using an information system to transform these data into usable information. Without such a tool, the chain data ———> information ———> knowledge cannot be completed. Without this completed process, public health programs will suffer needlessly from inadequate planning, poor management, and incomplete evaluation.

The decision to install a health information system entails not only the weighing of costs against anticipated benefits but also the measuring of the benefits that are expected, particularly over the long term, against those of other health activities. Ultimately, the choice to install a health information system is essentially a political decision, as it should be. But what has been learned through programs like the MATCH project makes that choice a more comfortable and practical one.

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Preparing and Presenting an Introductory Course on Motor Vehicle Injury

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Synopsis

Health professionals are key to any progress in reducing motor vehicle injury and death, yet they have been slow to recognize their role in this important area. One factor contributing to this problem has been the absence of courses on motor vehicle injury from the curriculums of the health professions schools. A comprehensive course on motor vehicle injury and death was developed, presented, and evaluated at the University of Illinois at Chicago School of Public Health. The major course objectives were for students to (a) comprehend that highway injury is a major public health problem, (b) understand that this problem can be mitigated by proven public health techniques, and (c) understand and be able to implement multidisciplinary solutions. It was hoped that students would champion the prevention of motor vehicle injuries as a high priority for public health agencies and other professional and community organizations. The course has now been presented twice.

A teaching guide was prepared and was reviewed by faculty at 13 schools of public health. This guide discusses practical aspects of introducing and implementing this type of course, overall course objectives, specific learning objectives, a model curriculum (with suggested readings) for nine topic areas, materials from which transparencies or slides could be made, and a geographic listing of resource persons. The objectives for the guide were for it to be a practical model for a motor vehicle injury course and to acquaint health professions faculty with the resources available to them for course development, as well as with a network of professionals who are willing to aid them in their efforts. The guide is not a programmed learning text or a collection of canned lectures, but rather it is intended to provide a framework and encouragement to those at other institutions who seek to develop such a course.

NEARLY 45,000 PEOPLE DIE each year in motor vehicle crashes in the United States. Motor vehicle related trauma is the sixth leading cause of death in the United States and *the* leading cause of death for persons 5–34 years old. For 1–4-year-olds, motor vehicle crashes are second only to nontransport injuries as the leading cause of death and for 34–44-year-olds, crashes are the third leading cause behind cancer and heart disease (*1*). Of the leading causes of death, motor vehicle crash-related trauma is second only to cancer in its economic burden on society (*2*). Close to 5 million people a year suffer injuries in motor vehicle crashes; 2 million of them are disabled. Motor vehicle crash injuries produce more new cases of quadriplegia and paraplegia each year than all other causes combined, and they contribute significantly to the incidence of epilepsy and brain damage (*3,4*).

Many of these deaths and nonfatal injuries need not occur. Improvements in vehicle design, occupant protection, and trauma care have reduced the toll of motor vehicle death and injury; significant further reductions are possible. Health professionals are key to such further progress. They are in positions to understand the nature of the injuries to be prevented or mitigated and to frame and implement solutions. But despite the fact that motor vehicle crash deaths and injuries are largely preventable, the health professions have not attacked this problem with the same vigor that they have applied to health problems that more readily fit the disease model. One crucial failure has been the absence from the curriculums of public health, medical, and other health professions schools of courses and materials on motor vehicle related crashes and occupant protection (*5,6*). Because effective prevention requires understanding, involvement, and leadership by health care professionals, it is especially unfortunate that this area of concern has not received more attention as part of education for the health professions.

The time is particularly ripe for meaningful progress. Recently several health care specialty groups have become actively concerned with the threat to life and health posed by motor vehicle crash trauma. Many groups have become involved in educating their members about crash trauma through special publications (*7–9*) and short continuing medical education courses (*10*). Resolutions have been adopted by the American Public Health Association in 1984, the American Medical Association in 1985, and the Society for Public Health Education in 1983. Moreover, the public has become increasingly aware of the magnitude of the motor vehicle crash problem and appears receptive to advice and leadership from the health professions (*11*).

