INTRODUCTION TO HEALTH RESEARCH METHODS

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INTRODUCTORY ESSAY

Introduction to Health Research Methods is required for all students enrolled in a master of public health (M.P.H.) or master of science (M.S.) program in public health at a large public university with a diverse student body, including a high proportion of international students. The M.P.H. and M.S. programs cater to students who work full-time, so each class meets for a 3-hour block one evening each week during a 15-week semester. This course is the third of a three-course research methods sequence; students are expected to have completed a biostatistics and an epidemiology course prior to enrolling in research methods.

Introduction to Health Research Methods uses a sequence of three projects to help students move quickly toward becoming confident and competent research collaborators. The first project is a short review paper—a "mini-review"—that gives students practice in selecting a study question, using abstract databases, accessing electronic journal collections and interlibrary loan services, and critically reading the literature. The second project is a proposal for a small-scale data collection project. Although students do not actually collect data for this project during the class, writing a proposal gives them an understanding of how questionnaires are designed and tested, how ethical considerations are addressed when research involves human subjects, how participants are sampled and recruited, and how data are collected and managed. The last half of the semester is dedicated to a final project in which students work in groups of 3 or 4 to analyze part of a publicly-available dataset—there are many that are freely available from the U.S. CDC, the World Health Organization, and other agencies—and write up the results in a formal report that could be submitted to a peer-reviewed journal or presented at a professional conference. A successful outcome is nearly guaranteed, even with a quick timeline, when the professor conducts enough preliminary analysis of the selected dataset(s) to confirm that meaningful and statistically significant results may result for a variety of potential study questions that could be explored by the student groups. By providing detailed, individualized feedback on the first two papers and doing the upfront work of selecting suitable datasets for the secondary analysis, the professor prepares students to take ownership of their own learning during the final project. A significant amount of class time can be devoted to group writing and editing exercises, and students feel empowered and motivated to do high-quality research.

This approach to teaching and learning is built on the principle that ***the best way to learn how to do research is to do research***. The goal of this course is to introduce students to the research process— identifying a study question, selecting a study approach, designing a study and collecting data, analyzing the data, and reporting the findings—and that is accomplished by letting students experience all of those steps.

In the typical research methods course, students spend more time reading published papers than doing their own research. Reading model papers provides insight into how to design and implement a valid study, and reading in a discipline is essential for learning how to write in that area. However, the journal critique approach tends to emphasize the limitations of studies more than the strengths, and often leads students to see research as inaccessible, flawed, and boring. Reading about how *other* people have conducted research does not convey the excitement of making research discoveries, and reading by itself will not build students' confidence that they can actually do research on their own.

Each project is divided into small weekly assignments in order to keep students on track, demonstrate that health research can be approachable and manageable if the standard research steps are followed, and foster the diligence that research requires. In a typical week, each student drafts a few new paragraphs totaling about 500 words and edits a section of similar length.

The professor provides frequent examples of instances when health research is important, which motivates students and helps to sustain energy for their projects. Every student in the course absorbs the fact that health professionals need to develop research competencies sufficient to summarize what is already known about a topic, ask a good research question, and design a study to answer it, analyze a dataset, and explain the results. Health research provides the necessary evidence base for advances in clinical and public health, and understanding the basic steps in health research is important for all health science professionals.

Students also receive weekly encouragement, and specific suggestions for improvement, from their peers. Each student is a member of the same 3 or 4 person writing group for the entire term, and the students build strong relationships with one another by working closely together for so many weeks. The groups help keep individual students from getting too far off track: if one member's draft looks significantly different from those of the other members, that is a signal to consult with the professor. The groups make it easier for less confident students to ask questions, because individuals can pose questions to the group first and then the group can present their collective questions to the professor.

For the first two projects (the systematic review and research proposal), students write individual papers on unique, self-selected topics. During the weekly in-class writing group sessions (which follow a lecture on the week's theme), each student receives peer and instructor feedback about the content, organization, and style of the newly drafted section. (Or, on the first day of a new project, receives input about his/her idea for the new project.) Students practice professional communication skills by serving as peer reviewers, and they develop critical thinking skills by offering suggestions about how to address research and writing challenges. The groups simulate the real world environment where research reports are typically the result of collaboration and are subject to various levels of review before publication.

