

CHAPTER

2

Conceptual and Historical Underpinnings of Injury and Injury Prevention

“Measures to reduce injuries have been used since ancient times. . . .
Many have worked so well that they have been used for millennia.”

—William Haddon, Jr.,

Landmarks in American Epidemiology, 1980

■ WHAT THIS CHAPTER IS ABOUT

What are injuries? How and why has injury prevention become a part of the public health agenda? Is it realistic to focus traditional public health research and program tools on the injury problem? Is intentional injury really a public health problem? These are important questions, the answers to which require some understanding of the conceptual and historical underpinnings of injury and injury prevention.

This chapter traces the evolution of the modern-day conceptual understanding of injury. This is important, because the way we think about injury, more than anything else, has brought injury prevention into the public health arena. And it is the way we think about injury that determines how effective we are in reducing the toll of injury in America.

■ INTRODUCTION

Until not too many years ago, unintentional injuries (intentional injuries will be discussed later) were viewed as either “accidental”—random, unpredictable and unavoidable occurrences—or events resulting from individual carelessness or “accident-prone” lack of coordination. This viewpoint made them isolated misfortunes experienced by individual victims, rather than public health concerns that could be understood and dealt with on a population basis. Working from such a conceptual approach, it made little sense to devote limited public health resources to dealing with injury. For example, motor vehicle crashes were seen almost entirely as matters of individual driver fault. Society could legislate who could drive, prohibit drunk driving, and punish reckless driving behavior, but few people thought of automobile crashes as a public health problem. At most the public health community’s injury prevention focus consisted of admonitions to the public to “be careful.”

Viewing a social problem in individualistic terms centering on the shortcomings of the victim is not unique to injury. Many people in the United States (particularly politicians and leaders of the religious right) have portrayed human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) as being the result—and also the just desserts—of the “shortcomings” of those who are gay or intravenous drug users. This focus on individual deficits was, for a long time, well received as a framework for understanding the injury problem. Sylvia Noble Tesh notes that science itself has long been permeated with value judgments and that one of the most important has been individualism, which:

makes the individual the basic unit of social analysis. It supports a politically conservative predisposition to bracket off questions about the structure of society . . . and to concentrate instead on questions about the behavior of individuals within that (apparently fixed) structure. One consequence is the assumption that health education is the best way to prevent disease. Unhealthy behavior results from individual choice, the ideology implies, so the way to change such behavior is to show people the error of their ways and urge them to act differently.¹

It is of great significance therefore that over the past several decades the theoretical focus on injury has shifted from a biological and behavioral emphasis on the individual to a concern with the environmental context within which injury occurs. This conceptual shift was connected to another theoretical advance: the growing awareness that single-cause explanations of injury events are incomplete and misleading. For example,

it is not sufficient to say that a motor vehicle fatality was the result of “drunk driving.” Such an explanation obscures a variety of surrounding questions. Why did *this* drunk driver crash while another did not? Why did he or she crash during *this* trip and not during any previous drunk driving episodes? Why did he or she crash at *this* place and not a mile earlier? Why was *this* crash fatal? Why was it fatal to *this* driver but not the passenger? In short, was *this* fatality inevitable and, if not, what could have prevented it? As Julian Waller has pointed out, because injury events are relatively rare occurrences, it is easy for people to fall into the trap of associating the event with a single characteristic—such as drunk driving—and then infer causation.

During the latter third of the 20th century, the science of injury prevention moved away from a highly individualistic approach to one that is more amenable to socially based (i.e., public health) interventions. There are a variety of reasons for this change, including the fact that injury prevention has drawn the attention of a growing number of disciplines, and that this interdisciplinary collaboration inspired conceptual advances. Intentional violence was once seen solely as a law enforcement and criminal justice issue, suicide was viewed as a mental health problem, and unintentional injury prevention was primarily the purview of safety engineers and psychologists. A public health approach has made injury the focus of research and programmatic concerns by a wide range of disciplines, not only those just mentioned but also epidemiologists and biostatisticians, maternal and child health officials, environmental and biomechanics experts, public health lawyers, and policy analysts. The public health approach to preventing both unintentional and intentional injuries is one in which, as Garen Wintemute stated, “We examine more of the variables, and we don’t insist that we have to change the fundamental nature of people in order to do something about a health problem.”²

There has been growing recognition that public health tools and methods used effectively against infectious and other diseases can also be applied to injury prevention. The National Center for Injury Prevention and Control (NCIPC), part of the US Centers for Disease Control and Prevention (CDC), is staffed by an interdisciplinary group of public health experts drawn from the traditional areas of public health expertise. These CDC experts point out that interventions designed to reduce the impact of injury, such as bicycle or motorcycle helmets, can be considered an injury “vaccine,” making the vaccinated public more resistant to injury. And as with any vaccine, its use must be fostered through a combination of education and legal requirements and its impact must be measured through surveillance and epidemiologic analysis. A result of this heightened public health awareness regarding injury is that preventive interventions concentrate not only on individual victims, but also on the environment and on the products used by the public.

