FA13 BIOS 40427
Topics in Epidemiology – Modern Infectious Disease Epidemiology
Debartolo 228
15:30 PM-16:45 PM Tuesday and Thursday
Fall 2013

Instructor
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Please note that there will be a number of different instructors who will provide students with training in specific skill areas.

This course is to introduce students to the field and methodology for researching modern infectious disease epidemiology. The emphasis will be on the important need to take an interdisciplinary approach, combining different analytical methods, in the study of the transmission ecology and control of infectious diseases. Students will be introduced to a range of topics and modern methods relevant to understanding and investigating the population biology, epidemiology, and control of diseases, ranging from transmission modeling to spatial ecology, host immunity and parasite genetics, socio-epidemiology of infection, intervention modeling, and health economics and management.

Learning goals
This course is designed to accomplish skill development in the following primary areas:
1. Appreciation of the burden and impact of infectious diseases on human populations
2. Gain understanding of modern theories of transmission dynamics, parasite immunity, population genetics, socio-ecology, epidemiological investigation, health economics, intervention design and management
3. Capacity to use modern methods for investigating infectious disease epidemiology, including transmission modeling, mapping and spatial analysis, surveillance analysis, meta-analysis, economic and decision analysis and querying molecular databases.
4. Capability to develop and apply inter-disciplinary approaches to investigating and intervening against major categories of infectious diseases

Office Hours
I welcome the opportunity to meet with students individually. I prefer speaking with you after class or by appointment. To set up a time, I can be reached at 574-631-2234 or by e-mail emichael@nd.edu
Academic Integrity
Students are expected to uphold the Academic Code of Honor described in the Graduate School’s Bulletin of Information (online at http://graduateschool.nd.edu/assets/29023/bulletin.1011.pdf), p. 18.

Attendance
Students are expected to attend all class sessions. If you cannot make a class, please obtain advanced approval from the instructor. The class participation grade will be lowered by one partial unit (i.e. from a B+ to a B) for each unexcused absence. More than three unexcused absences will lead to a failure of the course.

Course components and assessments

- Core course content will be introduced in lectures. Handouts will be available for each class, but will only outline the lecture topic and must be supplemented by notes taken in class and by reading of required texts
- Lectures will be followed by major practicals in mathematical modeling, mapping and spatial analysis, online molecular database queries/analysis, meta-analysis and economic analysis
- Students will present a group seminar presenting results of either a systematic review or meta-analysis on any topic of their choice in global health.
- 2 short pieces of assignment work will also be carried out by students and assessed.

Assessment of this course will be by:

1. Assignments (20%)
2. Practicals (40%)
3. Meta-analysis/systematic review seminar (10%)
4. End of term Exam (30%)

Required Texts


Cox, F.E.G., ed (1993) Modern Parasitology (Blackwell Science). A very good introduction to topics in Parasitology, including immunology, genetics and epidemiology.


**Optional Books**


**Schedule**

*Tuesday, August 27*
Introductions and discussion of course objectives.

*Thursday, August 29*
The global burden of infectious diseases.
Approaches to burden estimates, composite summary measures of population health, comparisons and trends in disease burden.

*Tuesday, September 3*
Principles of infectious disease epidemiology.
Overview of infectious agents, life cycles, routes of transmission, host exposure and responses, basic epidemiological patterns, and primary interventions.

*Thursday, September 5*
Epidemiological methods in health research I
Introduction to the Scientific Method in Epidemiology

*Tuesday, September 10*
Epidemiological methods in health research II
Study designs in epidemiological research

*Thursday, September 12*
Epidemiological surveillance.
Principles, rationale, history, methods, and types of modern surveillance systems.
Tuesday, September 17
Outbreak investigations.
Practical on applying statistical algorithms to detect outbreaks in surveillance data.

Thursday, September 19
GIS and remote sensing in epidemiology.
Introduction to GIS and remote sensing in mapping of infectious diseases.

Tuesday, September 24 (BM, Q, EM)
Hands-on computer practicals on using GPS, R and Google Map for mapping and analyzing disease spatial distributions I

Thursday, September 26 (BM, Q, EM)
Hands-on computer practicals on using GPS, R and Google Map in mapping and analyzing disease spatial distributions II

Tuesday, October 1 (KBS)
Parasite population genetics
Principles of parasite population genetics, molecular genetics of viruses, bacteria and protozoa, population structure, adaptive mechanisms, host-pathogen co-evolution, evolution of drug resistance

Thursday, October 3 (RP, SB)
Hands-on introduction to online genomic databases and clustering analysis I

Tuesday, October 8
Immunity to Parasites
Components and types of immunity to parasitic infection, immunity and population dynamics, vaccinations, immunity and dynamics of parasite control.

Thursday, October 10
Mathematical models in epidemiology: microparasitic infections I
Introduction to modeling directly-transmitted microparasitic infectious diseases: derivation and implementation of compartmental models, parameterization and predictions.

Tuesday, October 15 (BS)
Mathematical models in epidemiology: macroparasitic infections II
Introduction to modeling helminth infections: continuous models, impact of worm burden, density dependences and aggregation; derivation and implementation of simple macroparasite models, parameterization and predictions.

Thursday, October 17 (BS, SL, Q)
Hands-on mathematical modeling of a directly-transmitted microparasitic infection I

October 19-27--Mid-term break
Tuesday, October 29 (BS, SL, Q)
Hands-on mathematical modeling of a directly-transmitted microparasitic infection II

Thursday, October 31 (BS, SL, Q)
Hands-on mathematical modeling of a vector-borne microparasitic infection

Tuesday, Nov 5
Epidemiological methods in health research III
Data, and basic types of analyses in modern epidemiology

Thursday, November 7
Design and implementation of Systematic Reviews/Meta-Analysis in infectious disease epidemiology.
Introduction to research synthesis: concepts and methods

Tuesday, November 12 (MN, DL)
Design and implementation of Systematic Reviews/Meta-Analysis in infectious disease epidemiology.
Computer Practicals in R.

Thursday, November 14
Economic Methods for evaluation of health programs I
Principles of health economics, cost menus, discounting, cost-effectiveness and cost-benefit analysis, economics and health interventions.

Tuesday, November 19 (NP)
Social epidemiology of infectious diseases
Role of social disparities and inequalities on disease risk.

Thursday, November 21 (NP)
Culture, Behaviour and Health
Concepts of medical anthropology, cultural views of health and illness, theories of health behaviour and change, methodologies for understanding culture and health behaviour, case study of HIV/AIDS in sub-saharan Africa.

Tuesday, November 26
Economic Methods for evaluation of health programs II
Conducting a cost-effectiveness analysis using Excel/R

November 27 – Dec 1 – Thanksgiving Holiday

Tuesday, December 3 (ZS)
Interventions in infectious diseases I
Interventions against infectious diseases: innovations in controlling vectors

Thursday, December 5
Interventions in infectious diseases II
Program theory, complexity, and intervention design and management
Tuesday, December 10  
Group seminar preparations

Thursday, December 12  
Group presentations

December 13-15--Reading days

December 16-20--Final examination days

Course Tutors:

BS: Brajendra Singh  
BM: Benjamin Mayala  
DL: Diana LaTorre  
KBS: Katrina Button-Simons  
MN: Michelle Ngai  
NP: Naomi Penny  
Q: Quirine ten Bosch  
RP: Richard Pinapati  
SB: Susanta Behura  
SL: Sarah Lukens  
ZS: Zainulabeuddin (Zain) Syed  
EM: Edwin Michael