Research Methods in Global Health

Duke University, Fall 2015

Course Code:	GLHLTH 371-01/PSY 309-01
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COURSE DESCRIPTION

This course will introduce you to research designs and methods in global health. Global health is a multi-disciplinary field, so we will consider approaches common to the behavioral and social sciences, public health, and medicine. Our primary interest will be the study of causal inference. In global health, we are often interested in knowing what programs and interventions "work" and why. To answer questions of impact, we often turn to randomized controlled trials, a mainstay of medical research. As such, we will spend a good amount of time understanding the rationale, process, and limitations of field experiments. Randomization is not always possible or advisable, however, and researchers must build a causal argument using non-experimental methods. We will review several approaches, consider relevant threats to causal inference, and discuss how to improve non-experimental research designs. As we build up to this discussion, we will cover research basics, such as developing and testing theory, asking good questions, understanding variability, designing good measurement, and selecting research participants. In the latter part of the course, we will turn to more specialized topics in global health research, such as writing manuscripts, sharing your work, and making an impact.

LEARNING OBJECTIVES

We have two broad goals this semester:

1. to make you a better consumer of research, and
2. to prepare you to contribute to research teams at Duke and beyond.

Each module has specific learning objectives to help you achieve these overall goals. Jump to the "Session Info and Assignments" section to read the objectives of each module.

CLASS FORMAT

This class will incorporate pedagogical concepts and strategies from "flipped" classrooms and team based learning. After the first class, you will be assigned to a team of 4 to 6 students. You and your team will work

together on in-class assignments; expectations for team meetings outside of class sessions will be kept to a minimum.

You will be asked to prepare for class by completing assignments and reviewing pre-recorded lectures. At the beginning of each module you will complete a short online assessment based on the assigned readings and lectures (closed book, closed notes). Each assessment will consist of 10 multiple choice or short answer questions and last 10-15 minutes.

Following these Individual Readiness Assessments (IRAs), you and your team will complete the same assessment together as a team. We will then discuss answers as a group, and I may present additional material in class to clarify concepts. Class time will often be used to solve applied problems in teams.

Students needing additional help understanding the material will be encouraged to attend office hours or set up individual or small-group meetings. We may create post-lecture videos or notes as needed to clarify confusing concepts.

COURSE REQUIREMENTS

You will need to bring an iClicker2 device to every class to participate in assessments and in-class activities. You will also need to share the cost of printing a conference poster ($45 from PhD Posters) with 2 to 3 other students.

The main course text is "Global Health Research Methods". I have not found a suitable methods book for global health, so I decided to write one. It's a work in progress, and I will be asking for your feedback. The good news for you is that it's free. You can download it as a PDF or ebook from Leanpub. See this document for instructions.

You'll also be reading journal articles that will be available through Sakai or the Duke Library. You do not need to pay for any articles. If you are struggling to access a resource, consult with a librarian or ask for help on Piazza.

Enrolled students will be able to access podcasts of pre-recorded lectures on Sakai (click on Warpwire) or at https://dukestream.duke.edu/. If going through Warpwire, look for GLHLTH 371 (2015:Fall).

EVALUATION

Students should abide by the Duke Community Standard at all times. If a questionable circumstance arises, do not hesitate to seek my guidance (before is always better than after).

Any student with a documented disability needing academic adjustments or accommodations should speak with me and the TAs during the first two weeks of class. All discussions will remain confidential. Students with disabilities will also need to contact the Student Disability Access Office.

Grading Scale

The grading scale for this course is as follows:

A+: 100-98	A: 97-93	A-: 92-90
B+: 89-87	B: 86-83	B-: 82-80
C+: 79-77	C: 76-73	C-: 72-70
D+: 69-67	D: 66-63	D-: 62-60
F: 59 and below		

Final Grade

Your final grade will be a weighted average of several components: Individual Readiness Assessments (IRA), Team Readiness Assessments (TRA), application activities (AA), homework (HW), final exam, and peer evaluation. The table below shows ranges of possible weights for each component. Each team will present their preferences to the class, and we will come to consensus. I will update the syllabus after the votes are in.

