

**Washington University School of Medicine**  
**Master of Population Health Sciences (M19-5656)**  
**Master of Public Health (S55-4003)**

**Fall 2017 Global Burden of Disease: Methods and Applications**

**SYLLABUS<sup>1</sup>**

**Course Master:** Rumi Kato Price, PhD, MPE ([pricerk@wustl.edu](mailto:pricerk@wustl.edu))

**Guest Lectures** (alphabetical listing): <sup>2</sup>

Sundari Balan PhD, Department of Psychiatry, School of Medicine  
Peter Benson, PhD, Department of Anthropology, College of Arts and Science  
Graham Colditz, MD DrPH, Division of Public Health Sciences, Department of Surgery, School of Medicine  
Anne Glowinski MD MPE, Department of Psychiatry, School of Medicine  
Steve J. Lawrence, MD, Division of Infectious Diseases, Internal Medicine, School of Medicine  
Mark J. Manary MD, Department of Pediatrics, School of Medicine  
Manan V. Shroff, MBBS, MPH, Research Analytics, School of Medicine  
Bradley Stoner MD PhD, Department of Anthropology, College of Arts and Science  
Adetunji Toriola, MD PhD, Division of Public Health Sciences, Department of Surgery, School of Medicine

**Administrative Coordinator:** Maggie McCarthy ([margaret.mccarthy@wustl.edu](mailto:margaret.mccarthy@wustl.edu))

**Course Duration:** Fall 2016, I and II, August 31 to December 14, 2017

**Date and Time:** Thursdays, 1 pm – 4 pm

**Classroom:** Institute for Public Health, Medical Campus TAB Bldg. (Scott & Taylor), Second Fl. (Room TBA)

**Course Credit:** 3 credits

**Course Description and Objectives:** This transdisciplinary course provides an overview of quantitative and narrative methods and their applications for studying the global burden of diseases. The area topics include three major categories of global burden of diseases, including psychiatric & behavioral disorders infectious diseases, and non-communicable and chronic medical illnesses. Topical areas include maternal and child health, social determinants of health, environments and health. The course emphasizes causes, consequences of mortality and disability, and comparative risk assessments. Students will learn basic methods used for global health research and major global, regional and national trends in these areas, and will be able to apply the knowledge of measurements to forecast the future of the global burden of specific diseases and develop needed policy recommendations. Students will also be able to address prevention and intervention strategies targeted to specific nations or regions using a transdisciplinary approach. Students will learn dimensions of sociocultural, economic and environmental factors that affect global and regional distributions of major disease categories

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1. Content of this syllabus is subject to change.

2. Guest lectures are subject to availability of lectures; schedules of guest lectures TBA.

and how disease burdens are linked to global economy, policy and environment. The transdisciplinary knowledge and hands-on skills learned from this course will assist students with an interest in health research and practice in the international as well as local arena.

**Competencies:** <sup>3</sup>

1. Develop a critical understanding of the concepts and measures used in studies of global burden of infectious, chronic medical, psychiatric, and behavioral diseases.
2. Understand regional and national patterns of global burden of major infectious and chronic medical diseases and their risk factors including major differences in demographic, economic, and sociocultural factors such as cultural practices and national and regional policies.
3. Apply measures used in global burden studies to empirical data, field work, or interpretation of results in literature.
4. Apply critical knowledge in global burden studies to disease monitoring, intervention, health promotion, and policy implications in topical areas.
5. Acquire a deeper understanding of transdisciplinary thinking toward illness experiences and global health research.

**Prerequisites:** This course is open to postgraduate scholars, fellows, and graduate students. This course assumes knowledge of basic medical or behavioral science study design and statistics. An equivalent to an introductory epidemiology, a behavioral/social science quantitative method, or a biostatistics course is very helpful. Prior consultation with Course Master is recommended for undergraduate students or those who do not meet any prerequisite.

**Course Activities and Student Products:** Lectures, class exercises, discussion and other in-class participation, homework, short reports, and final group presentations. Additional analysis of an empirical dataset can be arranged individually.

**Administrative Notes:**

In-class conduct: Use of cell phones, texting and email communications, and web surfing are prohibited during lectures and student presentations, except for emergencies. This course may be audiotaped for educational purposes.

