

Chapter 2

Injury and Violence Prevention Interventions: An Overview

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2.1. INTRODUCTION

The traditional goal of research has been to expand the science base in a particular topic area, assuming that sometime in the future others will use that knowledge to address real-world problems. Public health scientists share the goal of increasing knowledge, but their research is also driven by the need to solve public health problems in the near term. This drive for rapid solutions and the demands for research accountability have never been more prominent than now (Office of Management and Budget [OMB], 1993, 2004). Scientists are expected by practitioners and funders to produce findings that can be used in public health practice. Similarly, practitioners are increasingly expected to identify and incorporate interventions with demonstrated effectiveness into their practices.

The fields of injury and violence prevention research are ready for this challenge. There is now a strong and growing scientific basis for injury and violence prevention and control. Injury and violence researchers have followed the public health model to (1) describe the problem, (2) describe risk and protective factors and their causal relationship with injuries, (3) design and evaluate intervention strategies, and (4) ensure widespread use of these strategies. Public health scientists have moved rapidly to the third phase, efficacy and effectiveness intervention trials. The objective of this book is to highlight the results of these trials in unintentional injury and violence prevention. The audience for the book includes both practitioners and researchers. We point out many effective interventions that can be used by practitioners now. Researchers will notice that there are many gaps in what we know. We hope this book will motivate researchers and students to build on this knowledge base to develop and evaluate more effective approaches to preventing unintentional injury and violence.

In this chapter, we provide a brief overview of preventive interventions. We introduce concepts and definitions used throughout the book. We also introduce

a framework that describes levels of scientific evidence to use in assessing intervention effectiveness. We end with brief overviews of the history and state of intervention science in unintentional injury and violence prevention.

2.2. PREVENTIVE INTERVENTIONS

In this book we define a *preventive intervention* as a strategy or series of strategies that are implemented with the goal of preventing, reducing, or ameliorating injuries. Measures can include products (e.g., seat belts, smoke alarms, hip protectors, firearm storage boxes), environmental changes (e.g., speed bumps, pool fencing, residential fire sprinklers), behavioral and communications interventions (e.g., individual and group behavior change strategies, parent training, targeted media campaigns), and policy guidelines or laws (e.g., laws preventing persons convicted of intimate partner violence [IPV] to own a firearm, defining permissible blood alcohol levels). Preventive measures can be passive in the sense that the individual need not intentionally behave in a specific way to benefit from the intervention (e.g., childproof cigarette lighters) or can be active as when interventions require specific actions to reduce risk (e.g., buckling a seat belt).

2.3. INTERVENTION CLASSIFICATION SYSTEMS

Different classification systems have been devised to categorize interventions. Preventive interventions have been categorized using terms originally derived from clinical medicine: primary (preventing new cases of disease), secondary (reducing established cases of disease), and tertiary (decreasing the frequency and severity of disability after a disease) (Commission on Chronic Illness, 1957). Using this terminology, this book largely focuses on primary prevention. Gordon (1983) devised a classification system based on population risk levels that is more directly applicable to injury and violence prevention. That system defines three levels of interventions; (1) universal preventive measures targeted to the general population or subpopulations without regard to level of injury risk; (2) selective preventive measures that target populations with increased risk (e.g., those exposed to family violence); and (3) indicated preventive measures that target populations whose behavior or personal history put them at above average risk of future injuries, perpetration, or victimization (e.g., those who use alcohol excessively, elderly persons who have fallen, and perpetrators or victims of sexual violence) (Institute of Medicine [IOM], 1994).

A complementary classification system that describes risk and protective factors was devised by Haddon (1968, 1980) and is used extensively in the unintentional injury control field. The Haddon Matrix is based on epidemiological principles and is used to describe interventions targeted to the host, the agent, and the environment. In injury prevention, the host is the individual and his or her characteristics or behavior (e.g., alcohol-impaired driving, aggressive behavior toward peers); the agent is energy, or the source of energy transfer (e.g., a motor vehicle or weapon); and the environment is the setting or context for the injury, which includes both physical and social environments (e.g., schools, violent neighborhoods).