Schools of public health are the logical place to begin systematic education in this area. These schools already bring together several areas of expertise that can be usefully applied to the study of motor vehicle related injury and death such as epidemiology, biostatistics, public policy analysis, environmental health, health law, health education, marketing, and cost-benefit analysis. Public health graduates end up in highly professional roles and positions from which effective preventive efforts can emanate: local health departments, State and Federal health-related agencies, voluntary health organizations, and similar organizations. Also among these graduates are significant numbers of students from the developing nations, where motor vehicle related injury and death often constitute even more of a public health problem than is the case in the United States (*3*).

Background

In 1980, the U.S. Department of Transportation (DOT) adopted as a priority the identification of motor vehicle crashes as a public health problem. As one result of this new priority, funds were allocated to be awarded for curriculum development. Many professional and civic organizations received funding to develop materials through which they could essentially turn their members into "health educators" on the subject of the health implications of occupant restraint (*12,13*). These materials are specific for the constituents of a particular organization (for example, family practitioners, Parent-Teacher Association leaders, health department administrators) (*14*). Although this approach addressed the problem of the working professional, it did not provide for students currently enrolled in schools for the health professions. Also, these projects focused specifically on the occupant restraint issue; information on the public health implications of motor vehicle crashes was included only as background.

In 1983, the School of Public Health of the University of Illinois at Chicago (UIC) received support from DOT to facilitate the preparation, presentation, and "packaging" of a comprehensive survey course on motor vehicle injury and death that could serve as a practical model for similar

courses at other institutions (*15*). By demonstrating an optimal approach to the presentation of such a course, both encouragement and assistance would be offered to those at other schools of public health interested in introducing a course of this type.

We report results of this project to alert the health professions education community to the existence of the resultant guide (*15*). However, a second objective of this report is to stimulate thought and discussion regarding the complex problem of developing an injury curriculum for health professionals. The original belief that a course devoted entirely to motor vehicle-related injury was both possible and worthwhile was not only confirmed but strengthened.

Methods

Course development. Preliminary course objectives and the content outline were developed by UIC faculty along with staff from the American Association for Automotive Medicine. A planning committee composed of professional and academic experts from public health, engineering, emergency medicine, and transportation safety reviewed the preliminary materials and helped to develop a draft curriculum at a 2-day conference in November 1983. Simultaneously, some 274 persons affiliated with relevant organizations were notified of the impending course. The general parameters and focu of the course were described, and an assessment of interest form was used to obtain information regarding potential participants. In addition, a project member described the curriculum effort at the fall 1983 meeting of the Association of Schools of Public Health, where each dean was requested to provide the name(s) of faculty who could be contacted to review a draft of the course outline and materials.

The draft curriculum was sent to all respondents to the assessment of interest form who had indicated that they wanted to participate in the course as a potential lecturer or as a planning group member. Copies were also sent to persons referred by initial respondents and by faculty at each of the accredited schools of public health. One hundred copies of the draft curriculum were distributed between December 1, 1983, and January 15, 1984, with a postage-paid return envelope (see table). The 45 responses returned by January 30, 1984, were used in revising the curriculum. The course was field tested during spring 1984, and a draft teaching guide was developed. The course

Response to assessment of interest forms and curriculum guides for motor vehicle injury course, December 1983–January 1984

Interests of respondents	Surveys of interest		Curriculums	
	Sent	Returned	Sent	Returned
Transportation, engineering	62	15	15	5
Medical and dental	83	37	23	7
Public health[1]	...	...	22	10
National, State, community safety	60	15	11	7
Safety and risk management	7	6	5	0
Allied health, rehabilitation	36	5	2	0
Health promotion, medical centers	11	7	10	5
National safety associations	10	2	7	7
Insurance agencies, manufacturers	5	5	5	4
Total	274	92	100	45

[1] Separate survey, conducted in cooperation with the Association of Schools of Public Health.

was offered again in summer 1985, this time without the direct benefit of outside funding, using the teaching guide and materials and resources supplied or recommended by those experts involved in the initial course presentation. Improvements in the draft guide were facilitated by this experience of actually presenting the course without the special advantage of outside funding. In addition, an evaluation instrument used for each course session provided feedback from students. This was particularly useful in gauging how well the course presentation had been adapted to the wide range of students' backgrounds (*15*).