Accommodations based upon sexual assault: The University is committed to offering reasonable academic accommodations to students who are victims of sexual assault. Depending on the specific nature of the allegation, such measures may include but are not limited to: implementation of a no-contact order, course/classroom assignment changes, and other academic support services and accommodations. If you need to request such accommodations, please direct your request to Kim Webb ([kim\\_webb@wustl.edu](mailto:kim_webb@wustl.edu)), Director of the Relationship and Sexual Violence Prevention Center. Ms. Webb is a confidential resource; however, requests for accommodations will be shared with the appropriate University administration and faculty. The University will maintain as confidential any accommodations or protective measures provided to an individual student so long as it does not impair the ability to provide such measures.

WUSM mental health services: Mental health services are available for full-time students enrolled on the Medical School campus. Students can self-refer to a counselor (phone: 314-362-

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3. Students from a home program different from MPHS should consult with the course master potentially to modify their required competency assessment.

2404, Option # 1 or Option # 2); or make an appointment with Dr. Karen Winters through Student Health Services (SHS), telephone: 314-362-3523, and follow the prompts. There are also contractual mental health service providers who are available off-campus. More information regarding this coverage and a list of participating providers are accessible via: <https://wusmhealth.wustl.edu/> and then clicking on Students and scrolling down to Mental Health Information <https://wusmhealth.wustl.edu/students/mental-health-information/>

### **Course Evaluation: Letter Grade or Pass/Fail with Course Master's Permission**

20%	Attendance
20%	In-class discussion and participation
10%	Homework, in-class exercises
30%	Short reports
20%	Class presentation

1. The total point of 100 will be converted to letter grades according to an established norm; grades will not be normalized. Pass/Fail is optional but requires advance permission from the course master.
2. Attendance is required for all classes. Planned absences for reasons other than acute illness need to be excused in advance by the course master. Absences will typically be excused for reasons such as religious holidays, career development activities, or illness. Students who miss more than four classes may be expected to withdraw from the class.
3. Required readings should be completed prior to appropriate sessions as instructed. Recommended readings are for further exploration depending on student's interest.
4. Homework and in-class exercise products and short reports will be due upon specified date, but usually no later than one week after when assigned.
5. Final class presentation will be planned and carried out by student groups. The final presentation should be of professional quality, similar to a short presentation at a national or regional professional meeting. Use of power point or similar media is highly recommended. The quality of the presentation will be judged based on how well it meets a majority of the five competency criteria.

### **Course Reading Materials:**

#### Required:

Kleinman A. The Illness Narratives: Suffering, Healing, and the Human Condition. Selected chapter(s) Basic Books, 1989.

Hyder, AA, Puvanachandra P, Morrow RH. Measures of health and disease in populations. In Merson MH, Black, RE, Mills AJ (Eds.) Global Health. Diseases, Programs, Systems, and Policies. Third Edition. Jones & Bartlett Learning, 2012 (Chap 1).

Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL (Eds.). Global Burden of Disease and Risk Factors. Washington, DC: Oxford University Press and Word Bank, 2006; Chap 1.

Murray CJL, Lopez, AD. Measuring the Global Burden of Disease. New England Journal of Medicine 2013; 369: 448-57.

World Health Organization. The Global Burden of Disease concept (Chap 3). Available at: [http://www.who.int/quantifying\\_ehimpacts/publications/en/9241546204chap3.pdf](http://www.who.int/quantifying_ehimpacts/publications/en/9241546204chap3.pdf).

## Recommended:

The Lancet 2012: 380 (December 15) Issue, also available:

<http://www.rkp.wustl.edu/GlobalBurdenofDisease/TheLancet.pdf>

1. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010 (pp. 2095-2128).
2. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010 (pp. 2163-2196).
3. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010 (pp. 2197-2223).
4. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010 (pp. 2224-2260).

**Note:** Required reading pdf copies are uploaded to BlackBoard (BB), or available with URLs. Weekly lectures will be listed and made available in BB. A copy of each required or recommended articles will be available in BlackBoard (BB).

## **Course Segments:**

The didactic lectures are organized to conceptually in six segments.