Another complimentary classification system, sometimes called the social-ecological model (Bronfenbrenner, 1992; Stokols, 1992), defines interventions by

the level of risk and protective factors that influence risk and is used extensively in violence prevention. Some work has also progressed applying the social-ecological approach to preventing unintentional injuries (Allegrante, Marks, & Hanson, 2006; Hanson et al., 2005). In this model, interventions can focus on (1) individual risk such as use of medication; (2) risk within dyads or groups, including relationship factors with intimate partners, peers, or families; (3) risks within communities such as high levels of youth violence or poor enforcement of drinking and driving laws; and (4) risks influenced by societal factors such as norms about partner violence.

2.4. INTERVENTION CHARACTERISTICS

Interventions strategies vary on many different dimensions. In this section, we discuss characteristics that are particularly relevant to public health-oriented preventive interventions for unintentional and violence-related injuries.

2.4.1. Population-Based Interventions

To distinguish its role from those of medicine, criminal justice, and mental health, the field of public health has traditionally defined its approach to interventions as population based. Such approaches attempt to reach large numbers of individuals by targeting and intervening with groups rather than individuals. Familiar population-based interventions addressing infectious diseases include safe water systems and vaccination programs. Analogous programs in injury and violence include community- and societal-level interventions. As we note later, the field of unintentional injury prevention has taken a course not unlike that of infectious diseases, with much emphasis placed on environmental-, community-, and societal-level interventions. The benefits of individual or social-level interventions are gaining greater acceptance, especially as more behavioral and social scientists enter this field of research (Gielen & Sleet, 2003). The field of violence prevention has in many ways taken a different trajectory. Interventions have long emphasized individual and interpersonal approaches. However, there is growing recognition that there are many community or societal factors that influence individual behavioral choices.

2.4.2. Behavioral, Social, and Environmental Interventions

Most injury and violence practitioners and researchers now realize that a combination of environmental, behavioral, legislative, and technological solutions is needed to ensure the adoption of safe behaviors (see Chapter 22). But as we noted earlier, this has not always been the case. Environmental, engineering, and legal approaches have been particularly attractive because they have the potential for protecting whole populations. However, even when such interventions are available, they need to be demonstrated to be effective, feasible, and acceptable to communities, which will ultimately decide whether to use them. Similarly, laws and policies that are effective in reducing injury or injury risk must be widely known, adhered to, and enforced to be effective (Shaw & Ogolla, 2006). Proponents of engineering, environmental, or legal interventions often argue against the use of behavioral or educational interventions. Indeed, interventions that provide only information

are rarely successful in reducing risk behaviors, although there are some notable exceptions (e.g., Willinger *et al.*, 1998). Well-designed behavioral interventions involve much more than simply providing information. Behavioral interventions that are theory based, focus on risk and protective factors, provide opportunities for skills building, and provide support and reinforcement for behavior change have repeatedly been shown to be effective in changing a variety of health-related risks and behaviors (Fishbein *et al.*, 1992; Halpern, Bates, Beales, & Heathfield, 2004; Schneiderman, Speers, Silva, Tomes, & Gentry, 2001).

2.4.3. Proximal and Distal Risk

Public health has historically focused on preventive interventions that change proximal or near-term risk (e.g., reducing youth access to drugs and alcohol that is related to violent behaviors, removal of environmental hazards that cause falls among the elderly). It is important to note, however, that preventive interventions also include the promotion of health and well-being by building social and psychological resiliency and mental health and by reducing more distal, long-term social determinants such as poverty, stigma, and racism. The Centers for Disease Control and Prevention's (CDC) work on positive parenting and supervision; promoting prosocial behaviors in children; and building societal norms around healthy, violence-free dating are examples of research that include both risk reduction and health promotion approaches (CDC, 2002).

2.4.4. Interventions Across Life Stages

It may be tempting to seek brief, one-time interventions that can quickly reduce violence and unintentional injuries. But with few exceptions (Fleming *et al.*, 2002), such interventions are often insufficient, particularly across a lifetime of exposure to risk. For example, parents may be successful in getting young children to wear bicycle helmets, but as these children expand their peer network or mature outside the age limits of helmet laws, they may fail to adhere to this life-saving intervention.