The draft guide was then subjected to further reviews by DOT personnel and by the previously identified faculty members at the other schools of public health. These faculty were asked to evaluate the potential use of the guide at their school. At least one telephone followup was made to each of the faculty who had not responded by the designated time. Responses were received from 13 schools (59 percent). The content of the curriculum sections of the guide was revised as a result of these reviews.

Course objectives. The teaching guide is intended for a course with students at a postbaccalaureate level who have such diverse backgrounds as medicine, engineering, nursing, business, and psychology. Students are assumed to possess at least an introductory-level familiarity

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with statistics, and a grounding (or first course) in epidemiology is desirable. The orientation is one of breadth rather than depth, and the result is a course that is ambitious in coverage.

The specific objectives for the UIC course were that students

- Comprehend that motor vehicle related death and injury are major public health problems, amenable to proven public health methods of prevention and techniques of control,
- Use statistical and epidemiologic techniques to analyze motor vehicle related trauma data,
- Understand and appreciate the need for, and be able to engage in, multidisciplinary approaches to solutions of the motor vehicle related trauma problem,
- Understand the relationship between the prevention of crashes and occupant protection, and
- Champion the prevention of motor vehicle related trauma as a high priority for public health agencies, associations, and civic and community organizations.

The breadth of coverage reflected in the objectives carries several costs. First, specific topics of considerable complexity (for example, the drinking driver problem) cannot be analyzed in detail. Second, several topics are left out completely because of time limitations: these include accident investigation techniques, transport of hazardous material, and allocation of resources for safety management. Even so, some course consultants argued for narrowing the focus of the course to a few specific problem areas.

Another disadvantage of broad coverage is that, while lecturers can attempt to distill their subject matter to fit a 1- or 2-hour class period, in most instances it is quite difficult to find reading materials that present an adequate, succinct overview of discrete subtopics in a manageable amount of time. Moreover, a reading intended to fill in gaps not covered in a companion reading often duplicates much of that companion reading. Nevertheless, despite these disadvantages experience suggests that the broader approach is both feasible and desirable. A discussion of several possible texts is included in the guide.

Course sequence. In developing the motor vehicle injury curriculum, considerable attention was devoted to the sequence the course should follow. It was decided to reverse the order of the commonly used precrash, crash, postcrash model (*16*). Reversed sequencing was found to be highly successful, but since some reviewers were disturbed by this nontraditional approach, the rationale will be elaborated upon here.

The overall framework of the course is the application of *public health* techniques of prevention and control to the motor vehicle crash problem, rather than a medical, health care services, or traffic engineering-vehicle design perspective. Most of the course is therefore devoted to the precrash phase of the injury event. However, before the students can comprehend and appreciate the issues involved in the precrash phase, a great deal of background material must be provided. For an audience with no exposure to the field, it seemed to make the most sense to focus on postcrash outcomes (that is, the physiological and medical aspects of a crash, the extent of the problem in epidemiologic terms, and the role of rehabilitation and emergency medical services). Postcrash outcomes provided a more familiar and meaningful context for the typical public health student. In addition, explaining the biomechanics of the crash phase early in the course was necessary to meaningful discussion of preventive measures used to mitigate the effects of the crash.

The sequence of the course's content begins with definitions and themes and with general background material on the magnitude and impact of the motor vehicle injury problem. The postcrash discussion explores the types and severity of the injuries involved and the role of health care services in dealing with injuries. The crash phase is then considered, with an emphasis on vehicle design and occupant protection measures. Next,

some precrash issues—roadway design and traffic engineering—are considered. These are the aspects of the precrash phase most removed from classical public health. Knowledge of terminology and an understanding of the roles of various engineering professionals and the constraints under which they work is important for the public health professional.