For the final project (the secondary analysis), each group chooses one group research question. Although the groups must choose a dataset from an approved list, the selection of the actual question to explore within the dataset is their own decision. Each student conducts independent statistical analysis and writes his or her own preliminary report, but decisions about methodological approaches and key findings are communal. Having multiple analysts check the data and do their own recoding (following the plan specified in the group's codebook) is important for ensuring that the final results are correct. Any discrepancies in the statistics reported by group members can be identified and corrected during class time on the day the results draft is due. During the final weeks of the term, the group merges all their individual reports into either a group paper (formatted to the specifications of a journal that publishes articles on the topic the group has explored) or a group poster (formatted to the

specifications of a conference at which findings on their topic will be presented). All groups also make a 15 to 20 minute oral presentation (complete with projected slides) during the course's "annual research conference," which is styled on the research sessions at the annual meetings of professional organizations.

This focus on "real world" conditions points to a key supporting premise for the course: **student research is real research**. All students are encouraged to write a research proposal for a study they themselves could actually do, and to write a secondary analysis paper on a novel topic that has the potential to be published or presented professionally. The emphasis on *real* research significantly increases the interest level of students and the quality of their products. Several students have gone on to implement their primary study proposals as mentored summer research projects and have published their findings in international peer-reviewed journals. Several students have presented their secondary analysis results at professional conferences and (with additional instructor mentoring) had their manuscripts accepted for publication in peer-reviewed journals. Students leave the course with both an understanding of the research process and a product that proves their own professional-level research skills.

SYLLABUS

COURSE DESCRIPTION

Introduction to Health Research Methods prepares students to conduct ethically sound and scientifically valid medical and public health research (3 credit hours).

STUDENT LEARNING OBJECTIVES (SLOS)

1. Identify health research questions and specific research objectives.
2. Find relevant abstracts and access full-text articles using online resources.
3. Critically read public health articles published in peer-reviewed journals.
4. Select appropriate epidemiological study designs for health research.
5. Develop a proposal for a primary research project.
6. Identify common challenges encountered during health research and discuss ways to address them.
7. Describe the process for conducting ethical health research.
8. Use statistical software packages to manage and analyze data.
9. Calculate, interpret, and compare measures of disease frequency in populations and measures of association between exposures and health outcomes.
10. Demonstrate professional writing skills.
11. Develop professional communication, teamwork, and leadership skills.

ASSESSMENT

Component		Week Due	% of Grade	Key SLOs
Project 1 (P1)	Systematic Review	4	10	1,2,3,10
CITI Ethics Modules*	Human Research Basic Course (Social & Behavioral Research)	7	7.5	7
	Responsible Conduct of Research (RCR) Basic Course	7	7.5	7
Project 2 (P2)	Research Proposal	8	10	1,4,5,6,10
	IRB Application Form	8	5	7
Project 3 (P3)	Secondary Analysis Paper	13	20	3,8,9,10
	Group Paper OR Poster	15	5	11
	Group Presentation	15	5	11
Peer Review (11 weeks; lowest score dropped)		As Scheduled	20	11
4 Quizzes (Q1: Citing, Q2: Study Designs, Q3: Research Ethics, Q4: Statistics)		As Scheduled	10	4,7,9,10

READINGS

- The recommended textbook for this course is ***Introduction to Health Research Methods: A Practical Guide*** (Jones & Bartlett, ©2012).
- The university library's online abstract databases and e-journals collection will be essential tools for conducting literature searches and finding the full-text manuscripts for relevant articles.
- Online research ethics training modules.

COURSE SCHEDULE

Week	Topic	Key SLOs	Writing Draft Due[†]	Graded Assessment	IHRM Chapters
1	The Research Process	1	--		1,2,3,4
2	Literature Reviews	2,3	P1 background and methods draft		7,24,29,30
3	Descriptive Studies	4	P1 data extraction table, results, and discussion draft		6,8,9,10,14
4	Analytic Studies	4	--	P1 DUE; Q1	11,12,13

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[*] The Collaborative Institutional Training Initiative (CITI) program is used by hundreds of colleges and universities to train faculty, staff, and students in research ethics. Many of these schools' IRBs (institutional review boards) require all researchers to successfully complete required modules before they engage in any research activities.
[†] On these days, each student must bring to class printed copies of a complete draft of the assigned sections.