Component	Min	Max	Final
IRA	5	20	20
TRA	5	10	10
AA	10	20	20
HW	5	15	15
Final exam	25	40	25
Peer	5	10	10

If you are in between grades, and if the difference is less than or equal to 0.5, your score will round up (e.g., 97.5 rounds up to 98).

Components of Final Grade

Individual Readiness Assessments (IRA)

At the beginning of every module you will complete a short assessment based on the assigned readings and lectures (closed book, closed notes). Each assessment will consist of ~10 multiple choice or short answer questions and last about 10-15 minutes.

Missed classes will result in a score of 0 and there will be no make-ups. Instead, I will drop your 2 lowest individual assessment scores. If there are 10 assessments worth 10 point each (100 possible points), I will drop your lowest two scores and divide your total by 80.

If the absence is excused, I will adjust your denominator accordingly.

Team Readiness Assessments (TRA)

Following the Individual Readiness Assessment, you and your team will complete the same assessment together as a team. Teams will use scratch off cards to mark answers.

Attempts Before Correct Answer	Points
1	5
2	4
3	3
4	2
5	1

Students who miss class will not receive a team score that day. For example, if a student misses 2 classes,

this student's final team score will be an average of her other 9 team scores.

Teams can appeal an incorrect answer by having one person submit a team response to the instructional team within 24 hours of the end of the class session. If a team's appeal is accepted, points will be awarded to the TRA (for the appealing team only). There will be no revisions to IRA scores unless the instructors decide that a question is bad. Individuals may not appeal.

Application Activities (AA)

I will assign short in-class team application activities most sessions. The AAs will give you an opportunity to explore a topic in more depth and use your new knowledge to solve problems. You will typically work together in pairs or triplets with members of your larger team. Students who miss class will be expected to complete the AA and submit by the make-up due date announced by the TA.

Homework (HW)

I will also assign individual homework to reinforce learning and challenge you to apply the course content to a topic that interests you.

This course is not a thesis development workshop, but I want to give you an opportunity to start building the pieces of a study proposal. When it comes time for you to go through this process for real, I hope you will be able to refer to the homework to guide you.

Unless otherwise specified, homework will be due at 1pm ET on the date indicated on Piazza. We will randomly select a subset of homework submissions to grade. Submissions not selected will be marked pass/fail. Late submissions will be graded and penalized 5 percentage points. For every 24 hours late after the missed deadline, an additional 5 percentage points will be deducted from the score.

Final Exam

The final exam for this course is scheduled for Wednesday, December 9 from 7pm-10pm ET. It will cover all course material (i.e., reading, lectures, class notes, in-class activities, homework).

Peer Evaluation

Team members will complete confidential ratings of all other members at the end of the semester. Student ratings will be averaged to construct an overall score.

CLASS SCHEDULE

Date	Session	Date	Session
T Aug 25	0.1 Introduction	Th Oct 15	5.1 Causal inference
Th Aug 27	0.2 From ideas to impact	T Oct 20	5.2 Causal inference
T Sept 1	1.1 Research 101	Th Oct 22	6.1 Experimental
Th Sept 3	1.2 Research 101	T Oct 27	6.2 Experimental
T Sept 8	1.3 Research 101	Th Oct 29	7.1 Quasi-experimental
Th Sept 10	2.1 Measurement	T Nov 3	7.2 Quasi-experimental
T Sept 15	2.2 Measurement	Th Nov 5	8.1 Observational