The initial topic areas in the curriculum provide necessary background information for the remaining precrash portion of the course and also introduce the public health student to other types of professionals involved in the traffic safety field. The remainder of the course focuses on other precrash aspects, with special attention devoted to environmental and prevention measures. The underlying message is that the legislative and enforcement systems have demonstrated some success, and that the next important steps are to evaluate what has been done and to determine what still needs to be done and how it can best be accomplished.

In short, the course moves from an overview (terminology, the extent of the problem, other professionals involved) to discussion of the role that public health professionals can play in the mitigation of motor vehicle injury and death.

The development of a single motor vehicle injury topic as a stand-alone short course or workshop was suggested by several reviewers. However, the use of the guide for this purpose has not been tested. The table of contents of the guide is given in the box. Although this report is not intended to duplicate the guide, several sections will be discussed in detail.

The University of Illinois course was initially offered on a 4-credit, 4-contact hours per week basis. Part of this time was devoted to evaluating the course itself and part to experimental presentations. Based on our experience and student evaluation, the course was offered again on a 3-contact hours per week basis for a 10-week quarter, an arrangement that was found to be sufficient for the course as outlined in the guide. Schools on a semester basis could also offer a 3-hour course with the additional time used to expand and enlarge upon the topic areas. It is strongly suggested that additional depth per topic be added if time permits rather than additional breadth. Those offering the course on a semester basis are in the enviable position of making greater use of a variety of educational resources, field trips, and available local experts.

Student evaluation. A critically important part of the motor vehicle injury course was the require-

A Course on Motor Vehicle Trauma: An Instructor's Guide

'The guide can only be used successfully as a framework by an instructor who already has some understanding of injury, public health, or both. This understanding need not approach expertise, but a person completely new to the injury control or public health fields would have great difficulty making effective use of the guide.'

ment that students prepare projects for classroom and written presentation. These projects proved to be a high point of the course for most students, providing a means by which the information and techniques learned during the course could be integrated and applied to a particular problem. Because motor vehicle injury was a new subject for the students (and the epidemiologic approach new to the nonpublic health students), hands-on experience using this new knowledge made the course more understandable and meaningful.

It is therefore strongly recommended that student projects be included when offering a course of this sort. Considerable thought needs to be given to the specific projects that can be accepted as fulfilling the student-project requirement. Data-based projects seem particularly appropriate. Possible projects include

- observation of safety belt and child safety seat use in traffic;
- development, implementation, or both, of a traffic safety program for a school, agency, or organization;
- analysis of specific crash sites; and
- analysis or evaluation or both of specific State and local laws or policies such as deterrents to driving under the influence, safety belt usage, reverse flow bus lanes, driver education, licensing specifications, and helmet usage.

It is particularly appropriate if the project requires the student to interact with motor vehicle professionals—State department of transportation staff, local traffic planning officials, police, traffic safety program personnel. The use of a project as a method of student evaluation for a graduate level course is also highly appropriate, rather than basing evaluation on tests alone. If class size permits, having students work on projects in groups is a valuable learning experience. Not only do most public health professionals work as part of a team throughout their careers, but traffic crash problems are more realistically investigated and analyzed in a team setting.

Marketing. Promotion is important to any new effort, including a new graduate course. To interest public health students in the motor vehicle injury course, a variety of marketing efforts were made during the academic quarter before the course was offered. Faculty lectured on various aspects of motor vehicle injury in several existing public health courses. Notices announcing the course were distributed to students and faculty, not only in the school of public health but also throughout the Health Sciences and University Center campuses. As a means of calling attention to the importance of the motor vehicle injury problem and to the new course, a film series was presented throughout the quarter.

A variety of efforts were undertaken to reach potential continuing education students. Persons outside the university who were identified as potential continuing education students were physicians, nurses, rehabilitation specialists, public health workers, emergency medical personnel, health planners, health educators, police, insurers, and others professionally interested in motor vehicle injury. A press release announcing and describing the course was distributed to organizations whose membership and staff were likely to be interested in the course (for example, the American Academy of Pediatrics and the Illinois Department of Public Health).