- (1) Introduction to global health and global burden of disease, as well as quantitative and narrative methodologies of GBD.
- (2) Practicing measurements of basic GBD concepts and learning global, regional and local GBD trends, both disease specific and combined disease groups.
- (3) Introduction to global psychiatric and addiction diseases and trends in burden of diseases, risk factors, and prevention.
- (4) Introduction to global, national and local trends and sociocultural factors in the infectious diseases and GBD.
- (5) Introduction to non-communicable chronic medical diseases, trends, risk factors, and prevention.
- (6) Topical areas including maternal and child health, social determinants of health, environments and health. Student expert presentations are encouraged.

## **Week 1: Thursday, August 31, 2017**

### **Introduction to the Global Burden of Disease**

- Class introduction
- Course review
- Historical background for global health and global burden of diseases
- Millennium Developmental Goals (MDG) and Sustainable developmental goals (SDG)
- Transdisciplinary perspective on global health research and practice
- Peril of the Amazonas: Case example illustrating the impact of economy, environment, cultures on global health and illness

### **Methods and Practices**

- Discussion: Why global health, why global burden of disease?
- IHME GBD visualization tools

### **Materials:**

- Hyder, AA, Puvanachandra P, Morrow RH. Measures of health and disease in populations. In Merson MH, Black, RE, Mills AJ (Eds.) Global Health. Diseases, Programs, Systems, and Policies. Third Edition. Jones & Bartlett Learning, 2012 (Chap 1).
- Sustainable Developmental Goals:  
<http://www.un.org/sustainabledevelopment/sustainable-development-goals/>

## **Week 2: Thursday, September 7, 2017**

### **Basic Models of Global Burden of Disease**

- Major WHO-initiated studies
- The global burden of disease, injuries and risk factors 2010, introduction
- Basic model of global burden of disease

### **Methods & Practices**

- MSG & SDG report
- International disease classification systems
- Review of basic epidemiological measures (incidence, prevalence, mortality, life expectancy, risk ratio, population attributable risk and fraction)
- GBD basic measures: years of life lost (YLL); disability weights; years of life lost due to disability (YLD); disability-adjusted life years (DALY)
- DisMod-II to DisMod-MR
- Short report #1 instruction

### **Materials:**

- World Health Organization. The Global Burden of Disease concept (Chap 3). Available at:  
[http://www.who.int/quantifying\\_ehimpacts/publications/en/9241546204chap3.pdf](http://www.who.int/quantifying_ehimpacts/publications/en/9241546204chap3.pdf).
- Barendregt JJ, van Oortmarssen GJ, Vos T, Murray CJL. A generic model for the assessment of disease epidemiology: the computational basis of DisMod II. Population Health Metrics 2003; 1:4; 1-8.
- Murray CJL, Lopez AD. Measuring the global burden of disease. N Engl J Med 2013;369:448-57.
- Lancet 2012, #1, #2, #3.

## **Week 3: Thursday, September 14, 2017**

### **Illness Experiences**

- Disease and illness
- Anthropological methods and ethnography
- Core concepts in medical anthropology

### **Methods and Practices**

- Illness experience – student report
- Gapminder introduction and practice

### **Materials:**

- Kleinman A. The Illness Narratives: Suffering, Healing, and the Human Condition. Basic Books, 1989. Chapter **x**
- Rosling H. Feb 2009 TED talk (video). Available at:  
<http://www.gapminder.org/videos/ted-talk-2009-hans-rosling-hiv-facts/>.

## **Week 4: Thursday, September 21, 2017**

### **Global Burden of Psychiatric and Addiction Diseases (1)**

- Global trends in major psychiatric disorders

- Selected addiction and substance abuse global trends
- Impact of psychiatric and addiction disorders on infectious and chronic medical illnesses

### **Methods and Practices**

- Visualization of global health financing
- Consultation for final presentation

### **Materials:**

- Lancet 2012, #2, #3
- Degenhardt L, Whiteford HA, Ferrari AJ, et al. Global burden of disease attributable to illicit drug use and dependence: findings from the Global Burden of Disease Study 2010. *Lancet* 2013; 382: 1564–74.
- Ferrari AJ, Charlson FJ, Norman RE, et al. Burden of depressive disorders by country, sex, age, and year: findings from the Global Burden of Disease Study 2010. *PLoS Med* 10(11): e1001547.
- Mokdad AH, Marks JS, Stroup DF, & Gerberding JL. Actual cause of death in the United States, *JAMA*, 2004; 291:1238-1245.
- Brookmeyer R, Johnson E, Ziegler-Graham K, Arrighi HM. Forecasting the global burden of Alzheimer’s disease, 2007. Berkeley Electronic Press.
- Dieleman JL, Graves C, Johnson E, Templin T, Birger M, Hamavid H, Freeman M, Leach-Kemon, K, Singh L, Haakenstad A, Murray CL. Sources and focus of health development assistance, 1990-2014. *JAMA* 2015; 313(23):2359-2368.