Date	Session	Date	Session
Th Sept 17	2.3 Measurement	T Nov 10	8.2 Observational
T Sept 22	3.1 Sampling	Th Nov 12	9.1 QUAL & mixed methods
Th Sept 24	3.2 Sampling	T Nov 17	9.2 QUAL & mixed methods
T Sept 29	4.1 Power	Th Nov 19	10.1 Making an impact
Th Oct 1	4.2 Power	T Nov 24	10.2 Making an impact
T Oct 6	4.3 Power	Th Nov 26	Thanksgiving
Th Oct 8	Mid semester review AA	T Dec 1	TBA
T Oct 13	Fall Break	Th Dec 3	Review

SESSION INFO AND ASSIGNMENTS

This course is divided into 10 modules. During the first class session of every module (x.1) you will complete individual and team readiness assessments. These formative assessments will cover all of the material assigned for the module, so come prepared to demonstrate your readiness for the in-class activities.

Module materials and assignments will typically be finalized and posted at least 7 days prior to the first module session (x.1).

1. Research 101

Overview

The purpose of this module is to lay a foundation for the rest of the course. We'll start with a review of the fundamentals of scientific research, but with a global health spin. You'll learn about how to develop a research question and search the literature for the existing evidence. Better yet, you'll learn to let someone else do that for you in the form of a systematic review or meta-analysis. We'll round out the module by discussing how to develop a program theory of change to guide program development, monitoring, and evaluation.

Assignments

- read Chapters 1, 2, and 3
- watch Module 1 lectures

Objectives

- explain what constitutes scientific research
- differentiate between the stages of clinical research
- contrast monitoring and evaluation
- classify research designs
- distinguish between research problems, research questions, theories, and hypotheses
- explain the purpose of a meta-analysis
- differentiate between systematic reviews and literature reviews
- describe how to conduct a literature search
- identify the core components of a theory of change

Homework and activities

Homework: Asking a question and searching the literature

Session	Activity
1.1	IRA/TRA
1.2	Hands on tutorial led by Duke global health librarians
1.3	From research question to logic model

2. Measurement

Overview

In this module we will review how to select and evaluate indicators and instruments. An indicator is an observable measure of a concept. For instance, if your program is designed to increase women's empowerment, you have to specify what you mean by "empowerment". What is the indicator of empowerment? How would you know if it's a good indicator? How would you measure it?

Assignments

- read Chapter 4
- watch Module 2 lectures

Objectives

- explain the importance of measurement at each step of the causal chain
- outline criteria for good indicators
- discriminate between good and bad indicators
- distinguish between reliability and validity
- calculate sensitivity and specificity
- comprehend the tradeoffs between using or adapting existing instruments, or developing new ones

Homework and activities

Homework: Measurement

Session	Activity
2.1	IRA/TRA
2.2	All about indicators
2.3	R, RStudio, and Instruments

3. Sampling

Overview

Now that you have a good, evidence-based research question and a primary outcome that you can define and measure, you are ready to think about the subjects of your research. Most often your research subjects—participants—will be people or places. You have two basic questions to answer about these participants:

1. How will you find, recruit, and select them? (sampling)
2. How many do you need to include to meet your studyobjectives? (power)This module focuses on the first question.

Assignments

- read Chapter 5
- read the 2008-09 Kenya DHS final report, Chapter 1 and Appendix B
- read the DHS Sampling and Household Listing Manual, selected sections from Chapter 1: 1.1-1.5, 1.8, 1.10
- watch Module 3 lectures

Objectives

- compare and contrast probability and non-probability sampling
- explain the reason for sampling error
- calculate and interpret the margin of error
- outline the differences between probability sampling methods
- outline the differences between non-probability sampling methods
- explain how DHS surveys approach sampling and provide a rationale

Homework and activities

Homework: Sampling

Session	Activity
3.1	IRA/TRA
3.2	From 1880 to 2003

4. Power

Overview

Whether you will use probability or non-probability approaches to sampling, you need to decide on how many people to include in your sample. If your goal is hypothesis testing, then considerations of sample size get us into a conversation about power.