Film series. A 9-week film series was presented before the motor vehicle injury course was offered. The series publicized the course and allowed faculty and students to preview films and offer critical input.

Suggestions for films had been solicited from DOT and the film departments of the Insurance Institute for Highway Safety, the University of Michigan Transportation Research Institute, and Transport Canada. In addition, several reviewers offered comments on films.

The primary criterion used both in selecting the films to be reviewed and in judging the films was their appropriateness for graduate level education. Many films on motor vehicle injury are meant to be used in health promotion settings for a general

audience and are therefore aimed at those with approximately a ninth-grade level of education. The overall objective of these films is to increase awareness or to supply basic health information for a specific segment of the population (for example, a prenatal class). Although such films may realize their objectives, they do not extend the knowledge of a graduate student audience and therefore were not included in the course. No attempt was made to evaluate films intended for use by health educators in community settings or public service announcements available to groups sponsoring safety belt or anti-drunk driving campaigns.

Resource organizations and individuals. The guide contains a list of organizations, manufacturers, and trade associations known to be involved in some aspect of the traffic crash problem. Although two reviewers of the guide suggested that a more useful item would be a description of the functions, organizational structure, sources of funding, and philosophy of each organization, this was beyond the scope of this project. In addition to the list of organizations, a list of resource persons was compiled during the development of the course and evaluation process. Although it was not always possible, an attempt was made to locate at least one physician, one engineer, one public program director or administrator, and one academic researcher for each geographic area in which a school of public health is located. These persons indicated their willingness to serve as a source of information and advice about vehicle crashes. It was hoped that these initial contacts could also provide leads for other useful experts and data sources in a specific locality.

Results

The reviewers' response to the first draft of the teaching guide was enthusiastic and encouraging. Comments were for the most part general, and they frequently reflected the individual's area of expertise. Most respondents focused on objectives, content, and materials for a single topic area.

Just as the UIC course did not cover techniques for highway or restraint device design, neither did it cover techniques for health education, program design, advocacy, public policy development, or evaluation *per se*. Rather, it was intended to motivate students and supply the necessary factual information that they could use with the public health techniques learned in other courses. Information on the nuts and bolts of establishing, managing, and evaluating community, employer, or institutional programs in traffic safety have been developed by other DOT grantees and can be found in DOT documents (*14,17-20*).

Although the teaching guide should be useful in presenting a comprehensive motor vehicle injury course where none has been offered before, it should be emphasized that the guide is *not* a programmed learning text or a collection of canned lectures. The guide can only be used successfully as a framework by an instructor who already has some understanding of injury, public health, or both. This understanding need not approach expertise, but a person completely new to the injury control or public health fields would have great difficulty making effective use of the guide.

Only 2 of 13 school of public health faculty respondents nominated by their deans to take part in this project indicated that the teaching guide was not likely to be used at their schools, 1 because such a course was already being offered and the other because the guide was viewed as crossing too many disciplinary areas to be useful. The majority of respondents stated that the guide would be used either in whole or in part at their schools. The principal anticipated use was as a resource for lectures in existing courses. The guide was seen as immediately applicable for courses in injury epidemiology at two schools. The second most cited use was as a resource in new course development. Two schools were in the process of developing an injury control course, and the development of a vehicle safety course was being explored at one school. The guide's use in the development of case studies for other courses and as a resource for independent study and tutorial projects was also reported.

Discussion

The University of Illinois motor vehicle injury course was a success in the eyes of both faculty and students. It is true that the faculty had the advantage of outside funding to underwrite the initial presentation of the course. It should be emphasized, however, that when this course was offered a second time the result was even more favorable than in the original offering. Indeed, the main finding of the work we report is that adequate resources for a course of this type exist at virtually all schools of public health. The most important task in presenting a motor vehicle injury

'This course got me interested in the whole field of injury control in general and has led to a career decision to work in that area.'

course is bringing together and integrating these resources. By drawing on the resources of the school of public health as well as emergency and surgery departments, rehabilitation centers, engineering schools, State transportation departments, health departments, injury prevention researchers, and citizen activist groups, it is possible to draw together a faculty valuable not only for classroom presentations but also for providing students with meaningful field practice opportunities.