Week	Topic	Key SLOs	Writing <u>Draft</u> Due[†]	Graded Assessment	IHRM Chapters
5	Research Populations	5	P2 background and objectives draft		15,16,17
6	Surveys and Interviews	5,6	P2 methods draft	Q2	18,19,20
7	Research Ethics	7	P2 full draft, including draft IRB application	ETHICS MODULES DUE	21,22
8	Data Management	8	--	P2 DUE; Q3	23,25,26
9	Review of Statistical Analysis	8,9	P3 methods draft		27
10	Statistical Analysis Strategies	8,9	P3 introduction and reference list draft		28
11	Writing and Revising Strategies	10	P3 results draft, including tables/figures	Q4	31,32
12	Professional Presentations	10	P3 discussion and abstract draft		33
13	Writing with Co-Authors	6,11	--	P3 individual paper DUE	5
14	The Publishing Process	3,11	P3 group project section draft		34,35,36
15	ANNUAL RESEARCH CONFERENCE	11	--	P3 group paper or poster DUE	--

ASSIGNMENTS AND ACTIVITIES

PROJECT 1: SYSTEMATIC REVIEW

A systematic review uses a well-defined search strategy to identify all prior publications on a specific topic and to summarize the findings of those studies as part of a comprehensive analysis of the current state of knowledge on the topic. For this course, the "mini-review" paper will be a synthesis of research results on a very narrow topic. Sample research questions may take the form of:

- Based on the published literature, what is the incidence/prevalence of {exposure or disease} in {population}?
- Based on the published literature, does {exposure} appear to be a risk factor for {disease} in {population}?
- Based on the published literature, does {intervention} appear to be an effective method for preventing/treating {disease} in {population}?

Topics can be narrowed by tightening the exposure, disease, and population of interest. For example, the population can be restricted to one country rather than the whole world or to one age group (such as children less than 5 years old or adults ages 70 and older) rather than all ages.

The goal is to identify all articles about the narrow topic that have been indexed in the PubMed database. This will require careful selection of initial search terms plus testing of alternate keywords to confirm that all relevant articles are captured by the search. "Snowballing"—looking up the references

cited in the articles found in PubMed—is also allowed but is not required. The mini-review paper will be limited to an abstract with no more than 100 words, a text of no more than 1000 words (which should include separate sections for the background, methods, results, and conclusion), 1 flow chart, 1 table, and no more than 8 references.

The keys to success for this paper include selecting a focused, narrow topic; defining a clear and comprehensive systematic search strategy; submitting interlibrary loan requests as soon as possible, if required; reading the full text of all relevant articles; and creating a clear data extraction table for inclusion in the manuscript. The paper should be formatted according to the International Committee of Medical Journal Editors (ICMJE) Uniform Requirements for Manuscripts, and all of the relevant items from the PRISMA Statement (Preferred Reporting Items for Systematic reviews and Meta-Analyses of experimental studies) or MOOSE Statement (Meta-analyses Of Observational Studies) should be addressed.

Several free-to-access step-by-step guides to conducting systematics reviews may be useful as resources. These include the Institute of Medicine (http://www.iom.edu) *Standards for Systematic Reviews* (see Standard 2.6: Develop a systematic review protocol), the Cochrane Collaboration (http://www.cochrane.org) *Guidelines for Systematic Reviews of Health Promotion and Public Health*, and the *Cochrane Handbook for Systematic Reviews of Interventions*. Sample systematic review papers will also be examined in class.

P1 PROJECT TIMELINE

Step	Outcome	Week Due
1	Select a topic	1
2	Draft of background and methods sections	2
3	Draft of results and discussion sections, including the data extraction table	3
4	Final paper due	4

PROJECT 2: DATA COLLECTION PROPOSAL

A variety of funding opportunities are available for students who want to do summer research, including grants from university offices. This assignment lays the groundwork for an application to conduct research the summer after completing this course. The proposal should be for the collection and analysis of new observational (not experimental) data, and must be for a project that could realistically be conducted during the summer term with a $3000 budget. (Data collection is not conducted as part of this course, but the course proposal can serve as the foundation for a future summer funding application.) Because most funding agencies have strict page limits for proposals, this assignment requires similarly concise background and methods sections.

The proposed methods do not have to be elaborate, but the study question and specific objectives must be clear, and the methods must be appropriate for the aims. Every component of the proposal should emphasize the research question and its importance, with each part building an argument for saying, "fund this proposal!" The proposal packet should include the following items: (1) a cover page with the project title, researcher name, and a 100 to 150 word abstract, (2) a statement of the objectives of the

proposed research project, (3) a background and literature review about the topic that emphasizes what will be new and important about the proposed study, (4) a description of the proposed methods, (5) a reference list, (6) a detailed and realistic timeline for completion of the work, (7) an itemized budget of not more than $3000, (8) a C.V. (curriculum vita) for the researcher that emphasizes the applicant's research skills, and (9) a completed draft of the university's human subjects review application form. The entire packet should be single-spaced, and no section (other than the IRB application) should exceed one page in length. Sample proposals and IRB applications will be reviewed in class.