Assignments

- read Chapter 6 of Running Randomized Evaluations (see Piazza/Resources; excludes 6.3)
- watch Module 4 lectures

Objectives

- to explain the concept of hypothesis testing to a lay audience
- to differentiate between the null hypothesis and the research hypothesis
- to identify the possible combinations of the result of a statistical test and reality
- to explain the concept of statistical power to a lay audience
- to list the determinants of power
- to perform power calculations to determine sample size
- to design a high powered study

Homework and activities

Homework: Designing a High Powered Study

Session	Activity
4.1	In-class lecture
4.2	IRA/TRA
4.3	Power, Money, Impact, and N

5. Causal Inference

Overview

Many of the today's most pressing questions are causal. Does X cause Y? Stated differently, does Program X increase/decrease some target outcome? To answer questions of impact, we often turn to randomized controlled trials, a mainstay of medical research. Randomization is not always possible or advisable, however, and researchers must build a causal argument using non-experimental methods. Whether randomized or not (or "quasi randomized"), it is important to think through how to build a causal argument.

Assignments

- read Chapter 1 and 2 of Experimental and Quasi-Experimental Designs for Generalized Causal Inference (see Piazza/Resources; in CH2, focus on internal validity)
- read Rogers, P. (2014). Overview: Strategies for Causal Attribution, Methodological Briefs: Impact Evaluation 6, UNICEF Office of Research, Florence
- watch UNICEF (2014). Strategies for Causal Attribution.
- review the JPAL design matrix

Objectives

- identify the requirements for causal attribution
- explain the idea of counterfactual thinking

- compare and contrast different approaches for causal attribution
- identify threats to internal validity

Homework and activities

Homework: Threats to internal validity

Session	Activity
5.1	In-class lecture
5.2	IRA/TRA

6. Experimental

Overview

In this module we'll cover the basic rationale for the use of randomized controlled trials and review what an RCT can and cannot tell us about the world. You'll learn how RCTs have been adopted outside of the realm of medicine to attempt to answer important social policy questions, and you'll hear from critics who think this is a mistake. Through the readings, homework, and in-class activities, you will be exposed to several study protocols and results that will help you to understand how RCTs are planned, conducted, and reported.

Assignments

- watch Duflo, E. (2010). Social Experiments to Fight Poverty
- read Chapter 2 of Running Randomized Evaluations (see Piazza/Resources)
- watch Deaton vs Banerjee, 2012 Debates in Development Conference
- read Manirakiza, A., Sepou, A., Serdouma, E., Gondje, S., Bata, G. G., Moussa, S., ... & Vray, M. (2013). Effectiveness of two antifolate prophylactic strategies against malaria in HIV-positive pregnant women in Bangui, Central African Republic: study protocol for a randomized controlled trial (MACOMBA). *Trials, 14(1)*, 255. [example study protocol for individually randomized trial design]
- read Blattman, C., Green, E. P., Jamison, J. C., Lehmann, M. C., & Annan, J. (2015). The returns to microenterprise support among the ultra-poor: A field experiment in post-war Uganda. Forthcoming in *American Economic Journal: Applied Economics*. Available at SSRN. [example cluster randomized trial with fractional factorial design]
- review CONSORT statement and checklist

Objectives

- to explain the rationale for experimental designs
- to evaluate whether or not experimental designs are the "gold standard"
- to list how experiments can be compromised
- to describe external validity
- to identify situations in which extensions of the RCT would be preferable (e.g., stepped wedge, factorial, cluster randomized)

Homework and activities

Homework: Homework Series on Malaria and Bednets Part 1: Experimental Designs

Session	Activity
6.1	In-class lecture
6.2	Getting to Know Randomized Evaluations

7. Quasi-Experimental

Overview

Experiments are the "gold standard" in the eyes of many people, but researchers are not always able to assign people or clusters to conditions or otherwise manipulate an independent variable. In these cases, researchers might rely on non-experimental designs commonly referred to as "quasi-experimental" designs. The name of the game in quasi-experimental research is to reduce threats to internal validity, something that randomization pretty much takes care of naturally (unless things go wrong during implementation). Beware: not all non-experimental designs are created equal.