The main objective of the University of Illinois project was the packaging of a comprehensive survey course on motor vehicle injury and death that could serve as a model for similar courses at other institutions. Of course, there can never be a truly model course that can simply be plugged into a school's curriculum. The value of the teaching guide is to provide encouragement, assurance, and practical suggestions to those who believe that one of today's major public health problems should be a vital component in the curriculum of every public health training program.

If the subject of motor vehicle injury prevention is so well received as part of a school of public health curriculum, why are there not more such courses? There are several reasons. First, at some schools of public health the subject is covered to some extent in courses in maternal and child health, health promotion and health education, behavioral science, environmental and occupational health, and epidemiology (*21*). Johns Hopkins has a specific curriculum track in injury control (*22*), and the University of Minnesota offers injury courses and an intensive continuing education program (*21*). Courses directed specifically at motor vehicle safety may be available to students at some schools of public health through other units of their university (for example, colleges of engineering).

Second, the very fact that public health training programs offer a broad, interdisciplinary curriculum means that students have programs of study already filled with basic required courses plus elective courses in the student's specific area of focus. Little room remains for courses that do not fit into a traditional public health program. Third, the interdisciplinary approach of public health brings together faculty who offer expertise in a broad range of specialties. But it is unlikely that any single faculty member will possess sufficient knowledge to allow that person to feel confident covering the entire range of motor vehicle injury issues, from the biomechanics of trauma to public policy analysis. Finally, the facts are that the epidemiology of injury is a relatively new area, and injury prevention has traditionally received short shrift within public health programs depite their preventive health concern (*5*).

The problems outlined previously—lack of time to take electives and resultant lack of support for the development of a course devoted solely to motor vehicle injury, plus the wide diversity of faculty interested in or currently involved in injury curriculum—are reflected in the results of the survey of deans of 23 accredited schools of public health. The affiliations of the 23 faculty members nominated by their deans to participate in the project follow: environmental health, 6; epidemiology-biometry, 5; health education-promotion, 4; health planning-administration-policy, 4; maternal and child health, 2; public health nursing, 1; and sociomedical sciences, 1.

The interdisciplinary nature of the injury control problem is underscored by this listing. The largest obstacle cited by these faculty to the development of a course devoted entirely to traffic-related injuries was the relatively high proportion of required courses in specific degree programs and the large number of competing elective courses in more traditional areas. The development of an introductory or overview course on all types of injury, followed by a "special topics" course, with the subject rotated from offering to offering, appears to be the most likely model to be adopted by schools of public health. Such a model is currently used by Johns Hopkins (*22*).

An argument can be made against including a motor vehicle injury course in a public health curriculum simply because it may become the sole part of the curriculum devoted to injury prevention. It might be better, according to this argument, to begin with a more generic injury course before introducing one that is more narrowly focused. However, there are two responses to this argument. First, local circumstances will be the

best guide to whether such a danger exists. Second, a course on motor vehicle injuries can draw previously uninterested persons to the general area of injury control. The University of Illinois motor vehicle injury course did seem to inspire a broader concern and interest in injury control in general. Although the number of students who participated in this project was too small to perform a statistical evaluation, the response of one student on the course evaluation questionnaire illustrates this point: "This course got me interested in the whole field of injury control in general and has led to a career decision to work in that area."

The most important overall objective for the course developed through this project was that students comprehend that highway deaths and injury are a major public health problem that can be mitigated by proven public health methods of prevention and techniques of control. The intention was to provide a concrete example of how injury can be incorporated into a public health curriculum. The lack of a multidisciplinary injury professional and the effect of this lack on injury prevention and control have been documented (*5*). This course sought to address that lack through the requirements that students understand, appreciate, and be able to work on solutions to the injury problem using a multidisciplinary approach and that they understand why efforts to bring public health and safety professionals together on this problem have not met with more success. The hoped-for-result is that students will champion the prevention of injury as a high priority for public health agencies, professional health associations, and civic and community organizations throughout their careers.

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