P2 PROJECT TIMELINE

Step	Outcome	Week Due
1	Select a topic	4
2	Draft of background and objectives sections	5
3	Draft of methods section	6
4	Full draft, including IRB application	7
5	Final paper due	8

PROJECT 3: SECONDARY DATA ANALYSIS PAPER

One of the most time-efficient ways to write a paper is to analyze an existing dataset and write up the results as a formal manuscript. There are many organizations (including the U.S. CDC and the World Health Organization) that make their datasets available to other researchers at no cost and encourage them to publish their results in peer-reviewed journals. For this assignment, each writing group will work with the professor to select a dataset from a trusted organization and then will choose a study question that can be answered with those data. After working together as a group to create an analysis plan (including a codebook that specifies how variables will be recoded, if necessary), each individual will conduct his/her own statistical analysis. The recommendation is that the analysis be conducted either with SPSS or Epi Info (a free software program from the CDC), since these are used in the courses that are prerequisites for this course. Each individual will write his/her own paper on the group's topic, then the group will merge the individual papers into either a group paper or a group poster and will present their findings in a 15 to 20 minute oral presentation.

The analytic techniques used for the paper do not have to be complex, but the paper must have a clear and compelling study question and the results section must provide the answer to that question. The individual paper should have a main text (in "IMRD" format: Introduction, Methods, Results, Discussion) that is 1500 to 2000 words long, cite a minimum of 10 articles, present 1 to 4 tables/figures, be formatted according to the ICMJE Uniform Requirements for Manuscripts, and include all relevant items from the STROBE Statement (Strengthening The Reporting of OBservational studies in Epidemiology) or CONSORT Statement (CONsolidated Standards Of Reporting Trials). Sample papers will be evaluated in class. The group paper or poster must follow the guidelines of a particular journal or conference that publishes or presents research on topics similar to the paper's theme; groups will select their target venue for themselves after consultation with the professor.

P3 PROJECT TIMELINE

Step	Outcome	Week Due
1	Writing groups select a dataset and research question	8
2	Draft of methods section	9
3	Draft of introduction section and reference list	10
4	Draft of results section	11
5	Draft of discussion section and abstract	12
6	Individual paper due	13
7	Draft of assigned sections of the group paper or poster	14
8	Group presentation; group paper or poster due	15

COURSE POLICIES

PEER REVIEW

Writing groups of 3 or 4 students will be formed the first week of class and will meet weekly during class time for the entire semester. Many groups will also choose to be in communication outside of class. For the first half of the term (Projects 1 and 2), group members will serve as brainstorming partners and peer editors and reviewers; during the latter half of the term (Project 3), groups will work together on a research project. A discussion guide will be provided most weeks to guide the conversation toward high-priority activities and outcomes.

To reward active in-class participation, each group member will earn weekly points for preparation (coming prepared with a printout of the complete draft section for each member of the group) and quality feedback (as assessed by other members of the writing group). Students who miss a session when drafts are reviewed in class will receive a peer review score of "0" for that session, but the lowest of the 11 scores will be dropped.

Group members are responsible for working together to make the review and feedback process as helpful as possible. This requires honesty, tact, and time management. If a group member is not providing appropriate or specific feedback, please ask for more detailed and critical comments. If a group member is losing focus, please point that out and help the group to get back on track. Please alert the professor to any concerns about group dynamics, and be sure to ask for explanations of any research methods that seem unclear.

FORMATTING RULES

Granting agencies that fund research and journals that publish research results often have very strict formatting guidelines. If the word count exceeds the stated limit, the proposal *will* be rejected. If the submission has one too many references, uses the wrong citation style, or fails to insert page numbers at the preferred spot on the page, the manuscript *will* be rejected. This may seem unreasonable, but it is the way the real world works. The general assumption seems to be that people who are careful with formatting will be equally careful with all the other aspects of their research, and that people who are sloppy with formatting probably were careless with some of their research methods. Thus, it is important to develop the habit of meticulously adhering to all formatting requirements. To encourage this professional development, compliance with formatting rules will be enforced as part of the assessment in this course.

ACADEMIC HONESTY

Plagiarism is a serious violation of academic and professional integrity. It can result in expulsion from a university, the public and embarrassing retraction of published articles, and even the loss of a job. Appropriate use of references will be discussed early and often in class, and the professor is happy to answer any and all questions about how to use and cite various information sources. Plagiarism in this course will result in a "0" for the assignment.