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# Measuring Adolescent Behaviors Related to Unintentional Injuries

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**A**NNUALLY, more than 150,000 Americans die from injuries, and one in four is injured seriously enough to require medical attention (1). In the United States, medical care costs and lost productivity due to injuries exceed \$100 billion annually (2). Additional costs of associated pain and suffering are incalculable. Unintentional injuries, including those due to motor vehicle crashes, falls, poisonings, drownings, fires and burns, and recreation and sports account for more than two-thirds of the injury mortality burden (1).

Many unintentional injuries are preventable. Some behaviors that are risk factors for unintentional injuries are initiated during childhood or adolescence and may persist into adulthood. To develop policies and programs to help prevent unintentional injuries, health and education officials need data on the prevalence of the most important behaviors that may result in unintentional injury among adolescents (3).

This paper describes the development of questions related to unintentional injuries for the Youth Risk Behavior Surveillance System (YRBSS) questionnaire. The YRBSS panel participants (see Appendix I, page 56) first identified the leading causes of adolescent mortality and morbidity associated with unintentional injuries. Guided by national health objectives for the year 2000 (3), we developed questions that would elicit information on behaviors related to these leading causes.

## Mortality from Unintentional Injuries

Unintentional injuries are the fourth leading cause of death in the United States and the leading cause of death among 12- to 24-year-olds (3). Each year, approximately 100,000 people die from unintentional injuries. Males are more than twice as likely as females to die from unintentional injuries. Blacks have slightly higher death rates than whites, and death rates are two times higher for American Indians and Alaska Natives than for whites (1,4,5). Because so many of the people killed

by unintentional injuries are children, adolescents, and young adults, injuries are the leading cause of years of potential life lost (YPLL) before age 65. In 1990, unintentional injuries accounted for 2,147,094 YPLL—17.8 percent of YPLL from all causes in the United States (6).

For all age groups combined, the leading causes of death from unintentional injury are motor vehicle crashes, falls, poisonings, and drownings (1). Motor vehicle crashes account for about half of these deaths and are the leading cause of death among 1- to 34-year-olds (1,7). In 1991 alone, motor vehicle crashes killed 6,730 youths ages 15–20 (8). About 80 percent of motor vehicle crash deaths are among occupants of motor vehicles, excluding motorcycles (9). Two of the most common contributors to fatalities from motor vehicle crashes are consumption of alcohol and nonuse of safety belts. As recently as 1991, approximately half of all fatal crashes were alcohol-related, and 31 percent of drivers in fatal crashes were alcohol involved (8). Despite drinking laws prohibiting alcohol use before age 21, 30 percent of drivers ages 15 to 20 in fatal crashes were alcohol involved (8).

In 1990, 77 percent of persons killed in motor vehicle crashes were not wearing safety belts (9). Adolescents have the highest proportion of belt nonuse (83 percent) of any age group involved in fatal motor vehicle crashes (9).

Fatal head injuries among motorcyclists and bicyclists are another significant problem. Each year, motorcyclists account for about 12 percent of all deaths from injuries sustained in motor vehicle crashes, and slightly more than half of these deaths involve head injuries (10). In 1990, 856 traffic fatalities occurred among bicyclists; most of these deaths were among adolescents and adults (9). One national study found that more than two-thirds of bicyclist fatalities result from head injuries (10).

Overall, fall-related death rates are the second lead-

ing cause of deaths from unintentional injury, but these rates are much lower among persons younger than age 75 (1). The circumstances typically surrounding fatal falls vary with age, from infancy (falling from one level to another) and working ages (falling from heights) to older ages (falling from stairs or tripping or slipping in the home) (1,11).

Unintentional poisonings are the third leading cause of unintentional injury deaths, resulting in over 5,000 deaths annually (3). More than half of these deaths are due to misuse of drugs and medications, and about 8 percent are attributed to motor vehicle exhaust. Rates of unintentional poisoning from motor vehicle exhaust peak among females ages 15–19 and among males ages 20–24 (1).

Drowning is the fourth leading cause of death from unintentional injuries among all age groups and the second leading cause of such deaths among adolescents (1,12,13). The number of potential drowning cases in which the person is rescued without serious medical consequences is believed to be substantial. Drowning rates are highest among children younger than age 5 and among 15- to 24-year-olds. Drowning occurs five times as often among males as females. Annually, nearly one-fifth of the 5,000 drownings involve boats (1,14,15).