Assignments

- read Experimental and Quasi-Experimental Designs for Generalized Causal Inference (see Piazza/Resources)
  - CH4, but skip case-control p128-134
  - CH5, pay particular attention to section on "The elements of design"
- read Moscoe, E., Bor, J., & Bärnighausen, T. (2015). Regression discontinuity designs are underutilized in medicine, epidemiology, and public health: a review of current and best practice. *Journal of Clinical Epidemiology, 68(2)*, 122-133.
- read Lagarde, M. (2012). How to do (or not to do)... Assessing the impact of a policy change with routine longitudinal data. *Health Policy and Planning, 27(1)*, 76-83.
- review TREND statement and checklist
- watch Module 7 video lecture

Objectives

- to compare quasi-experimental and experimental designs
- to rank the relative strength of different quasi-experimental designs
- to identify design elements that can improve the strength of quasi-experimental designs
- to interpret an interrupted time-series analysis (segmented regression)
- to interpret the results of a regression discontinuity design

Homework and activities

Homework: Homework Series on Malaria and Bednets Part 2: Quasi-Experimental Designs

Session	Activity
7.1	IRA/TRA
7.2	Flip or flop?

8. Observational

Overview

When randomization is not possible, researchers will sometimes turn to cohort, case-control studies, or cross-sectional studies (a.k.a. prevalence studies, discussed with descriptive research). You'll see these categorized as observational or non-experimental designs, and employed a lot by epidemiologists. Researchers use these designs to determine whether there is an association between some exposure and a disease. Prospective cohort designs are the best of the lot, but they can be quite expensive due to large sample size requirements and the need to wait a number of years to see who develops the disease. Emily Oster gives a good example of how this design can be impractical for determining whether exposure to cell phones leads to rare diseases like gliomas. The fall back in situations like this is often the case-control design. Find some people with gliomas ("cases") and some people without gliomas ("controls"), and ask them about their cell phone use patterns. We'll discuss the pros and cons of each design.

Assignments

- read Cummings et al. (2007). Designing a cohort study. In Hulley et al. Designing Clinical Research. Philadelphia, PA: Lippincott Williams & Wilkins. (see Piazza/Resources)
- read Newman et al. (2007). Designing cross-sectional and case-control studies. In Hulley et al. Designing Clinical Research. Philadelphia, PA: Lippincott Williams & Wilkins. (see Piazza/Resources)
- review STROBE statement and checklist
- watch Module 8 video lectures

Objectives

- to compare cohort and case-control studies
- to contrast prospective and retrospective cohort designs
- to explain the pros and cons of each design

Homework and activities

Homework: Homework Series on Malaria and Bednets Part 3: Observational Designs

Session	Activity
8.1	IRA/TRA
8.2	Does everything cause (and prevent) cancer?

9. Qualitative and Mixed Methods

Overview

Qualitative research can be a powerful complement to a quantitative impact evaluation in addition to being valuable on its own as a method of developing and testing theory. We'll discuss specific qualitative approaches and analytic strategies and consider how to mix QUAL and QUANT approaches. One qualitative approach we'll discuss is community based participatory research, or CBPR. There is a growing recognition that community involvement can lead to better designed interventions and more successful evaluations. In CBPR, the research process starts and ends with the community. In terms of end goals, social change is at least as

important as the production of generalizable knowledge. In this sense, CBPR is action oriented. CBPR is not a method, per se, but a orientation to research. We'll discuss what this means and looks like in practice.