■ HIGH POINTS IN THE CONCEPTUAL EVOLUTION OF INJURY

The preventability of injuries is not solely a late-20th-century notion. Julian Waller notes that, in 1788, Johann Peter Frank described injury prevention activities as a desirable part of comprehensive public health programs.³ But Waller also notes that this message did not fall on fertile ground in highly individualistic, noninterdependent frontier America.

The science of modern injury prevention evolved during the 20th century along with the social realization that individuals are often in a poor position to perceive and control injury risks. The standard history of this evolution focuses on several people who played critical roles in advancing understanding. The first of these individuals was Hugh De Haven, a World War I pilot who survived a plane crash and went on, as a physiology researcher, to attempt to better understand the reasons why. This pioneer in biomechanics concluded that “Structural provisions to reduce impact and distribute pressures can enhance survival and modify injury within wide limits in aircraft and automobile accidents.”⁴ In other words, the fact that a crash or other injury event occurs is but the first step in a process that may or may not result in an injury. The injury event is only the beginning of understanding the injury process.

Another critical figure in injury prevention history was John Gordon, an epidemiologist at Harvard in the mid-19th century, who studied the distribution and causes of injury in the same way as classic infectious diseases were studied. Disease had long been the subject of scientific scrutiny and rarely did such scrutiny focus on the “disease-prone” behaviors and shortcomings of victims (only much more recently has HIV/AIDS become an unfortunate exception). Epidemiology, as the scientific study of diseases among populations, focuses on patterns and distributions of disease in order to tailor preventive measures to reduce disease by focusing on populations. Gordon was interested in applying the same approach to injury. His studies of injury distribution patterns, according to such factors as age, place, time, and the like, demonstrated the nonrandomness of injury events. Gordon focused epidemiologic techniques not only on injury patterns, demographics, and trends, but also on the classic triad of epidemiology. Rather than concentrating on single-cause explanations of injury, Gordon described injuries as being the result of “forces from at least three sources . . . the host . . . the agent . . . and the environment in which host and agent find themselves.” This approach parallels that of infectious disease prevention, in which the host might be protected via immunization, the agent dealt with through antibiotics, and environmental transmission interrupted by sanitary engineering. In terms of injury, the host might be a curious, mobile two year old; the agent might be a potentially poisonous bottle of cleaning fluid that looks similar to a drink—such as apple juice—that the toddler likes; and the environment might be a screw-top bottle in an accessible area at the toddler’s

level, such as under the kitchen sink. Taken together, this scenario could result in a serious, unintentional injury. But intervention to prevent such an injury could occur at several points to secure the host, agent, and/or environment.

This insight was critically important because it showed the full power of an epidemiologic approach to the study and understanding of injuries. But although the injury host and the injury environment could be understood in terms comparable to that of the disease model, it was not clear how to approach and understand the agent of injury. Unlike a virus or toxin associated with a disease, the agents of injury seemed innumerable and varied: knives and explosives, cars and fires, or ladders and machinery. In 1961, James Gibson advanced the concept of injury in classic epidemiologic terms by suggesting that “energy interchange” was the agent of injury harm. Today injury is commonly defined as the transfer of energy to human tissues in amounts and at rates that damages the cellular structure, tissues, blood vessels, and other bodily structures. This includes mechanical (kinetic), thermal, chemical, electrical, or radiation energy: *mechanical energy*, as when an unrestrained motor vehicle occupant’s head strikes the windshield during a crash; *thermal energy*, as when the heat and flames of a house fire burn an occupant; *chemical energy*, as when the aforementioned cleaning fluid attacks the toddler’s metabolic process; *electrical energy*, as from contact with accessible high-voltage power lines; *radiation energy*, as with a serious sunburn.

Gibson’s definition didn’t fit perfectly, for it ignored injuries such as death by drowning or freezing. William Haddon, a physician and engineer who is considered the “founding father” of modern-day injury prevention, took Gibson’s insight further, showing that the few injuries that did not fit this pattern of physical energy transfer involved the absence of necessary energy elements—such as oxygen or heat occurring in drowning or hypothermia. By 1989, the NCIPC would define injury as “any unintentional or intentional damage to the body resulting from acute exposure to thermal, mechanical, electrical, or chemical energy or from the absence of such essentials as heat or oxygen.”⁵

■ INJURY BIOMECHANICS

Of the various forms of energy—kinetic, thermal, chemical, electrical, and radiation—kinetic (or mechanical) energy transfer is the biggest contributor to injury. It is useful for public health injury prevention specialists to understand the biomechanics of kinetic energy injuries (just as it is important for them to understand the epidemiology of injury). Injury texts by Leon Robertson and Julian Waller provide useful explanations of the physics (and chemistry) of injury. No injury prevention library would be complete without these two basic texts.⁶

Mechanical injury results from the “deformation of tissues beyond their failure limits.”⁷ In *Injury in America*, the Committee on Trauma Research noted that:

