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Teaching Social Epidemiology: An Applied Assignment for Undergraduate Instruction

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Introduction

The area of health sociology has expanded to include the topic of social epidemiology. Social epidemiology is the study of the distribution of disease, impairment, and general health status across various social groups within the same population (Ibrahim, 1983). Its focus is on documenting and explaining the origins and distribution of health problems in a society or subgroup of a society within a larger socio-ecological context.

Although sociologists and demographers have contributed to social epidemiology through both research and teaching, the recent upsurge of interest was stimulated by Fuch's (1974) *Who Shall Live?* and Clark's (1977) *Mortality American Style: A Tale of Two States*. Both presented compelling data and arguments linking life style to health status and utilization of health care. In addition 1975 marked the onset of a new age of epidemics—swine flu (which never materialized), Legionnaires' Disease, and AIDS—all of which focused on socio-ecological factors and life style.

In response, textbooks in medical sociology and sociology of health began to emphasize social epidemiology. Cockerham (1978) was one of the first to

devote an entire early chapter in his text to social epidemiology, focusing on Legionnaires' Disease. He was followed by Wolinsky (1980) who presented Clark's study, and Kurtz and Chalfant (1984) who brought in demography and ecology in the development of a critical review of social models of epidemiology. These books formed the backbone of sociological and health care courses during the past decade. Social epidemiology is now an important component of such courses.

About the same time, Lilienfeld (1979) argued that the study of epidemiology should be expanded beyond the province of graduate study in public health, and Bunker et al. (1986) outlined the implications for expanding social epidemiology and health promotion into undergraduate and professional programs in health administration and education for nursing and allied health students. Arand and Harding (1987) saw the study of epidemiology by health care students as fostering the ability to attack unknown information as problems to be solved and Fraser (1987) went so far as to argue that epidemiology ought to be included in liberal arts curricula because it helps free students from the limitations of prior beliefs and experiences and teaches important modes of thinking to prepare them to ask and answer new questions.

Teaching social epidemiology at the undergraduate level and as part of a health care or sociology course poses special challenges. Undergraduate students often view studies of disease as pathological descriptions, clinical case reports, or treatments for sick individuals. This view differs from the traditional epidemiologic orientation of disease which includes comparisons of sick and well persons, emphasizes prevention and early detection in the community through screening, and stresses that disease seen by the practitioner is only the "tip of the iceberg."

To help "free students from the limitations of prior beliefs and experiences," we have designed an assignment to facilitate students' understanding of the impact of disease on communities and the importance of risk factors (diet, exercise, work environment, habits) and social/demographic characteristics (age, sex, race, location) to explain disease distribution. The purpose of this paper is to describe the assignment, give examples of its use as a teaching tool, and discuss students' reactions to the assignment.

The assignment is designed to have students use epidemiologic concepts and understand the social epidemiologic perspective as an investigative tool. We attempt to promote learning by making social epidemiology more relevant and meaningful with an applied assignment (Arand and Harding, 1987). It is hoped that those who teach social epidemiology to undergraduates may be able to adopt some aspects of this assignment to help promote both interest in and an understanding of social epidemiology.

This assignment is used in two dissimilar programs. It was first introduced in 1980 at the University of Michigan-Flint's Health Care program in "Introduction to Epidemiology." This program has a non-traditional student population; most of the students are employed as nurses or allied health professionals such as respiratory therapists, x-ray technologists, dental hygienists, medical record technicians, and physical therapy, veterinary and medical assistants. It was introduced into the Health, Management and Policy (HMP) program at the University of New Hampshire in 1987. This program enrolls primarily residential undergraduate students. The assignment has been used more than one dozen times between these two universities. Both programs continue to use this assignment.

Description of the Assignment

Students are required to select a disease and write a research paper containing the following five sections: (1) natural history of the disease; (2) review of epidemiologic literature; (3) identification of unanswered questions about risk factors for the disease; (4) outline of a research proposal; and (5) summary of an interview with a "disease expert."

Class time is set aside for discussion of the research assignment to help students avoid common errors such as studying risk factors or syndromes rather than diseases. Students hand in sections 1 and 2 by midterm. This requires them to select a disease early and to read selected literature during the same weeks social epidemiologic concepts are covered in class lectures. Students can submit a revised draft of these sections at the end of the term.

The assignment deadlines reflect the topical sequence of lectures throughout the semester and give students their own disease context for lecture material. Throughout the first half of the semester, while students are gathering and organizing reference material on specific diseases, the lectures focus on definitions of epidemiology, the use of rates to measure morbidity (illness) and mortality (death), and the application of these to an understanding of how diseases are distributed in communities. These lectures provide the foundation for students to understand the concepts discussed in selected journal articles. Examples of some disease topics are listed in Table 1.