## **Week 5: Thursday, September 28, 2017**

### **Global Burden of Psychiatric and Addiction Diseases (2)**

- Suicide, injury and violence
- Global monitoring, prevention, intervention, and health promotion

### **Methods & Practices**

- Discussion - stigma
- Discussion - mental health prevention right here in our campus
- Other commonly used health metrics: Healthy life years (HeaLY); quality-adjusted life years (QUALY)
- Discussion & home review (DisMod-II instructions)
- Short report #2 instruction

### **Materials:**

- Hagopian A, Flaxman AD, Takaro TK, et al. Mortality in Iraq Associated with the 2003–2011 War and Occupation: findings from a National Cluster Sample Survey by the University Collaborative Iraq Mortality Study. *PLoS Med* 10(10): e1001533.
- WHO. Global Status Report on Violence Prevention, 2014. WHO Press.

## **Week 6: Thursday, October 5, 2017**

### **Global Burden of Infectious Diseases (1)**

- Sexually transmitted infections
- Global examples and emerging infectious diseases
- Pandemic influenza
- Ebola
- Zika

### **Methods and Practice**

- Class exercise using DisMoD II, chronic disease examples

- Computations of YLL, YLD and DALY
- Group presentation, YLL, YLD, DALY
- Discussion: group presentation topics

**Materials:**

- Lewis, DA, Latif AS, Ndowa F. WHO global strategy for the prevention and control of sexually transmitted infections: time for action. *Sexually Transmitted Infections* 2007; 83:508–509.
- Ortblad KF, Lozano R, Murray CJL. The burden of HIV: insights from the Global Burden of Disease Study 2010. *AIDS* 2013, 27:2003–2017.
- Jones KE, Patel, NG, Levy AC, Storeygard A, Balk D, Gittleman JL, Daszak NG. Global trends in merging infectious diseases. *Nature* 2008; 451; 990-994.
- Garrett L. Ebola’s lessons. How the WHO mishandled the Crisis. *Foreign Affairs*; Sep/Oct 2015. <https://www.foreignaffairs.com/articles/west-africa/2015-08-18/ebola-s-lessons>
- Barendregt JJ, et al., 2003.
- Manan S. DISMODE II, 2014 (pdf, tutorial)

**Week 7: Thursday, October 12, 2017**

**Global Burden of Infectious Diseases (2)**

- Biomedicine as a cultural system
- Heterodox medical system
- Malaria and other mosquito-borne diseases
- Global warming and infectious diseases
- Prevention and control

**Methods and Practices**

- Bayesian regression basics
- Short report #3 instruction

**Materials:**

- Moyer E, Hardon A. A disease like any other? Why HIV remain exceptional in the age of treatment. *Medical Anthropology: Cross-Cultural Studies in Health and Illness*, 2014; 33:4, 263-369.
- Sidibe M, Piot P, Dybul M. AIDS is not over. *Lancet* 2012; 380: 2058-2060.
- WHO, Global Tuberculosis Report, 2014. Chapters, 2, 4, 5, 7
- Harries, A. Heading off the looming diabetes-tuberculosis epidemic. *Health Affairs Blog*, August 19, 2015, <http://healthaffairs.org/blog>
- van de Schoot R, Kaplan D, Denissen J, Asendorpf JB, Neyer FJ, van Aken MAG. A Gentle introduction to Bayesian analysis: applications to developmental research. *Child Development*, 2014; 85: 842–860. doi: 10.1111/cdev.12169

**Week 8: Thursday, October 19, 2017**

**Maternal and Child Health (1)**

- Infant and maternal mortality and morbidity measures
- Maternal and child health in developing countries

**Methods and Practices**

- Comparative risk assessment (CRA) concepts and model
- Computation of CRA

**Materials:**

- Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A-B, Daniels J, Gülmezoglu AM, Temmerman M, Alkema L. Global causes of maternal death: a WHO systematic analysis. Lancet 2014; 2: e323–33.
- Lancet 2012, #4.