Injury biomechanics research uses the principles of mechanics to explore the mechanisms of physical and physiologic responses to mechanical forces . . . by penetrating or nonpenetrating blows to the body. . . . Research in biomechanics involves a variety of disciplines, including engineering, physiology, medicine, biology, and anatomy. . . .⁷

The Committee on Trauma Research also noted that mechanical injuries can be caused in three ways:

- Crushing deformation of the body, such as through chest compression, rib fracture, and aortic laceration.
- Impulsive impact, such as by violent sternal motion that deforms the heart beyond its viscous tolerance and causes contusion and rupture.
- Acceleration of the skeleton and tearing of internal organs, because of their inertia; for example, during head impact, the skull accelerates and the loosely attached brain lags, so injury is due in part to deformation of brain tissues beyond their limit of recovery. . . . As long as the energy delivered to the tissue is below the limit of injury—whether it be the crush limit, the viscous limit, or the acceleration limit—the energy will be absorbed without causing injury. . . . The two main types of strain . . . that can damage tissue are tensile strain and shear strain; a third type is compressive strain, which is responsible for crushing injuries.⁸

Regardless of whether the kinetic energy results from a motor vehicle crash, a shooting, or a fall, the force to which human tissue will be subjected is the product of the mass and the velocity involved. The basic formula—force equals one half of mass multiplied by the square of velocity—illustrates that the effect of velocity is greatly enhanced as velocity increases. This force will cause more or less damage to the host depending upon the shape and the rigidity of the colliding surface or object, but velocity usually plays the most critical role.

The physics and biomechanics of injury have been of concern primarily to the engineers who design the environment in which injury occurs, whether it be automotive design, highway design, building design, or other designs. The resulting designs affect all people, so in some cases government controls those designs (e.g., federal motor vehicle safety standards or local building codes). In other cases the market influences the designer (e.g., in terms of whether cars are larger—with more “crush space” to absorb dangerous energy—or smaller for reasons of energy efficiency). Certainly biomechanics has made a broad contribution to injury prevention, ranging from determining the best bike helmet design

for minimizing head impact, to developing hip pads to reduce the effect of falls by the elderly, to defining human tolerance limits for injury among very young children, women, and the frail elderly.

For the public health practitioner, understanding the physics and biomechanics of injury is important not only in helping to educate the men and women who design these environments, but also in educating the public who must interact with (i.e., be subjected to) energy transfers within these environments. For example, it is important to educate parents on why holding a baby in their arms is not a way of providing protection in a crash and on why a child restraint system offers protection in a crash. In a crash, an unrestrained object—such as a child—travels with a force equal to one half of the product of its *mass* (weight divided by force of gravity) times the square of its *velocity* (in feet/seconds). If a car is traveling at 35 miles per hour and crashes into a rigid object, a 20-pound baby will travel with a force of as much as 800 pounds (depending on the amount of energy absorbed by the car's "crush space"). It would be as easy to hold such a baby securely as it would be to lift 800 pounds a foot off the ground. As one commentator has noted, "Crashing an automobile at 30 miles per hour is like diving headfirst off a three-story building."⁹

It is not difficult to imagine the result of forces of this magnitude striking some part of a car's interior (the so-called "second collision"). A child restraint system allows for a more uniform "ride down" of such a crash, so that the force is distributed more uniformly over time, and also spreads the load, so that the force is distributed more uniformly over the body.

■ INJURY PREVENTION

William Haddon also extended John Gordon's epidemiologic insights by noting that injury host, agent, and environment can be analyzed temporally in terms of a preinjury phase, an injury phase, and a postinjury phase. The preinjury phase is when primary prevention approaches can be implemented (such as the use of conflict resolution programs, construction of divided highways, or enforcement of speed limits). The injury phase is when secondary prevention is possible (such as the deployment of airbags in crashes, the installation of breakaway sign posts, or the wearing of a bulletproof vest). The postinjury phase is the time to focus on tertiary prevention (such as effective emergency medical services, minimal trauma response times, or rehabilitation programs). This systematic breaking down of the injury problem into temporal as well as epidemiologic components is often represented in what has come to be known as the Haddon Matrix¹⁰ (Exhibit 2-1).

Haddon continued this systematic conceptualization of injury by identifying 10 basic categories of injury prevention countermeasures, also arranged temporally. These 10 approaches or strategies represent the

Exhibit 2-1 The Haddon Matrix

Factors Phases	Human Factors	Agent or Vehicle	Physical Environment	Sociocultural Environment
Pre-event				
Event				
Post-event				

Source: Authors

various ways in which energy transfer can be controlled, modified, or interrupted. They are:

