GHP351: Epidemiology: an ecological and evolutionary perspective

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****Currently undergoing revision****

Description

This required course for GHP students focuses on the distribution and determinants of disease. Diverse methodological approaches for measuring health status, disease occurrence, and the association between risk factors and health outcomes will be presented via classic and contemporary studies of chronic and infectious illness. The core underlying ecological and evolutionary drivers of human health will be introduced. Emphasis on: causal inference, study design and sampling, bias and confounding, the generalizability of research, infectious disease dynamics, global health.

Sample Reading List

Katherine M. Keyes & Sandro Galea, Epidemiology Matters: A New Introduction to Oxford University Press 2014., Methodological Foundations

Reading/Writing Assignments

In addition to the required reading, students will select 3 case studies illustrating different epidemiologic study approaches (case-control study, cohort study, clinical trial). One page summaries of the case studies will be turned in as written assignments. Case studies comprise 20% of the course grade.

Requirements/Grading

Mid term exam - 30%
Case studies - 20%
Precept participation/Problem sets - 20%
Class participation/Assignments - 20%
Paper in lieu of final - 10%

Other Requirements

Course is required for concentrators Open to Global Health & Health Policy Students Only. Prerequisites and Restrictions Completion of an approved basic statistics course (e.g., ECO 202, EEB/MOL 355, ORF 245, POL 345, PSY 251 or SOC 301, SML101 and SML201), or completion of an advanced statistics course (e.g., ECO 302, ECO 312, ORF 405, SOC 404, WWS 200, and WWS 332).

Other Information

Classes will primarily consist of lectures emphasizing epidemiologic methods and discussion of current and historic research studies. Precepts will provide for additional opportunities to discuss current research, examine methods and explore analytical approaches. There will be 5 spots available to Non-GHP Certificate Students; e-mail conoline@princeton.edu for permission to enroll in course.

Part 1: Descriptive Epidemiology

- 3rd Feb: Lecture 1: Epidemiology: An Introduction
  Reading: Keyes & Galea: Chapter 1, 2.

- 5th Feb: Lecture 2: Populations, Measurement
  Reading: Keyes & Galea: Chapter 3, 4, 5
  Videos: Epi Measures (7min); Measures of mortality 1 (3min)

  No Precept

- 10th Feb: Lecture 3: Reliability, validity and diagnostic tests
  Reading: Keyes & Galea: Chapter 13.
  Videos: Sensitivity and specificity (7min)

- 12th Feb: Lecture 4: CHARITY LUNCHEON in class exercise, application
  Reading: Review Keyes & Galea: Chapter 1-5
  Videos: Outbreak Investigation (4 min)

  Precept 1: Paralytic illness in Ababo

Part 2: Association and Causation

- 17th Feb: Lecture 5: Measuring association between exposure and outcome;
  Reading: Keyes & Galea: Chapter 6, 7.
  Videos: Exposure and Outcome (8min); Interaction (4min)

- 19th Feb: Lecture 6: Comparability, confounding
  Reading: Keyes & Galea: Chapter 8, 9
  Videos: Confounding (4min)

  Precept 2: Screening for antibody to HIV

- 24th Feb: Lecture 7: Causality
  Reading: Keyes & Galea: Chapter 10, 11
  Interview with Barry Marshall [link] (and if interested: [link])

Part 3: Study designs

- 26th Feb: Lecture 8: Case control and Cohort Studies
  Reading: Foltz et al. 2014. Epidemiologic Investigation of Potential Risk Factors for Nodding Syndrome in Kitgum District, Uganda. *Plos One*, 8 e66419
  The Framingham HeartStudy [link]
  Videos: GWAS (6min); Asthma (4min)

  Precept 3: Cigarette smoking and lung cancer

- 2nd March: Lecture 9: Randomized Controlled Trials
  Reading: Chandramohan et al. 2019 Effect of Adding Azithromycin to Seasonal Malaria Chemoprevention. *NEJM* 380: pp.2197-2206.
  Videos: RCTs (6min)

- 4th March: Lecture 10: Grappling with the literature
  Reading: Leaf 2013. Do clinical trials work? New York Times
  Ionnadis 2005. Why Most Published Research Findings Are False *PloS Medicine* 2, e124
  Videos: Publication Bias (7min)

  Precept 4: Contraceptives and Cancer

- 9th March: Lecture 11: Studying sex differences in health
  Reading: Klein, S.L. and Pekosz, A., 2014. Sex-based biology and the rational design of influenza vaccination strategies. *The Journal of infectious diseases*, **209**: S114-S119.