Assignments

- read Padgett, D. K. (2012). *Qualitative and Mixed Methods in Public Health.* SAGE Publications. Chapters 1-3. (available through Duke as an eBook)
- read Israel, B. A. et al. (2010). Critical issues in developing and following CBPR principles. In Minkler, M., & Wallerstein, N. (Eds.). (2010). [*Community-based Participatory Research for Health: From Process to Outcomes*]. John Wiley & Sons. (available through Duke as an eBook; chapter 3)
- read Mack, N. et al. (2005). *Qualitative research methods: A data collector's field guide*. FHI360. (at least read the overview of Modules 1-4; if you are planning a qualitative study, you should eventually read this cover to cover)
- review SRQR and COREQ qualitative reporting guidelines
- watch Module 9 video lectures
- review the following resource prior to the in-class activity: IDEO (2011). Human Centered Design Toolkit, 2nd ed. San Francisco: IDEO. (available for free download here)

Objectives

- to compare qualitative methods to quantitative methods
- to list rationales for using qualitative methods
- to outline major qualitative approaches
- to explain the rationale for mixed methods research
- to outline various mixed methods designs
- to compare CBPR approaches to more traditional, investigator-driven models of research
- to outline the core principles of CBPR

Homework and activities

Homework: Qualitative Data Analysis

Session	Activity
9.1	IRA/TRA
9.2	A different meaning of global health "design"

10. Making an Impact

Overview

In the final module of the semester, we'll examine how research fits into the larger process of policy change. It's often a long slog from the development of an idea to the large scale implementation and adoption of the idea ("scale up"). We'll review the general timeline and process for academic research, and then we'll discuss barriers to moving from research findings to policy impact. To maximize impact, new researchers need to learn how to communicate results and study implications to a broader audience than just academic colleagues. This means gaining experience writing policy briefs and op-eds and conducting interviews with the media. It also means thinking about how to place results in context. If the first lesson of analysis is "effect size matters" and that your job is not done when $p<0.05$, the follow-up lesson is that cost matters too.

A program with a large effect that costs 30 times a country's per capita spending on health might not be a good investment. It might not be cost-effective. But then, what is cost-effectiveness and is this the right bar?

Assignments

- read Dhaliwal, I & Tulloch, C. (2012). From research to policy. *JPAL*.
- read Ord, T. (2013). *The Moral Imperative Toward Cost-Effectiveness in Global Health*. CGD.
- read Farmer, P. (2015). Who lives and who dies?. *Slate*.
- read Dhaliwal, I. et al. (2012). *Comparative Cost-Effectiveness Analysis to Inform Policy in Developing Countries*. Sections 1 and 2.
- read JPAL policy brief "Is the price wrong?"

Objectives

- to examine the process and timeline from development of an idea to real world impact
- to explain the purpose and process of academic peer review
- to conduct a basic cost effectiveness analysis

Homework and activities

Homework: None

Session	Activity
10.1	In-class lecture
10.2	Preparing a policy brief

FREQUENTLY ASKED QUESTIONS

How can we contact you?

This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TAs, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. You can always call or email me with personal concerns, but I would like you to post all course-related questions to Piazza. You can post anonymously.

If you need to email me, please copy the course TA and include "371" in the subject.

How will you announce changes to the syllabus?

I'll post any substantial changes as announcements on Sakai and mention in class. Minor changes will just be pushed to GitHub.

Where do I find course information?

You can get to everything from Sakai, including this syllabus. You can also go directly to each resource.

Platform	Purpose
Sakai	Info hub and grades
Piazza	Q&A, communication
GitHub	Syllabus and documents for application activities (just using as a website)
Warpwire	Lecture videos
Leanpub	Get course textbook
Google Drive	Collaboration on team documents

How much time should I be working outside of class each week?

A reasonable rule of thumb is somewhere between 2:1 and 3:1 out-of-class to in-class hours. We meet in class 150 minutes each week, so expect somewhere between 5 to 7.5 hours outside of class. If you find yourself putting in a lot more hours than the upper end of this estimate, come see me. It's quite possible that you are not using your time as efficiently as you could.

Should I bring a computer to class?

Yes. A computer is not a strict requirement, but it will be useful for in-class assignments.

On readiness assessment days (sessions x.1), please do not open your computer until AFTER the TRA.