Computerized literature searches are suggested to identify several journal articles which report specific research studies. Students are asked to extract key elements from each study reviewed such as population studied, data sources, methods, and conclusions (see Appendix) and to compare and contrast studies on these items. Students are told that they are not expected to fully comprehend all aspects of these studies, but are expected to understand and report on these key elements.

Table 1
Examples of Student's Topics for Assignment.

Infectious Diseases	Mental Disorders	Chronic Diseases
AIDS	Alzheimers	Amnesia
Botulism	Depression	Asthma
Cholera	Schizophrenia	Cancer
Dengue fever	Anorexia nervosa	colon
Emphysema		colo-rectal
Hepatitis B		lung
Histoplasmosis		cervical
Gingivitis		mouth
Kawasaki		prostate
Legionnaires'		Cystic fibrosis
Leprosy		Hodgkin's
Meningitis		Juvenile rheumatoid
Mononucleosis		arthritis
Reyes syndrome		Diabetes
Rheumatic fever		Lupus
Rubella		Chronic bronchitis
Smallpox		Multiple sclerosis
Trichomonas vaginalis		Scoliosis
Typhoid		Osteoarthritis
Toxic-shock		Ulcerative colitis
		Sickle cell anemia
		SIDS
		Hyaline membrane
		disease
		Periodontal disease

During class discussion of types and uses of rates, students are asked about the rates reported in their selected journal articles. During a class lecture focusing on "person" characteristics of disease, a student studying Dengue Fever asked whether "age distribution" was relevant as this disease primarily affects children. The student had assumed a disease must affect many different age groups for there to be a "distribution." This question prompted a discussion of the concept of distribution as a variable with no inherent range. During a lecture on AIDS, one student realized that her selection of articles on various AIDS educational programs was outside the scope of a social epidemiologic study.

The importance of disease classification was made clearer during a discussion on a student's work with COPD (Chronic Obstructive Pulmonary Disease). Because this student focused on a syndrome rather than a specific disease, she was finding inconsistent information on disease distribution. After narrowing the focus to a specific disease category of asthma, it became clearer that syndromes consist of symptoms which do not necessarily behave like a disease. Other students pointed out that they found different constants with different disease incidences. Incidence is the number of new cases of a specific health disorder arising within a given population during a stated time period. They noticed that infant mortality was reported as "per 1,000" while breast cancer was reported as "per 100,000." The students' concrete examples helped to convey the reason for selecting different constants; i.e., to achieve a rate that is a whole number.

Students learned that mortality or death rates do not apply to all diseases such as periodontal disease; one class was introduced to the concept of "tooth mortality." Another student studying lung cancer was interested in studies of occupational exposure, rather than cigarette smoking, but found that studies of lung cancer almost always include cigarette smoking as a risk factor. Apart from smoking's important causal role, this demonstrated that lung cancer, like most chronic diseases, is caused by multiple factors.

As mentioned, the first two sections of the paper (natural history and literature review) are due midterm. This deadline is intended to involve the student as early as possible in researching and writing the paper. However, because the specific concepts, the literature sources, and the organization of this paper are new to almost all students, the sections handed in at midterm are often incomplete, or not well organized, with some of the reviewed literature inappropriate for the assignment.

We provide extensive comments on these papers at midterm and offer detailed suggestions as to how the student can improve these sections. Many students follow these suggestions and re-write these sections as the concepts become more familiar as they are repeated through lectures, class discussions and reading assignments. The revised sections usually are much improved and reflect a better understanding of the subject material covered.

By the second half of the semester students complete the literature review and turn in three questions about the nature of the relationship of their disease to a given risk factor. With instructor assistance students restate these questions into researchable form, learning the importance of clearly posed questions. One student posed the following question: "What will be the incidence of AIDS in the year 2000?" This example was used to demonstrate the necessity of asking questions in the context of time, place, and person. The new question was more precise and specific: "Based on the number of reported cases of AIDS

in New York City in 1986 among *male IV drug users*, what is the expected number of cases in 2000 in *New York City* among this high risk group?" This process helps to teach students the importance of social demographic variables in understanding disease distribution.

Students learn which research designs fit different types of research questions through class discussions. Instructors ask "What type of research design would allow us to answer this question?" Specific research questions are selected to demonstrate the appropriateness of different research designs.

Epidemiological research designs and methods focus on the manner in which the data are collected and how they are to be analyzed. Retrospective studies collect data from subjects or records about characteristics and events that happened in the past. Subjects who already have the condition of interest are compared with a control group which does not have the condition. Prospective studies are longitudinal. A population is sampled and observations made over a number of years to measure their exposure and resulting morbidity or mortality.