For many behaviors, interventions must be repeated across the life stages and reinforced in different settings with different approaches. For very young children, the most important intervention approach is to enhance parental or caretaker supervision and responsibility for keeping children safe. As children develop their cognitive and motor skills, interventions can be devised to enhance their intrinsic motivation to engage in safe and healthy behaviors. At the same time, communities must also provide tools and environments that reinforce or facilitate safe behaviors (e.g., sidewalks for pedestrians, removing unsafe playgrounds). As these examples suggest, innovation in the design of interventions is essential for meeting the developmental needs of children and adults across the life stages (Mercy, Sleet, & Doll, 2003).

Interventions that prevent youth suicide can provide an example of the changing nature of interventions across the life stages. Universal interventions in the preschool years include those that promote the emotional and physical well-being of the child (e.g., positive parenting, programs building social competence and self-esteem, physical activity programs). School-based, universal interventions can promote prosocial behavior and conflict-resolution skills during the elementary

and middle school years. Family interventions can be devised for children who bully or who are bullied by their peers. Screening for depression and counseling referrals are appropriate for high-risk youth. Finally, because youth suicide attempts are often impulsive, preventing access to suicidal means is essential (e.g., providing protective fencing on bridges, removing household poisons and drugs, and storing and locking firearms) (Simon et al., 2001).

2.4.5. Multilevel, Comprehensive Interventions

Two changes in public health have drawn the fields of unintentional injury and violence toward the support of comprehensive, multilevel interventions, which attempt to intervene at several points of the social-ecological model. The first change came with the recognition that poor health is increasingly a result of risky lifestyle choices or behaviors (e.g., smoking, drinking and driving, unprotected sexual behavior), rather than infectious diseases (CDC, 1999). Such behaviors are usually a result of multiple influences within and across life stages. Evidence increasingly suggests that such risk behaviors are most successfully changed through comprehensive, multilevel approaches (Nation et al., 2003). The second change came with the recognition that public health interventions are not the sole responsibility of public health agencies. Interventions are now conducted in schools, churches, community centers, beauty parlors, and sports stadiums. They are sponsored by health, transportation, and police departments and a variety of community-based organizations, which form community coalitions that together mount simultaneous interventions to address public health problems.

2.4.6. Effective Interventions

Nation and colleagues (2003) reviewed the scientific literature to identify the principles of effective prevention programs. These principles summarize much of what has been learned in developing and implementing injury and violence-related interventions. Interventions should be comprehensive, use varied teaching methods, deliver a sufficient dosage of the intervention, be theory driven, encourage positive relationships, be appropriately timed, be socioculturally relevant, include an outcome evaluation, and have well-trained staff. Chapters throughout this book describe these and other characteristics of effective interventions in selected topic areas.

2.5. UNINTENTIONAL INJURY PREVENTIVE INTERVENTIONS

Historically, unintentional injuries have been considered an unavoidable fact of life. Even today, the occurrence of such injuries is commonly attributed to luck or fate. However, the high public health burden resulting from unintentional injuries has prompted epidemiologists and behavioral scientists to study their underlying causal factors in an attempt to develop effective means of prevention. Although there had been isolated efforts to reduce the injury risks from events such as motor-vehicle crashes, it was not until 1949 that unintentional injuries were first comprehensively addressed from a public health perspective (Gordon, 1949), and this approach has been remarkably successful in reducing injury risks (CDC, 2005). Unintentional injury prevention is now a vibrant field in public health and is developing a substan-

tial body of evidence about how to prevent what used to be known as “accidents” (Zaza, Briss, & Harris, 2005).

Despite our progress, unintentional injury remains a major cause of morbidity and mortality. In the United States, unintentional injury is the fifth leading cause of death among people of all ages and the leading cause of death among people aged 1–44 years (CDC, 2005). For every person who dies from unintentional injuries, there are many more who are permanently disabled or who require medical treatment for injuries of varying degrees of severity.

