

U.S. Government Printing Office, Washington, DC, August 1979.

4. National guidelines for health planning; proposed rules, part XI. Federal Register, pp. 78552-78586, Nov. 25, 1980.
5. Public Health Programs: Health in Los Angeles County: a report on selected health status indicators. Department of Health Services, County of Los Angeles, 1984.
6. Green, L. W., Wilson, R. W., and Bauer, K. G.: Data requirements to measure progress on the objectives for the

nation in health promotion and disease prevention. Am J Public Health 73: 18-24 (1982).

7. Centers for Disease Control: Implementing the 1990 prevention objectives: summary of CDC's seminar. MMWR 32: 21-24 (1983).
8. Breslow, L.: The challenge to health statistics in the eighties. Public Health Rep. 96: 231-237 May-June 1981.

Teaching Medical Students Epidemiology: Utilizing a State Health Department

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Synopsis

An epidemiology teaching course for third-year medical students was developed at the University of Vermont's College of Medicine by staff members of the Vermont Department of Health in conjunction with clinical faculty members. The course consists of analyses of actual community health problems encountered by the health department, evaluation

of published clinical studies, and design of studies on current public health issues in Vermont.

In the course's first year, 54 percent of the students gave it an overall assessment of average or above average. A striking improvement was found in the second year; 98 percent of the students rated their overall assessment as average or better. Sessions rated the best by students were the critical appraisal of clinical studies, followed by sessions on study design and outbreak investigations.

The Vermont course communicates epidemiologic concepts to students by stressing their clinical relevance and by putting the concepts into a recognizable public health context. Students are required to grapple with epidemiologic issues as participants.

This approach to teaching epidemiology combines faculty having both public health and clinical perspectives, emphasizes relevance to future practice, and requires students to actively work through epidemiologic problems. The Vermont experience has shown that combining health department and clinical faculty resources can result in a useful format for teaching epidemiology to medical students.

THE VERMONT DEPARTMENT OF HEALTH and the clinical faculty of the University of Vermont's College of Medicine jointly developed a program to teach epidemiology to medical students at the university. This course is required for the approximately 90 third-year medical students. It has been offered since 1982 and is available in 1985.

The course's basic elements consist of analyzing the epidemiologic evidence outbreaks of disease, demonstrating the usefulness of epidemiology in clinical practice, and developing study designs to test hypotheses about specific public health issues in Vermont.

Health department staff members developed the student exercises for investigating actual health problems. Students also appraise evidence from nationally published studies for clinical management of patients. These problems are used to develop skills in defining disease distribution, designing and interpreting scientific studies, and appraising evidence of epidemiologic investigations.

The objectives and content of the epidemiology course resulted from a committee that worked for more than 1 year with representatives from both the department of health and the College of Medicine. The implementation of the teaching program and

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the subsequent appraisals of the course have provided the opportunity for it to be developed over a 4-year period.

Medical students often perceive public health instruction as being unrelated to the skills they will need in their future practice of medicine. Epidemiology and public health courses can fare poorly when competing with clinical courses for the attention of medical students. Five years ago, this problem existed at the University of Vermont's College of Medicine. Student attendance and evaluations of the epidemiology and public health courses clearly indicated a need for improvement. A faculty committee recommended that public health teaching be reorganized and that the Vermont Department of Health be requested to help implement a revised format for instruction.

The Epidemiology Course

Each year the class of approximately 90 third-year students is divided into 4 smaller groups and taught by a total of 4–8 faculty members from the department of health and the College of Medicine. The health department faculty consisted of the Health Commissioner, the State Epidemiologist, and a physician epidemiologist assigned to the State by the Centers for Disease Control. In the second year of the epidemiology course, two internists and a nonphysician epidemiologist joined the health department teaching team. By the third year, preceptors included the health department teaching team, four internists, and a nonphysician epidemiologist. With additional course preceptors, two instructors could be assigned to each small group—generally one primarily public health preceptor and one clinical preceptor.

At individual sessions in 1982, the Chief Medical Examiner, the Director for Maternal and Child Health, and the Director of Vital Statistics of the

State of Vermont participated in classroom activities. Also in 1982, members of the statistical faculty of the College of Medicine gave several lectures on elementary statistics. The epidemiology course was taught 3 times a week in 2 hourly sessions for 1 month, for a total of 24 hours.

After an introduction, the first section of the course consisted of the analyses of two to four disease outbreaks that included toxic illness in a hospital and an outbreak of gastrointestinal illness in a Vermont community. One case was presented as an outbreak of illness of unknown cause and involved nine employees of a small community hospital in northwestern Vermont. The workers sought treatment at the hospital's emergency room for headache, nausea, eye irritation, throat irritation, dizziness, and vomiting. As the case develops, students are given information on worker characteristics and worksites and maps of ventilation systems. Students are required to work through attack rates, to graph the onset of illness, and to put forth and test hypotheses. In general, students do the first part of these cases as assignments and complete the remaining parts in teams in class. Statistical tests pertaining to these cases are part of the session.