1. Prevent the initial creation of the hazard by banning the manufacture and sale of inherently unsafe products or prohibiting inherently unsafe practices (e.g., don't produce firecrackers, three-wheeled all-terrain vehicles, baby walkers, or various poisons; eliminated "spearing" in high-school football).
2. Reduce the amount of energy contained in the hazard (e.g., limit the muzzle velocity of guns and the amount of gunpowder in firecrackers; limit the horsepower of motor vehicle engines; package toxic drugs in smaller, safer amounts).
3. Prevent the release of a hazard that already exists (e.g., store firearms in locked containers; close pools and beaches when no lifeguard is on duty; make cigarette lighters and medicine containers child proof; alter the porosity of cigarette paper to reduce smoldering).
4. Modify the rate or spatial distribution of the hazard (e.g., require safety valves on boilers; use seatbelts to control the deceleration of occupants in motor vehicle crashes; use short cleats on football shoes so feet rotate rather than transmit sudden force to knees).
5. Separate, in time or space, the hazard from that to be protected (e.g., provide pedestrian overpasses at high volume traffic crossings; do not have play areas near unguarded bodies of water).
6. Separate the hazard from that which is to be protected by a material barrier (e.g., install fencing to enclose all four sides of swimming pools; insulate electrical cords; provide protective eyewear for racquet sports; build highway medians; make use of bulletproof barriers).
7. Modify relevant basic qualities of the hazard (e.g., provide padded dashboards in motor vehicles; make crib slat spacing too narrow to strangle a child; adopt use of safer baseballs and breakaway baseball bases; install nonslip surfacing in bathtubs; provide protective surfacing under playground equipment; provide rollover protection on tractors).

8. Make what is to be protected more resistant to damage from the hazard (e.g., encourage calcium intake to reduce osteoporosis and brittle bones in case of falls; encourage musculoskeletal conditioning for athletes; prohibit alcohol sales and consumption near recreational water areas).
9. Begin to counter the damage already done by the hazard (e.g., provide emergency medical care on-site at car crashes; employ systems to route injured persons to appropriately trained trauma care providers; develop school protocols for responding to injury emergencies).
10. Stabilize, repair, and rehabilitate the object of the damage (e.g., develop rehabilitation plans at an early stage of injury treatment; make use of occupational rehabilitation for paraplegics or elderly people who have been bedridden for a stretch of time).

The conceptual advances of Haddon and others were introduced into the policy and political arenas by Haddon himself, Ralph Nader (beginning with his classic book, *Unsafe at Any Speed*¹¹), and Senator Daniel Patrick Moynihan,¹² among others. Their efforts—and those of many others—led to legislative enactments such as the National Traffic and Motor Vehicle Safety Act of 1966, which incorporated a system of motor vehicle safety standards organized according to preinjury, injury, and postinjury phases.

It is hard to overemphasize the importance—from a public health perspective—of the conceptual shift from single-cause, behavioral explanations of injury to multiple-cause, environmental explanations. It is only from within the later conceptual framework that it is possible to apply the strengths of the public health approach to the injury. If injuries are “accidents,” there is little society can do to prevent them. If injuries result from individual shortcomings, there is little, other than heightening awareness through education, that society can do to reduce injury risks. As the authors of *Injury Prevention: Meeting the Challenge* put it:

The contributions of De Haven, Gordon, Gibson, Haddon, and others helped to shift injury prevention away from an early, naive preoccupation with distributing educational pamphlets and posters and toward modifying the environments in which injuries occur. By developing new laws and enforcement mechanisms and through new technologies and engineering changes in products, injury experts from a broad range of disciplines sought to protect people from coming into contact with injurious amounts of energy.¹³

The goal of the environmental approach to injury prevention is to structure the physical environment so as to minimize the injurious release of energy. This approach, if aggressively implemented, can significantly

reduce the toll of injury. An example is the dramatic decrease in US motor vehicle deaths during the past three decades, resulting from environmental modifications—particularly federal motor vehicle safety standards to improve vehicle crashworthiness and safer highway design with fewer roadside hazards. There have also been important changes in the “psychosocial environment.” For example, even those individuals whose attitudes regarding drinking and driving may be irresponsible must now function in an environment in which those around them are less likely to tolerate and facilitate drinking and driving behavior.

Environmental modification obviously cannot provide perfect protection from injury. So education and behavioral approaches, once the mainstay of injury prevention, continue to play a role in preventing injury. It is a more meaningful role today, because behavioral interventions are a complement to environmental modifications, rather than the sole approach to injury prevention.¹⁴ Moreover, behavioral modifications no longer rest solely on the shoulders of the potential injury victim. Waller emphasizes the important point that injury events occur when performance levels—driving performance, for example—fall below task demands. Such performance deficiency situations can be reduced not only by improving individual performance levels but also by lowering task demands, either behaviorally—as convincing people not to drive in unfavorable conditions or while using cell phones—or by re-engineering the task itself. As a result, for most people, most of the time, performance levels can be more than a match for task demand.