## **Morbidity from Unintentional Injuries**

Many persons suffer temporary or lifetime disability as a result of unintentional injuries. The most common injuries resulting in persistent disabilities are traumatic head injuries and spinal cord injuries.

Each year, approximately 500,000 people suffer a traumatic head injury requiring hospitalization (3). Motor vehicle crashes, falls, and unsafe diving are the most common unintentional causes of severe traumatic head injury (16). These injuries not only are devastating in themselves, but place their victims at increased risk for secondary disabilities (17).

Spinal cord injuries are usually associated with long-term disability and extensive treatment and rehabilitation. Approximately 2.8 to 5 spinal cord injuries per 100,000 people occur each year, and about 40 percent of these injuries are fatal (18). Males experience about 80 percent of all spinal cord injuries. Adolescents and young adults ages 15–24 are at greater risk than any other age group of sustaining a spinal cord injury that results in lifelong needs for special services and reduced employment potential (19). Motor vehicle crashes account for almost 50 percent of all spinal cord injuries (20). Falls and unsafe diving are other common causes (21).

Nearly all persons with spinal cord injuries suffer secondary complications and disability as a result of their injury. Secondary complications commonly in-

clude bladder and urinary tract infections, pressure sores, and respiratory tract problems (3,22).

## **National Health Objectives**

The national health objectives measured by the Youth Risk Behavior Surveillance System are listed in Appendix III, page 67. Six of the national health objectives for the year 2000, presented in “Healthy People 2000” (3), are relevant to unintentional injuries among adolescents. These objectives helped guide our selection of priority health behaviors.

Among the health status objectives that concern unintentional injuries, objective 4.1 calls for reducing alcohol-related motor vehicle crashes and objective 9.3 calls for reducing all motor vehicle crashes. Specific goals are set for 15- to 24-year-olds. Objective 9.5 calls for reducing drowning deaths and sets a specific goal for 15- to 34-year-olds.

Risk reduction objectives that concern unintentional injuries among adolescents call for increasing the use of occupant protection systems such as safety belts, inflatable safety restraints, and child safety seats (objective 9.12), and increasing the use of helmets among motorcyclists and bicyclists (objective 9.13).

One service and protection objective (objective 9.18) calls for increasing the provision of instruction on injury prevention and control in grades kindergarten through 12, preferably as a part of quality school health education.

## **Priority Behaviors**

To focus our development of questions related to unintentional injuries for the YRBSS, we selected, by priority, the following five behaviors: riding in a motor vehicle driven by an intoxicated driver, driving a motor vehicle while intoxicated, using seatbelts while riding in a motor vehicle driven by someone else, wearing a helmet when riding a motorcycle or bicycle, and swimming in an unsupervised area.

We based our decisions on the leading causes of mortality and morbidity related to unintentional injuries and on the relevance of the behavior to national health objectives (3).

Alcohol use is a highly correlated and prevalent risk factor for fatal motor vehicle crashes (23). Alcohol use is a factor in approximately half of all deaths from motor vehicle crashes. In 1990, among drivers younger than age 21 in fatal crashes, 21 percent were legally intoxicated (blood alcohol concentration [BAC] above 0.10) (9). For persons with a BAC .10, the relative risk for motor vehicle crash fatality is 4 to 5 (23).

Among front-seat motor vehicle occupants, use of

safety belts reduces the risk for fatal injury by 40 percent to 50 percent and the risk for moderate to critical injury by 45 percent to 55 percent (24). However, according to observational surveys, rates of using safety belts have leveled off at 54 percent to 59 percent (25). Adolescents are less likely than other age groups to use seatbelts (26).

Motorcycle and bicycle helmets are effective safety equipment. Helmet use reduces risks for death from motorcycle crashes 28 percent to 73 percent (27,28) and reduces the risk for head injuries from bicycle crashes 85 percent (29). Recent surveys in the United States indicate that bicycle helmet use is infrequent (30). Motorcycle helmet use varies from nearly 100 percent in States with mandatory helmet laws to 40 percent to 60 percent in States without such laws (27).

Data describing behaviors related to drowning are sparse. Alcohol frequently is involved in drownings and, in one study, 80 percent of drownings occurred in nondesignated swimming areas (1). Unsupervised swimming also is associated with drowning (7).