Discussions of these cases are far-ranging and include public health ramifications. In one case there was an outbreak of gastroenteritis in a community frequented by tourists in southern Vermont just as the Fourth of July weekend began. An estimated 800 people became ill, and the health department's study linked the outbreak to the water supply before initial coliform testing indicated a problem. Students must also grapple with the problem of the community not accepting an order to boil water when there was epidemiologic evidence of transmissible disease but no demonstrable microbes.

The second part of the course consists of demonstrating the usefulness of epidemiology in clinical practice. Students appraise scientific evidence in a variety of published studies.

In the third part of the course, students in groups of four are assigned a public health issue in Vermont and are required to develop study designs that test scientific hypotheses. The issues are the safety of home births and the potential community health effects of the Vermont Yankee Nuclear Power Plant. In Vermont, there are approximately 100 home births attended by a lay midwife annually. Students are required to formulate a study method, specify measurable outcome factors, and determine the study group size. Student teams then present their studies to their section and discuss issues of

study and control group comparability, methods of data collection, and analysis.

Student Evaluation

Students evaluate the course each year it is given; evaluations have the same format and are administered in a uniform manner. In the first year, 54 percent of the students gave the program an assessment as average or above average. Table 1 shows a striking improvement is seen for the program's second and third years, in which 98 percent and 93 percent of the students, respectively, rated the overall assessment as average or better. The proportion of students who rated the course as above average or excellent increased from 10 percent in 1982 to 60 percent in 1983 and 69 percent in 1984.

Only the students who took the course in 1982 were also surveyed about their reaction to specific parts of the course (table 2). Analysis of their responses was helpful in reviewing the format of the course. Lectures on the reporting of deaths, births, and statistics were judged much less helpful than other sessions and were replaced in 1983 by discussion of these subjects in the smaller group sessions formed to consider these topics. A statistical lecture was again added in 1984, and the number of these lectures will be increased in future years. No other statistics courses are in the medical students' curriculum.

Rated best were the sessions on critical appraisal of clinical studies, followed by the sessions concerning study design and outbreak investigations. Some students in the program's first year commented that too many investigations had been assigned; the number of problems was reduced to two in 1983. In addition, in 1983 more clinical epidemiology problems were introduced. Three sessions—on therapy, diagnosis, and prognosis—were added; they were based on materials developed at the Department of Clinical Epidemiology

and Biostatistics at McMaster University, Hamilton, Ontario.

Discussion

The teaching of epidemiology to medical students has been widely recognized as an arduous and often frustrating task for teachers and students alike (1-8). The major problem facing the instructor of epidemiology is how to present the material in an interesting and relevant manner to clinically oriented medical students. A basic knowledge of epidemiology is essential to comprehending the medical literature, but medical students do not always perceive the immediate need for epidemiologic information.

Many strategies have been used by medical schools to make epidemiology more attractive to medical students. Small seminars have been reported to be more successful than traditional methods of teaching epidemiologic concepts because of the opportunity for students to solve problems (4-10).

Epidemiology's clinical relevance has been shown in the Vermont program by use of patient medical records, critiques of published studies, and student projects with hospital and ambulatory services (4,9,10). Student acceptance of public health as a relevant part of medicine can also be facilitated

Table 1. Assessment of epidemiology teaching by students who rated the course as average or above in 1982-84¹

	Percent		
	1982	1983	1984
Objectives identified	66	91	93
Objectives met	60	92	95
Teaching effectiveness	48	91	96
Overall assessment	54	98	93

¹ In 1982, 76 of 84 students (90 percent) responded to the course evaluation questionnaire; in 1983, 68 of 87 students (78 percent) responded; in 1984, 78 of 99 students (82 percent) responded.

Table 2. Percent distribution of 68 responding students¹ evaluating specific components of epidemiology course in 1982

Component	Not helpful	Somewhat helpful	Helpful	Highly helpful
Death certificate exercise	37	32	26	4
Mortality and natality rates	25	58	15	1
Outbreak investigation	1	43	50	1
Clinical studies	4	15	38	43
Study design	12	25	44	19
Statistical sessions	47	32	18	3

¹ 81 percent.

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by a course structure analogous to clinical clerkships in which groups of students focus on specific problems at health facilities or in the community (5,6,9,11).

Vermont's teaching program communicates epidemiologic concepts to students by stressing clinical relevance and by putting the concepts into a recognizable public health context. Students who take the course must grapple with epidemiologic issues as participants.