The significance of the Haddon Matrix and Haddon’s 10 injury prevention countermeasures is that they make clear that not only can society intervene to reduce injury, but that such intervention can occur at many different points. This may or may not mean that intervention at the preinjury phase is the most effective approach. The beauty of having a variety of intervention points, as highlighted in Haddon’s work, is that it allows for a mixed preventive approach, incorporating several intervention options. Having several intervention points allows for selection of the strategies likely to provide the greatest efficacy at the lowest cost and allows for repeated opportunities to reduce injury. Haddon and Baker argue that:

First, the choice of countermeasures should *not* be determined by the relative importance of causal or contributing factors or by their earliness in the sequence of events. . . . Rather, priority and emphasis should be given to measures that will *most effectively* reduce injury losses. . . . *Second*, a “mixed strategy” should usually be employed, incorporating countermeasures addressed to each of the three phases of the injury-control sequence. . . . *Third*, preference should be given to “passive” measures, i.e., those that protect the individual automatically, without any action on his part. . . .¹⁵

■ INTENT

Intentional and unintentional injury prevention efforts have traditionally operated independently. They have used different paradigms and have not been integrated. As a result, they have failed to take advantage of their commonalities.¹⁶ This separation between unintentional and intentional injury prevention has been reinforced by funding streams, the perspectives of different disciplines, turf wars (criminal justice, mental health, public health), and the pitting of environmental (unintentional) against behavioral (intentional) orientations. Intentional injuries—homicides and suicides—are no less unpredictable and random than are unintentional injuries. Nor is intent a clear distinguishing characteristic. Just how intentional or unintentional are drunken driving deaths, “shaken baby” injuries, or copycat suicides? During the past two decades, it has begun to dawn on the public health community that intentional injury is a public health problem amenable to interdisciplinary public health surveillance, analysis, and intervention similar to those employed to reduce unintentional injuries.¹⁷

From a prevention perspective, it is not at all clear that intent is a critical factor in reducing injury occurrence and severity. It is clear, however, that the same prevention approaches can have an impact on injury incidence regardless of intent. For example, parenting courses or home visits for pregnant teens can help reduce both child abuse and falls from infant furniture. Also, the modification of firearm design to produce safer, personalized “smart” guns can reduce unintentional deaths from firearms as well as suicides and homicides. Outdoor physical environments that are well designed and maintained by a community will promote a sense of safety and aid in reducing injuries regardless of intent. It is also clear that the process of developing a community-based prevention program is the same regardless of the cause of an injury problem or the nature of the intent involved.

Public health professionals need to emphasize the points of natural intersection between intentional and unintentional injury prevention (Exhibit 2-2). Although acknowledging differences associated with intentionality (e.g., motivational factors, risk factors, targets for intervention), the Committee on Injury Prevention and Control recommended “continued integration of all injury prevention activities within a common framework of research and program development.”¹⁸ These two categories of injury prevention may involve the same surveillance data sources and systems and the same programs and agencies to implement prevention efforts. Also, the same key factors, such as alcohol use and adolescent impulsivity, may cut across both injury categories. “The injury field provides the wide lens, while the specific focus is provided by specialists from pertinent disciplines in adjacent fields.”¹⁹ For public health, that focus is a population-based perspective, framing interventions for risk factors

Exhibit 2-2 Points of Natural Intersection Between Intentional and Unintentional Injury Prevention

- Linkage of different data sets
- Mapping of injuries for high-risk areas
- Good parenting interventions
- Youth connections with adult role models
- School-based youth mentorship programs (e.g., peer pressure, aggressive behavior, alcohol use, and inadequate anger management affect road rage and traffic safety as well as violence)
- Teen pregnancy programs (e.g., parenting, dating violence, lack of child passenger safety seats, and child neglect)
- Teen worker safety programs (e.g., enforcement of child labor laws regarding hours of work and violence, sexual harassment)
- Safe streets (e.g., pedestrian protection, lighting, parks, playgrounds, violence prevention)
- Safe Routes to School initiatives
- Healthy communities movement (e.g., exercise and walking can help in feeling safe from violence)
- Safe rides home at night (e.g., reduce drinking and driving and night time crashes as well as dating violence)

(especially environmental ones) and providing tools for measuring outcomes. Public health has the tools and resources to be a player in the social response to violence and should be prepared to coordinate efforts with the disciplines of criminal justice and mental health and generate ideas that can be applied across the range of both intentional and unintentional injury prevention efforts.

■ CONCLUSION

During the 1990s, many public health agencies added injury prevention to their agendas. Fortunately, this increased responsibility for protecting the public has been accompanied by increased insights into how to apply public health approaches to the task. There is still a long way to go, however. Individual behaviors are still overemphasized in the public's understanding of injury. And much of injury prevention is still focused on making injury-creating environments more survivable, rather than on changing the nature of these environments through broader social change. For example, a massive changeover from individual automobile use to effective public transportation use would substantially reduce motor vehicle injury. Organizations such as the Partnership for a Walkable America²⁰ should

be promoted as part of a public health approach to reducing motor vehicle injuries. From a public health perspective, it would be better if we moved people out of cars, rather than focusing almost solely on making automobile travel safer. Yet in practical terms, this is not an approach currently amenable to public health agency intervention in the United States.