Retrospective studies depend heavily on subject memory, and the researchers may know which subjects do or do not have the condition. Retrospective studies, however, are relatively inexpensive to conduct, can be done in a short period of time, and are useful in finding out about new or rare diseases. Prospective studies permit direct measurement of subjects and decrease reporting bias. But they are costly and require a long term commitment by both researchers and subject.

As Kurtz and Chalfant point out (1984:37), the sociological approach assumes that risk factors and socio-demographic characteristics are independent variables which explain, contribute to, or cause the health condition of interest, the dependent variable. Directionality is clear from socio-ecological factors to disease and illness. But students may become confused because some epidemiologists have a tendency, in retrospective studies, to determine if characteristics were present in the past and therefore extrapolate percentage or perform regressions against the line of cause (Zeisl, 1957).

In their classic study linking smoking to lung cancer, Doll and Hill (1952) collected data retrospectively by matching male lung cancer patients with control patients having other diseases. They then projected percentages in the wrong direction (percent of lung cancer patients who smoked "n" cigarettes daily and percent of non lung cancer patients who similarly smoked). On examining the data (Table 8-7 in Lilienfeld, 1976:177), students were unable to find the expected dose-response effect: the more cigarettes smoked, the greater the proportion in hospital for lung cancer. In fact, the tobacco industry was able to criticize the findings by arguing that the data did not link smoking to lung cancer. But a simple recalculation of the data in the line of cause (percent of "n" cigarettes a

day smokers who were hospitalized for lung cancer or for other diseases) clearly reveals a dose-response effect.

Students need to identify an appropriate reference population including cases and controls, and then develop some dummy tables to indicate how they would perform the analysis. When this is done, the students are required to interview a "disease expert." This expert may be a researcher or clinician at the University, an epidemiologist at a city or county health department, a medical records administrator at a local hospital or a staff member from a voluntary health organization like heart, lung, cancer, cerebral palsy, March of Dimes or multiple sclerosis. Students should ascertain the expert's views on the literature, assessment of the risk factors and socio-demographic characteristics linked to the disease, feasibility of conducting the proposed research in terms of accessibility to subjects, ability to obtain measurements, and expected costs and outcomes.

Students' papers are graded on the following criteria: (1) appropriateness of literature reviewed; (2) demonstration of understanding of basic concepts discussed; (3) clarity of research question; (4) demonstration of an understanding of the steps in a research proposal; (5) the appropriateness of the specific research design for the stated question; and (6) the extent to which the interview reflects the content of sections I-IV of the paper.

Student Evaluations of Assignment

Students completed a self-assessment evaluation of how the assignment affected their knowledge in several different areas. Over three-fifths of the students reported that the assignment greatly increased their knowledge of the differences between types of analytical studies (retrospective, prospective and experimental); differences between epidemiologic studies and descriptions of the pathology of disease; concepts of incidence and prevalence; and the importance of time, place and person for the distribution of disease. In addition, students with little health science background reported learning more about the natural history of disease, disease transmission, risk factors for disease and the disease classification system.

In addition to the students' own assessment, a review of items addressed in the assignment and included on the mid-term and final exams indicated that students did consistently better on the exam items covered in the assignment. Students' comments on evaluations, such as "many of the concepts I learned about while researching my paper were included on the test . . . it helped me to do well on the test," also suggest the paper did contribute to exam success. We believe that correct responses to these exam items reflect learning that is qualitatively different, and not just a function of repetition of material.

Students provided comments which indicate some frustrations and difficulties

in completing the assignment. These include "difficulty in narrowing topic," "organizing literature review," "lack of available library resources," and "difficulty finding local person to interview." Some students stated they felt ill-prepared to develop and organize a research design and indicated they would like examples of a "good" research design available in the library.

Most of these concerns can be addressed through individual consultation with students and early planning to use an interlibrary loan system if local resources are inadequate. In addition, model assignments from previous students can be made available, along with additional reference material on research design.

Students' comments have led to continuous refinements in this assignment. Examples of these changes which reflect students' comments include: more detailed instructions for the literature search; suggesting specific journals; deadlines early in the semester to submit copies of articles which students are considering reviewing; establishing section deadlines, providing extensive written comments, and allowing students to re-do sections; using student-generated researchable questions as the basis of classroom instruction and translating those into appropriate research designs; and requiring students to hand in interview questions to provide for a more structured and focused interview with their "expert." Most of these refinements have been introduced to give students more guidance and feedback so they complete the assignment in a piecemeal fashion, which seems to reduce their anxiety and enhance learning.

