.

Background

Climate change is closely linked to urban development. Hot days, hot nights and heat waves have become more frequent. Heat has had among the most direct, discernable impacts and receives considerable public attention. Beijing is studied because it is one of the most rapidly growing cities in the world, with population increased by 44% in the past 10 years.

Method

Daily temperatures of Beijing were available from the IRI Data Library China Meteorological Administration Station ID Beijing 54511. We used 35 years' data from 1 January 1971 to 31 December 2005. In the late 1960's, Beijing meteorological observatory moved to the south suburban, temperature changed obviously after the movement, so we just analyze the data from 1971 to 2005.

Daily temperatures from June to August and from December to February were analysed. Criteria for hot days (exceeding 35/37/40°C) and cold days (below -10°C/-12°C) were determined based on Beijing's weather warning thresholds. Linear regression was performed with SPSS software for trend analysis.

Results

A. Temperature Trends

In the late 1960's, Beijing meteorological observatory moved to the south suburban, temperature records changed obviously after the movement, so we only analyze the data from 1971 to 2005.

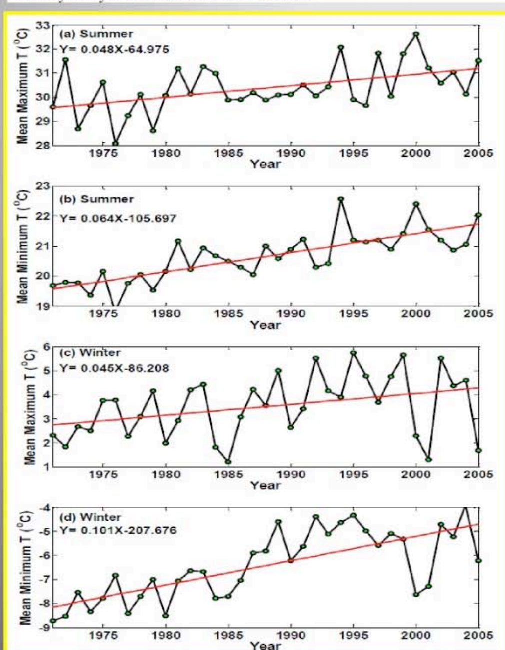


Figure 1 Time series of mean daily maximum/minimum (a/b) temperature in summer for 1971–2005, and time series of mean daily maximum/minimum (c/d) temperature in winter for 1971–2005.

Summer months

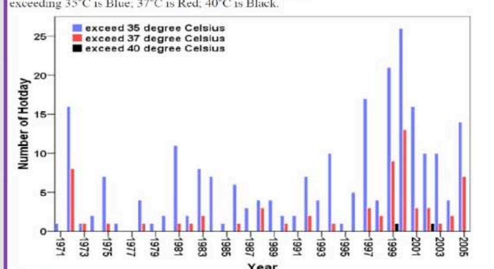
- Increasing trend of mean maximum & minimum temperature every summer. **All trends are significant at 5% level.**
- Long term trend analysis: Mean **maximum** temperature of every summer increases by **0.48°C per decade.** Mean **minimum** temperature of every summer increases by **0.64°C per decade.**
- The trend difference between maximum and minimum temperatures indicates that the diurnal temperature difference is becoming smaller.

Winter months

- Increasing trend of mean maximum temperature every winter. **Rapid increasing trend of mean minimum temperature. All trends are significant at 5% level.**
- Long term trend analysis: Mean **maximum** temperature every winter increases by **0.45°C per decade**. Mean **minimum** temperature every winter increases by **1.01 °C per decade.**

B. Extreme temperatures

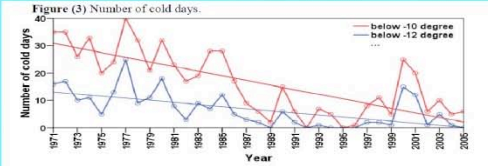
Figure 2 Number of hot days. Daily maximal temperatures exceeding 35°C is Blue; 37°C is Red; 40°C is Black.



Hot days

- From 1971 to 2005, **number of hot days** with maximum temperatures > 35° C increases obviously at rates of **2.93 days per decade.**
- y – 0.293x -575.793 **(significant at 5% level)**
- Hot days are more frequent in the recent 7 years, they occur mostly in June and July. Year 2000 has the largest number of hot days.

Figure (3) Number of cold days.



Cold Days

- From 1971 to 2005, number of cold days with minimal temperature <-10 and -12°C are decreasing by **8.46 and 3.81 days per decade respectively.**
- y = -0.846x + 1698.768 (below **-10°C, significant at 5% levels**)
- y = -0.381x + 763.962 (below **-12°C, significant at 5% levels**)
- In 1977, Beijing experienced the most frequent cold days. And year 2000 was very cold. Cold days occur most frequently in January.

Conclusion

Temperatures in Beijing are increasing. Winter is affected more than summer. Minimal temperatures are rising with greater speed. Number of hot days is increasing and number of cold days is decreasing significantly.

Discussion

- Weather information is from one single station in Beijing. We cannot compare rural areas with urban areas on urban heat island effect.
- The weather station was changed in late 1960s and so we have discarded data before 1971.
- Urban heat island effect may affect the night time minimal temperatures more seriously.
- Winter temperatures are affected more than summer may be a result of global warming and urbanization.

Appendix 7: Poster Prize Evaluation Form

Summer Institute 2011 – Poster Evaluation Form

Poster #	1	2	3	4	5	6	7	8	9
	Relation between Malaria cases and Climate information in Madagascar. District of Antsirabe II (Madagascar)	The Economic Implications of Climate Variation on Dengue in Brazil	Losing Winter -Temperature trend and extremes of Beijing over a 35 year period	Heat Waves EWS in Buenos Aires, Argentina	Use of sea surface temperature monitoring for dengue early warning in Ecuador	Temporal Distribution of malaria diagnosis in San Jose del Guaviare in Colombia	Climate trend analysis for heat wave warning and emergency dispatch calls in Toronto, Canada	Yellow Fever risk assessment in Cameroon *Ecological variables*	Hantaviruses in Brazil 2002-2009: Land Use and Land Cover Changes
1 point if present									
Title									
Names & affiliations									
Targeted country									
Objectives									
Audience/users									
Hypothesis									
Methods									
Results									
Interpretation									
Tables & figures									
Rate the following from 1 to 5, 5 being the highest score									
Is the objective clearly stated?									
Does the objective relate to climate and health?									
Is the project framed in terms of decision-making?									
Do the findings support the objective?									
Are the findings well illustrated?									
Are climate and health terms and definitions uses appropriately?									
Are tables and figures clear?									
Are descriptions clear and concise?									

Notes:

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The IRI was established as a cooperative agreement between NOAA's Climate Program Office and Columbia University. It is part of The Earth Institute, Columbia University, and is located at the Lamont Campus.