Still, the way we look at and deal with injuries has changed significantly in the last decade or two. Even the term “accident” does seem to be in decline. It has never been the case that the public or the media would refer to an airliner “accident.” Today, through organized efforts by the injury prevention community, the word “accident” is used less and less in any injury context. More important, “injury prevention” is more and more the focus of organized public health—at the federal level with the National Center for Injury Prevention and Control and the Maternal and Child Health Bureau and at the state and local levels with injury prevention programs or divisions within health departments. The State and Territorial Injury Prevention Directors Association and its initiatives to define relevant training competencies and to establish standards for comprehensive state health department injury prevention programs exemplify the maturing of state programs. (These programs are discussed in later chapters.) As with other major public health problems, the pace of prevention may seem too slow, but it is steady and its momentum is growing.

NOTES

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APPENDIX

2-A

Overview of Landmark Injury Prevention Events in the United States, 1937–2004

- 1937 Godfrey publishes one of the first statements in the United States on the need for public health involvement in accident prevention in the *American Journal of Public Health*.
- 1942 DeHaven publishes breakthrough work describing structural environments as a primary cause of injury in falls from heights.
- 1943 American Public Health Association (APHA) Committee on Administrative Practice appoints a subcommittee on accident prevention. Subcommittee reports accident prevention programs in six state and two local health departments.
- 1945 Federal Children's Bureau, American Academy of Pediatrics (AAP), National Safety Council, and Metropolitan Life Insurance Company sponsor national child safety campaign.
- APHA Subcommittee on Accident Prevention develops program guidelines for accident prevention. Subcommittee reports accident prevention programs in 9 state and 25 local health departments.
- 1948 WK Kellogg Foundation awards first home accident prevention demonstration grant (Kalamazoo, Michigan).

40 CHAPTER 2 CONCEPTUAL AND HISTORICAL UNDERPINNINGS

- 1949 Gordon formalizes concept that epidemiology could be used as a theoretical foundation for accident prevention in health departments.
- 1950 AAP forms Committee on Accident Prevention.
- 1951 Kellogg Foundation funds three- to six-year home accident prevention demonstration projects in Michigan, Massachusetts, California, Ohio, North Carolina, Kentucky, Georgia, Kansas, and Oregon.
- 1953 First conference on home accident prevention held at the University of Michigan School of Public Health, with sponsors including the National Safety Council, APHA, US Public Health Service, and the Kellogg Foundation.
- First poison control center opens (Chicago).
- 1954 AAP Committee on Accident Prevention creates Subcommittee on Accidental Poisonings.
- 1955 McFarland publishes “Epidemiological Principles Applicable to the Study and Prevention of Child Accidents” in the *American Journal of Public Health*.
- APHA surveys 1,556 state, local, and provincial health departments to assess the scope and effectiveness of health department programs in accident prevention. A total of 33 state, 3 provincial, and 296 local health departments report having an accident prevention program. Sixty-two report a full time position in place for public health safety.
- 1956 APHA policy statement urges health agencies to assume an active role in all types of accident prevention programs. Recommends the development of a national accident prevention center within the federal government to coordinate activities among various accident prevention agencies.
- US Public Health Service establishes an accident prevention program. Program grows to division status, only to be discontinued in the early 1970s.
- 1957 APHA policy statement urges that state and local health departments give high priority to training staff in accident prevention principles and techniques and to developing accident prevention programs.

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- 1958 Department of Health, Education and Welfare publishes uniform definitions of home accidents.
- 1959 APHA policy statement recommends that state health departments develop and maintain accident prevention programs and designate a full-time director.
- 1960 APHA public policy statement recommending that accident prevention be recognized as a major public health problem and that all units of APHA cooperate to improve accident prevention efforts at the local, state and national levels. Recommendations are made concerning roles for state and local health departments, research initiatives, collaboration among national organizations, and funding for injury prevention programs.
- 1961 Gibson publishes theory of injury produced by energy exchange.
- The *Journal of Trauma* begins publication.
- APHA publishes *Accident Prevention: The Role of Physicians and Public Health Workers*.
- Health sanitarians and educators in Philadelphia initiate four-year research demonstration project on home injuries (“Accident Control through Small Group Discussion”).
- 1962 *Journal of the American Medical Association* publishes article on “Battered Child Syndrome.”
- 1963 Haddon publishes pioneering paper on “accident theory.”
- 1964 Twenty-four state health departments report having accident prevention programs.
- Eleven schools of public health develop training programs in injury prevention with funding from the US Public Health Service.
- 1965 US Public Health Service publishes *A Guide to the Development of Accidental Injury Control Programs*.
- 1966 National Research Council, National Academy of Sciences recommends the development of a national coordinating council on accident prevention in a report entitled *Accidental Death and Disability: The Neglected Disease of Modern Society*.

42 CHAPTER 2 CONCEPTUAL AND HISTORICAL UNDERPINNINGS

National Highway Safety Bureau, later the National Highway Traffic Safety Administration (NHTSA), established as part of the US Department of Transportation.

1968 American Trauma Society established.

APHA publishes monograph by Iskrant and Joliet on *Accidents and Homicide*.

US Department of Transportation authorized to promulgate motor vehicle safety standards.