Rosenberg described public health as unique because it is not taught in a practice setting: "Only in public health do students find faculty members whose practices they can neither observe nor participate in." (5). Cullinan described the greatly disadvantaged teacher of epidemiology and the clinician who has more immediate time scales and rewards for action (1). At Vermont, the epidemiology teaching program has overcome these obstacles with content from public health and clinical practice and with instructors actively dealing with community health problems.

Involving the State health department was key to the initiation and development of this type of teaching format. The College of Medicine's administrators recognized the Vermont health department as a resource of both public health specialists and public health case material. Rather than attempt to duplicate these capabilities at the college, an active collaboration with the department of health was sought that could link a teaching format to actual public health practice.

For the Vermont health department, considerable incentives existed for participating in the teaching program. Physicians and epidemiologists in this department view teaching medical students as an opportunity to be affiliated with a school of medicine faculty and to show that public health is a useful and necessary discipline. This type of teaching is challenging and sharpens the skills of preceptor and student alike, often providing new perspectives on the department of health's instructional examples.

Additional advantages accrued to the health department, including consultation on community health problems that was facilitated by the enhanced relationships developed with clinical faculty through collaboration in the epidemiology program. Furthermore, benefits will be realized by the State of Vermont as future physicians gain increased understanding of public health.

The Vermont experience points to the potential for expanding the role of health departments in medical student teaching programs. Instruction can draw on the increasing activity of the public health agency in health promotion, long-term care, and environmental epidemiology. For example, the growing responsibilities of health departments for environmental health problems associated with chemical substances and other potential hazards can provide both experience and case material for risk assessment of affected communities. Health departments have a substantial opportunity to develop environmental epidemiology instruction in which case information is provided and medical student participation is required to estimate exposure of the public, evaluate information on toxicity, and make recommendations to the public.

The Vermont Department of Health has used such a teaching format with practicing physicians. In this example an industrial drycleaner contaminated the water supply, groundwater, and soil of a small town with tetrachloroethylene. Extension of this teaching format to medical students can develop and transmit epidemiologic concepts in a relevant clinical and community context.

As judged by the students' evaluations and comments, the epidemiology course was acceptable, relevant, and of value to their future practice of medicine. Preceptors also rated their experience highly. Of note is the increasing number of clinical faculty over the 3-year period expressing an interest in teaching the course.

This educational format achieved success in addressing a vital aspect of public health teaching. Unlike a department of public health's concern with the health of populations, medical students operate on a one-to-one patient to physician framework. Yet disease occurrence and determinants, risk factors, treatment efficacy, and prognosis all involve community phenomena. Understanding the relationship of their patients or their practice subgroup to the community at large or that reported by a national study is a necessary element of medical education. Utilizing the health department and focusing on actual community problems is a promising method of achieving this goal. The approach

described here combined faculty with both public health and clinical perspectives, emphasized relevance to future practice, and required students to actively work through epidemiologic problems. This Vermont experience has shown that combining health department and clinical faculty resources can result in a useful format for teaching epidemiology to medical students.

References

1. Cullinan, T. R.: Teaching concepts in epidemiology. *J Epidemiol Community Health* 34: 201-203 (1980).
2. Ernster, V. L.: On the teaching of epidemiology to medical students. *Am J Epidemiol* 109: 617-618 (1979).
3. Garraway, M., Hurt, W., and Petrie, H.: Preparation of data boards for teaching epidemiology in a clinical setting. *Med Biol Illus* 27: 151-154 (1977).
4. Mulvihill, M. N., Wallman, G., and Blum, S.: A seven-year retrospective view of a course in epidemiology biostatistics. *J Med Educ* 55: 457-459 (1980).
5. Rosenberg, S. N.: Student acceptance of a public health clerkship: advantages of a 'clinical' format. *J Med Educ* 53: 364 (1978).
6. Rosenberg, S. N., Schorow, M., and Haynes, M. L.: Bridging the gap between clinical medicine and public health: an experimental course for medical students. *Public Health Rep* 93: 673-677, November-December 1978.
7. Terris, M.: Epidemiology as a basic science in the education of health professionals. *Int J Epidemiol* 7: 294-296 (1978).
8. Waters, W. E.: Teaching epidemiology to medical students. *Int J Epidemiol* 6: 329-330 (1977).
9. Stewart, M. M., Richstone, N., Greene, M. G., and Longe, P.: Community medicine clerkships in an applied research setting. *J Med Educ* 52: 145-146 (1977).
10. Vuturo, A. F.: Teaching clinical epidemiology in the family practice office. *J Family Practice* 6: 653-654 (1978).
11. Epstein, L. M., Tamir, A., Spenser, T., and Perlman, S.: The community project: the teaching implications of applied epidemiology. *Med Educ* 77: 39-44 (1983).

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