## **YRBSS Questions**

We developed eight questions to measure the priority behaviors related to unintentional injuries among adolescents. (See Appendix II, Youth Risk Behavior Surveillance System questionnaire, for the specific questions, page 60.) Question No. 11 was developed to measure the frequency of riding in a motor vehicle driven by an intoxicated driver, and question No. 12 was developed to measure the frequency of driving a motor vehicle while intoxicated. We used the phrase "car or other vehicle" because laboratory and field tests conducted by the National Center for Health Statistics indicated that adolescents interpret this phrase to mean all types of motor vehicles, including trucks. These tests also indicated that asking only about alcohol use, rather than alcohol and other drug use, did not significantly change adolescents' responses and simplified the questions. To provide a current measure of these behaviors, we used a "30-day" recall period.

Question No. 6 was developed to measure respondents' use of safety belts when riding in a motor vehicle. We specified safety belt use when riding, rather than when driving, because these are two distinct behaviors that entail different perceptions of risk (30), and because the YRBSS target population includes youth younger than the legal driving age. A five-point Likert scale ranging from "never" to "always" was selected for response categories.

Laboratory and field tests indicated that adolescents could respond more reliably to this type of question than to requests for the specific number of times they used a safety belt during a given recall period. Comparisons

between self-reports and observations of safety belt use indicate that the "always use" category of self-reported rates is the response category that most closely corresponds to observed rates (31). Data from this question can be used to measure objective 9.12 (3).

Four questions were developed to measure the frequency with which respondents wore helmets when riding motorcycles and bicycles during the previous year. A "12-month" recall period was selected for all four questions because, in some regions, motorcycle and bicycle riding is a seasonal activity. To enhance the usefulness of data about helmet use, two questions measure the frequency of motorcycle (No. 7) and bicycle riding (No. 9). Two additional questions measure the frequency of helmet use when riding motorcycles (No. 8) and bicycles (No. 10). Response categories consist of a five-point Likert scale ranging from "never" to "always," plus an option for adolescents who have not ridden a motorcycle or bicycle during the previous year. Data from these questions can be used to measure objective 9.13 (3).

Question No. 13 was developed to measure the frequency of swimming in an unsupervised area during the previous year. A 12-month recall period was selected because of seasonality of exposure and the wide range of swimming frequency. Response categories consist of a five-point Likert scale ranging from "never" to "always," plus an option for adolescents who have not been swimming during the previous year.

Because only a limited number of questions could be included in the YRBSS questionnaire, we could not measure other important respondent behaviors, including use of alcohol when driving specific types of motor vehicles, such as all-terrain vehicles, motorcycles, or farm equipment; use of safety belts when driving a motor vehicle or when riding in particular seats; delinquent driving that results in official warnings, citations, arrests, or license suspensions; performing stunts, such as wheelies on a motorcycle, bicycle, or all-terrain vehicle, or drag racing in an automobile or boat; unsafe diving; and use of protective gear, such as mouth guards or helmets, when participating in sports and recreational activities. Because the YRBSS was designed to focus primarily on behaviors, we did not include questions to measure determinants of risk behaviors or the provision of education on injury prevention and control.

## **Discussion**

Reducing unintentional injuries among adolescents depends in part on our ability to identify, measure, and reduce high-risk behaviors. To date, the prevalence of priority behaviors related to unintentional injuries among adolescents has not been well documented. The YRBSS

is the first surveillance system to monitor these behaviors at the national, State, and local levels over time. Consequently, the YRBSS will be an important tool for prioritizing and evaluating effective policies and programs to reduce behaviors that contribute to the leading causes of adolescent mortality and morbidity from unintentional injuries. The YRBSS also will be useful for directly measuring two national health objectives related to unintentional injuries among adolescents (3).

Unintentional injuries take their toll in direct medical costs, indirect economic costs to society, and in the untold emotional costs of death and disability. The coordinated efforts of health, education, criminal justice, law enforcement, and social service agencies are needed to address effectively the public health problems posed by unintentional injuries. Families, physicians, the media, and community leaders also have an important role to play. These groups must work together to identify and implement effective school- and community-based interventions, enact and enforce appropriate legislation, and develop and disseminate technologies to reduce hazards in the environment.

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