1969 Insurance Institute for Highway Safety founded.

Accident Analysis and Prevention begins publication.

1970 Occupational Safety and Health Act enacted by Congress, creating the Occupational Safety and Health Administration within the US Department of Labor and elevating the Bureau of Occupational Safety and Health to national institute status as the National Institute for Occupational Safety and Health.

Report of the National Commission on Product Safety.

National Institute on Alcohol Abuse and Alcoholism established.

1972 Consumer Product Safety Act, Flammable Fabrics Act, Hazardous Substances Act, and Poison Prevention Packaging Act passed by Congress.

Highway Loss Data Institute established.

1973 Congress enacts Emergency Medical Services Systems Act, establishing a systems approach to emergency medical care.

National Center on Child Abuse and Neglect established by Congress.

National Institute on Disability and Rehabilitation Research founded.

The Robert Wood Johnson Foundation funds 44 EMS projects in 32 states.

1974 Congress passes Child Abuse and Prevention and Treatment Act.

- 1976 APHA issues policy statement on handguns as a public health hazard.
- 1977 Federal Mine Safety and Health Act establishes the Mine Safety and Health Administration.
- 1978 National Coalition Against Domestic Violence founded.
- Tennessee becomes the first state to enact a child passenger safety law.
- 1979 Federal Division of Maternal and Child Health established in the US Department of Health and Human Services and funds childhood injury prevention programs in San Diego, Virginia, and Massachusetts.
- The Center for Disease Control, later the Centers for Disease Control and Prevention (CDC), establishes a violence epidemiology branch to track the incidence of interpersonal violence.
- 1980 AAP publishes *Handbook on Accident Prevention*.
- First population-based emergency room injury surveillance systems implemented (Massachusetts and Ohio).
- Mothers Against Drunk Driving (MADD) founded.
- 1981 First national conference on injury control held, sponsored by the CDC and Johns Hopkins University.
- National Child Passenger Safety Association established.
- Survey by the National Environmental Health Association finds that 12 state health departments have injury prevention programs.
- 1982 CDC publishes *Injury Control and Implementation Plan for State and Local Governments*.
- 1983 CDC hosts an invitational injury program management course for state health agency officials.
- Division of Maternal and Child Health publishes *Developing Childhood Injury Prevention Programs: An Administrative Guide for Maternal and Child Health (Title V) Programs*.

Center to Prevent Handgun Violence founded.

- 1984 Division of Maternal and Child Health funds Massachusetts injury prevention implementation project.

Congress enacts the Health Services, Preventive Health Services, and Home and Community Based Services Act, establishing the Emergency Medical Services for Children program.

Contra Costa County, California adopts isolation fencing ordinance for new home swimming pools (calling for pool covers, pool alarms, and/or self-latching, self-closing devices on all exits to pools).

- 1985 *Injury in America: A Continuing Public Health Problem* published by the National Academy of Sciences.

First regional injury control network established (New England Network to Prevent Childhood Injuries).

Division of Maternal and Child Health funds five childhood injury and violence prevention demonstration projects (Ohio, New England, New Mexico, North Carolina, and Wisconsin).

Surgeon General hosts Workshop on Violence and Public Health.

US Department of Transportation provides \$10 million to CDC to fund injury prevention research.

- 1986 CDC funds five Injury Prevention Research Centers and 31 injury prevention research projects.

- 1987 First Injury in America conference.

National Safe Kids campaign founded.

California enacts first legislation requiring helmets for child bicycle passengers four years old and younger.

Carnegie Foundation funds National Childhood Injury Prevention Resource Center.

- 1988 *Injury Control*, an outside review of the CDC injury control program, published by National Academy of Sciences as follow-up to *Injury in America*.

Childhood Injury Prevention Resource Center releases national assessment of injury prevention programs in state health departments.

Congress enacts Child Abuse Prevention, Adoption and Family Services Act.

Violence Policy Center founded at Johns Hopkins University.

- 1989 *Injury Prevention: Meeting the Challenge* published by a national committee of experts assembled by the Division of Maternal and Child Health, NHTSA, and CDC.

Report to Congress on *Cost of Injury* is released.

All states now have occupant protection laws covering children younger than 4 years of age.

Advocates for Highway Safety founded.

Special federal task force releases report on youth suicide, which Bush Administration repudiates and from which it distances itself because of chapter on gays and lesbians.

- 1990 Six states (Arizona, California, New York, Rhode Island, Virginia, and Washington) mandate external cause of injury coding.

CDC sponsors forum on youth violence in minority communities, "Setting the Agenda for Prevention."

CDC releases report to Congress on *Childhood Injuries in the United States*.

Howard County, Maryland, adopts law requiring children 16 years and younger to wear helmets while riding as either passengers or operators of bicycles.

Maternal and Child Health Bureau (MCHB) provides funding to establish the Children's Safety Network National Injury and Violence Prevention Resource Center to provide technical assistance and training to state health departments.

- 1991 CDC sponsors national injury control conference to set a national agenda for injury control.

World Health Organization Helmet Initiative begun.