Discussion and Applications

We feel that this exercise is appropriate for undergraduate students to enhance the teaching of social epidemiology. An understanding of abstract concepts is promoted when these concepts are applied to a "concrete" disease of the student's choice. The assignment helps students to broaden their understanding of the impact of disease beyond the disease process. They learn that clinical case presentations represent only one perspective on the study of disease. They are exposed to new literature sources and gain experience with literature searches.

The classroom discussions of appropriate research designs demonstrate the problem-solving processes of inter-disciplinary teams such as those in public health settings. This can be used to promote group problem-solving within a class with diverse professional or educational backgrounds. This is particularly important for students interested in public health where the solution of problems requires input from many varied professions.

Some students who have completed this assignment have conducted in-service training sessions and presentations to community groups on their disease topic. Other students have indicated their ability to apply social epidemiologic

concepts to issues in the media such as AIDS and environmental hazards, and have indicated that the assignment helped them to improve their writing ability.

Recent trends in educational requirements for allied health personnel reveal a greater emphasis on general studies/liberal arts which may include a social epidemiology or sociology of health/medicine course. In such courses, the skills learned and reinforced through this assignment can contribute to broader educational goals.

Students with allied health backgrounds often enter four-year academic programs from community college or, if they are older returning students, from hospital-based programs. Both tend to emphasize scientific concepts and technical training over formal writing and research skills. In addition, many of these students are without the benefit of adequate preparation in formal writing in their previous educational settings. These students are not always well-prepared to write a formal research paper requiring extensive library work and organization of detailed material.

For sociology, social work, health education and health administration students, this assignment familiarizes them with the public health literature, medical terminology and epidemiological thinking. It also helps them to apply more abstract behavioral and social science concepts to health/medicine and sharpens their analytical and methodological skills.

In addition to the wide range of students who might be attempting this assignment, not all instructors are equally knowledgeable or comfortable with the social epidemiological approach and methods. We recommend Lilienfeld (1976) and Mausner and Kramer (1985) for a basic overview of epidemiology, and Cockerham (1989) and Wolinsky (1988) for their discussions of social epidemiology and social demography of health. Instructors at institutions without an extensive medical library may wish to make arrangements with their state or local public health department for access to journals and experts who may be willing to be interviewed by the students.

The assignment, then, does take some preparation on the part of the instructor and requires a considerable investment on the part of the student. But we have enjoyed teaching it and recurring comments on student evaluations are: "This assignment is very challenging, but worthwhile," and "I didn't think I could do this well."

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APPENDIX

Suggested Outline

I. Natural History of Disease

- A. When was the disease first diagnosed and included in the International Classification of Diseases (ICD)?
- B. How has the classification changed over time, if at all?
- C. Natural history of the disease
 1. What are the agent, host and environment factors?
 2. What is the natural course of the disease?
 3. What is the incubation period?
 4. How long is its duration?
 5. What is known about the primary, secondary and tertiary prevention of this disease?

IIa. Review of Literature (for each article reviewed)

- A. What is the stated purpose of the study?
- B. What study population is used?
 1. How is study population described: age, sex, race, ethnic background, clinical characteristics, etc?
 2. Over what time period is population observed?
 3. Where does study take place?
- C. What risk factors are examined in this study?
- D. What ratios and rates are presented?
 1. Sex ratio
 2. Morbidity rates
 - a. attack rate
 - b. incidence
 - c. prevalence
 3. Mortality rates
 - a. case fatality
 - b. age-sex specific
- E. What research design was used?
- F. What are the specific results/conclusions such as rates of illness, etc?

- G. Are there any recommendations made based on results for future studies or interventions?
- H. Are limitations of the study addressed?
- I. Do authors discuss any special problems due to quality and availability of data?

IIb. Summary of Articles Reviewed

- A. Discuss similarities of articles according to A through I
- B. Discuss differences of articles according to A through I

III. Research Questions

- A. Main research question and brief explanation of why you want to investigate this relationship
- B. Additional research questions with explanation

IV. Research Design

Answer the following questions about your research question:

- (1) What research design is most appropriate to answer your question?
- (2) What is the reference population for your research study?
- (3) What study population would you use and why?
- (4) How do you define "cases" and "controls" for your study?
- (5) What do you expect the outcome of your study to be?
- (6) What difficulties do you see if your proposed study were actually carried out?
- (7) Develop dummy tables necessary to analyze your results.

V. Interview

- A. Who you interviewed, training, experience, position
- B. Expert's Opinion on:
 1. Literature
 2. Risk factors and socio-demographic characteristics linked to the disease or condition
 3. Feasibility of conducting the study you proposed in terms of:
 - a. Access to subjects or records
 - b. Ability to obtain measures or observations
 - c. Costs
 4. What outcomes would they expect you to find and why?