- 11th March: —-MIDTERM EXAM—-

  March 15th-21st . Spring recess

- 23rd March: Lecture 12: Nutrition and health: shifting grounds
  Reading: None

- 25th March: Lecture 13: Measuring mortality
  Videos: Measures of mortality 1; Measures of mortality 2; Measures of mortality 3.

  Precept 5: Ethics precept

Part 4: Infectious disease

- 30th March: Lecture 14: Infectious Disease concepts 1
  Reading: Lessler et al. 2016. Time to key events in Zika virus infection and implications for blood donation: a systematic review *Bull. World Health Org* 94, 841-849
  Videos: Concepts ID (7min);

- 1st April: Lecture 15: Infectious Disease concepts 2
  Reading: Roberts and Heesterbeek. 1993. Bluff your way in epidemic models. *Trends in Microbiology* 1:343-348.
  Videos: Infectious disease models (10min)

  Precept 6: Infectious disease

- 6th April: Guest Lecture: Amy Winter: Rubella vaccination
  Reading: Lawn et al. 2000. Unseen blindness, unheard deafness, and unrecorded death and disability: congenital rubella in Kumasi, Ghana. *American Journal of Public Health* 90, 1555-1561
  Grant et al. 2019. Progress Toward Rubella and Congenital Rubella Syndrome Control and Elimination Worldwide, 2000-2018. *Morbidity and Mortality Weekly Report*, 68, p.855.
  Videos: Rubella (10min)

- 8th April: Guest Lecture: Malavika Rajeev: Global Burden of Disease
  Reading: GBD Viz Hub
  Arinaminpathy et al. 2016. The number of privately treated tuberculosis cases in India: an estimation from drug sales data. *The Lancet Infectious Diseases* 16.11 (2016): 1255-1260.

  Precept 7: Study Design Preparation [Case study 1 (case-control) due in class]

Part 5: Evolution

- 13th April: Lecture 16: Evolution and Health: the basics
  Videos: Evolution basics (5min); Virulence (5min): [link]

- 15th April: Lecture 17: Pathogen genetics and health: antibiotic resistance
  Reading: Antonovics et al. 2007. Evolution by any other name: antibiotic resistance and avoidance of the E-word. *PLoS Biology*, 5, p. e30.

  Precept 8: Study Design Presentations [Case study 2 (cohort study) due in class]

- 20th April: Lecture 18: Human genetics and health
  Reading: Pittman et al. 2016. The Legacy of past pandemics: common human mutations that protect against infectious disease *PloS Pathogens* 1-7

Part 6: Ecosystem around health

- 22nd April: Climate and infectious disease (Guest Lecture, Caroline Wagner/Rachel Baker)
  Reading: Patz et al. 2005. Impact of regional climate change on human health. *Nature* 438, 310-317.
  Metcalf et al. 2017. Identifying climate drivers of infectious disease dynamics: recent advances and challenges ahead. *Proc. Roy. Soc. Series B* 284, 20170901.
  Baker et al. 2019. Epidemic dynamics of respiratory syncytial virus in current and future climates. *Nature Communications*, **10**: 1-8. [link]

  Precept 9: Study Design Presentations [Case study 3 (RCT) due in class]

- 27th April: Lecture 19: Emerging infections
  Reading: Metcalf and Lessler 2017. Opportunities and challenges in modeling emerging infectious diseases. *Science* 357, 149-152.
  Videos: https://www.tedmed.com/talks/show?id=627340

- 29th April: Lecture 20: CHOICE: Microbiome or Networks or Big Data or One Health

  No precept

  —— May 1st. Classes end ——