Institute of Medicine publishes *Disability in America: Towards a National Agenda for Prevention*.

National Committee on Vital and Health Statistics recommends national plan for collection of E code data with release of *Report on the Need to Collect External Cause of Injury Codes in Hospital Discharge Data*.

- 1992 CDC elevates injury control and establishes the National Center for Injury Prevention and Control (NCIPC).

CDC issues recommendations for youth suicide prevention.

- 1993 Congress passes the Handgun Violence Prevention Act (the Brady Bill).

Institute of Medicine releases *Emergency Medical Services for Children*.

National Research Council releases *Understanding and Preventing Violence*.

President Clinton declares violence to be a public health emergency.

E Codes: The Missing Link in Injury Prevention produced through APHA mini-grant, helping spark movement to improve external cause of injury coding.

- 1994 State and Territorial Injury Prevention Directors Association (STIPDA) founded.

National Academy of Sciences publishes *Violence in Urban America: Mobilizing a Response*.

- 1995 *Injury Prevention*, the journal of the International Society of Child and Adolescent Injury Prevention, is initiated with a practitioner focus.

- 1996 National Academy of Sciences publishes *Violence in Families: Assessing Prevention and Treatment Programs*.

National Rifle Association succeeds in getting Congress to prohibit firearm violence research by the CDC or its grantees, contractors, or researchers.

WHO publishes guidelines for national suicide prevention plans.

United Nations develops *Prevention of Suicide: Guidelines for the Formulation and Implementation of National Strategies*.

- 1997 Institute of Medicine convenes panel of experts to review injury prevention in America 12 years after *Injury in America* report.

NHTSA follows earlier lead of CDC by officially abandoning use of the word “accident.”

External cause of injury coding mandated in 23 states.

National Association of Injury Control Research Centers (NAICRC) founded (later to become the Society for the Advancement of Violence and Injury Research (SAVIR)).

CDC provides funding for the first four state health departments to develop and enhance core capacity for injury prevention.

Recommended Framework for Presenting Injury Mortality Data produced as a collaboration among the National Center for Health Statistics, the National Center for Injury Prevention and Control, and the Injury Control and Emergency Health Services Section of the American Public Health Association.

- 1998 National Conference on Suicide Prevention held in Reno, Nevada.

Landmark report, *Reducing the Burden of Injury*, released by the Institute of Medicine.

- 1999 Department of Health and Human Services releases *The Surgeon General’s Call to Action to Prevent Suicide*.

STIPDA launches State Technical Assistance Team program with five-day site visits to state health agencies understood by audience.

STIPDA, Council of State and Territorial Epidemiologists (CSTE), CDC, and SAVIR develop Consensus Recommendations for Injury Surveillance in State Health Departments.

Six foundations provide funding to Harvard School of Public Health for pilot National Violent Injury Statistics System at 12 sites.

- 2000 National Training Initiative for Injury and Violence Prevention initiated through a partnership between STIPDA and SAVIR.

48 CHAPTER 2 CONCEPTUAL AND HISTORICAL UNDERPINNINGS

- 2001 Department of Health and Human Services releases *National Strategy for Suicide Prevention: Goals and Objectives for Action*.

The first State Injury Indicators Surveillance Report released by CDC, CSTE, and STIPDA.

- 2002 Institute of Medicine report, *Reducing Suicide: A National Imperative*, released.

National MCH Center for Child Death Review established.

National Suicide Prevention Resource Center founded.

Congress appropriates \$1.5 million to initiate the National Violent Death Reporting System, with six states receiving funding.

CDC Injury Research Agenda released by the National Center for Injury Prevention and Control.

- 2003 Association of Schools of Public Health (ASPH) Injury Advisory Workgroup Recommendations released (Available at: <http://www.asph.org/userfiles/final.doc>).

Consensus Recommendations for Using Hospital Discharge Data for Injury Surveillance released by STIPDA.

The Injury Coalition formed to support injury prevention funding, research, and programs.

- 2004 World Health Day focus is road traffic injuries and includes release at the United Nations of *World Report on Road Traffic Injury Prevention*.

Garrett Lee Smith Memorial Act passed by US Congress.

National Research Council releases reports on *Reducing Underage Drinking: A Collective Responsibility* and *Advancing the Federal Research Agenda on Violence Against Women*.

Note: Reflecting the realities of the day, the term *accident*—instead of *injury*—is used in this timeline until events of the 1980s. This timeline expands upon earlier work by one of the authors and others. See Dana A & Gallagher SS. *Overview of injury prevention events in the United States, 1937–1990*. Boston, MA: Childhood Injury Prevention Resource Center, Harvard School of Public Health; 1990; Fisher L. Childhood injuries—causes, preventive theories and case studies—An overview of the role of sanitarians and other public health workers. *Journal of Environmental Health*. 50:355–360, 1988 and *Injury Control and Emergency Health Services. A timeline of the history of injury prevention*. Poster presented at the 125th anniversary of the American Public Health Association. Indianapolis, IN, November 1997.