### **Week 9: Thursday, October 26, 2017**

#### **Maternal and Child Health (2)**

- Eliminating child malnutrition – a success story
- Health care and cultural practices of reproductive systems in developing countries

#### **Methods and Practices**

- Computation of CRA – practice and presentation
- Short report #4 instruction

#### **Materials:**

- Trehan I, Goldbach HS, LaGrone LN, Meuli GJ, Wang RD, Maleta KM, Manary MJ. Antibiotics as part of the management of severe acute malnutrition, N Engl J Med 2013; 368:425-43.
- Ross GS, Mark J. Manary: Saving starving African children a few thousand at a time.  
[https://www.stlbeacon.org/#!/content/29584/mark\\_manary\\_profile?coverpage=2838](https://www.stlbeacon.org/#!/content/29584/mark_manary_profile?coverpage=2838)

### **Week 10: Thursday, November 2, 2017**

#### **Global Burden of Non-communicable Chronic Diseases (NCDs)**

- Major chronic diseases in developed countries: adult and geriatric diseases (cancer, obesity, cardiovascular diseases)
- Prevention and intervention studies of major diseases and eradicating underlying conditions
- Health promotion in developed countries
- Integrating biomarkers in chronic disease identification and prevention
- Best buys and obstacles for prevention

#### **Methods and Practices**

- Discussion on paired presentation topics and format

#### **Materials:**

- WHO, Global Status Report on Noncommunicable Diseases 2010, Chapter 4.
- Global Burden of Disease Cancer Collaboration. The global burden of cancer 2013. JAMA Oncol 2015;1(4):505-527.
- Colditz GA, Wolin KY, & Gehlert S. Applying what we know to accelerate cancer prevention. Science Translational Medicine 2012; 4: 1-9.
- Geneau R, Stuckler D, et al. Chronic diseases: Chronic diseases and development 1. Raising the priority of preventing chronic disease: a political process. Lancet 2010; 376:1689-98.
- Beaglehole R, Alleyne G, et al., for the Lance NCD Action Group. UN high-level meeting on non-communicable diseases: addressing four questions. Lancet 2011; 378:449-55.

### **Week 11: Thursday, November 9, 2017**

#### **Economic and Social Determinants of Global Health**

- Health or wealth? A case example from the Amazonas
- Improving sanitation practices in African countries

- Reproductive practices and women's rights

**Methods and Practices**

- Short report #5 instruction

**Materials:**

- Amazon river pollution project: available at: <https://www.youtube.com/watch?v=ZvvokDNG1GM>
- Performance Monitoring and Accountability 2020. Available at <http://www.pma2020.org/about-pma2020>

**Week 12: Thursday, November 16, 2017**

**Ethical Considerations in Global Health Research**

- Informed consent in international research
- Ethical issues in genetics research
- Responsible conduct as a global citizen

**Methods and Practices**

- Instruction and Q &A: paired presentation for Weeks 14 & 15

**Materials:**

- Stapleton G, Schroder-Back P, Laaser U, Meershoek A, Popa D. Global health ethics: an introduction to prominent theories and relevant topics. *Global Health Action* 2014, 7: 23569
- WHO, Ethical considerations for use of unregistered interventions for Ebola viral disease. WHO, 2014.
- Kiss L, Pocock NS, Naisanguansri V, Suos S, Dickson B, et al. Health of men, women, and children in post-trafficking services in Cambodia, Thailand, and Vietnam: an observational cross-sectional study. *Lancet Global Health* 2015; 3: e154–61.

**Week 13: Thursday, November 22, 2017 – NO CLASS, Thanksgiving**

**Week 14: Thursday, November 30, 2017**

**Final student presentation (1)**

- Final presentation
- Class discussion

**Week 15: Thursday, December 7, 2017**

**Final student presentation (2)**

- Final presentation
- Class discussion

**Week 16: Thursday, December 14, 2017**

**Makeup and finalizing presentation**

- Missed portions and clarifications
- Final class presentation due
- Course evaluation

Version 12: 08-25-2017