Causal mechanisms, and thus effective prevention activities, generally tend to be unique to the specific type of injury in question, and this is reflected in the organization of this book. One notable exception is the crosscutting role of alcohol consumption as a risk factor for many injuries. Alcohol is an important risk factor for most, if not all of the causes of unintentional injury and many violence-related injuries covered in this book and is described more fully in Chapter 16. The estimated association of alcohol consumption with fatalities from motor-vehicle crashes, fires, drowning, and falls ranges from 38% to 63% (National Highway Traffic and Safety Administration [NHTSA], 2004; Smith, Branas, & Miller, 1999). Thus it is not surprising to find that interventions to reduce excessive drinking, such as the national minimum drinking age (established in 1986), can effectively reduce injuries from multiple causes (see Chapters 4 and 5).

Following in the tradition of the epidemiologic triad and the Haddon Matrix, all the authors in this volume who are concerned with unintentional injury categorize their interventions according to their focus on the person or host (person), the environment, or the agent (energy or sources of energy transfer). In addition to functioning as a useful categorization tool, the perspective that the Haddon Matrix provides on the causal mechanisms underlying injury can guide the development of a comprehensive health promotion approach that addresses multiple causal factors (Gielen & Sleet, 2003; Howat, Sleet, Elder, & Maycock, 2004). This perspective highlights the fact that interventions addressing individual and interpersonal behavioral change are often key components of comprehensive health-promotion efforts aimed at unintentional injury prevention, even when the primary focus is on changing the physical environment. For example, Gilchrist, Saluja, and Marshall (see Chapter 7) discuss a comprehensive approach to changing bicycle helmet use, which includes components such as establishing a coalition, conducting awareness and education campaigns, using incentives (e.g., giveaways, coupons, and rebates), and encouraging legislation mandating helmet use. Similar approaches are necessary to reduce falls among the elderly (see Chapter 3) and drowning (see Chapter 5).

Legislation and regulations are also a particularly important aspect of the broad environment, and they can be important avenues for changing both behavior and the physical environment (Schieber, Gilchrist, & Sleet, 2000; Shaw & Ogolla, 2006). As Warda and Ballesteros point out (see Chapter 6), legislation can also help ensure that effective interventions are widely implemented. These authors note that the public health benefits from highly effective devices for preventing fire-related injuries (e.g., smoke alarms) could be greatly improved if optimal usage of such devices were mandated in building codes. The importance of legislation and regulation to unintentional injury prevention is exemplified by the fact that legislative and regulatory interventions are listed among the most effective interventions for preventing injuries from all of the types of unintentional injury addressed in this volume. Rubenstein, Stevens, and Scott (see Chapter 3) point out that the public

health community can play an important role in encouraging legislative action by providing data on costs or costs averted by effective injury prevention intervention (see also Chapter 1).

2.6. VIOLENCE-RELATED PREVENTIVE INTERVENTIONS

Every year, millions of children, women, and men in the United States suffer physical consequences of violence ranging from minor cuts and bruises to death. In 2002, more than 49,000 Americans died as a result of suicide or homicide, and millions more suffered nonfatal injuries due to violence (CDC, 2005).

Perhaps because it is such a widespread problem, many believe that violence is inevitable. Therefore, solutions have traditionally been reactive ones, focusing on what to do with those who commit violent offenses and those who are victimized (i.e., indicated approaches). These solutions are typically carried out by criminal justice, law enforcement, and victim service organizations (Dodge, 2001; World Health Organization [WHO], 2002). Public health, on the other hand, views violence as predictable based on various contributing factors and thus as preventable. This viewpoint evokes solutions that are more proactive, including more focus on universal and selective preventive approaches (WHO, 2002). Mercy and O'Carroll (1988) summarized the history of the emergence of violence as a public health problem. A significant turning point for bringing the public health perspective to violence occurred via the Surgeon General's Workshop on Violence and Public Health in 1985 (Mercy & O'Carroll, 1988). Since then, many people have made the case that violence is a public health problem (IOM, 1999; Mercy, 1999; Mercy, Rosenberg, Powell, Broome, & Roper, 1993; Powell, Mercy, Crosby, Dahlberg, & Simon, 1999; WHO, 2002). In fact, the view of violence as a public health problem is now widely shared globally. The 49th World Health Assembly of WHO declared that violence is a leading public health problem worldwide and thus preventing violence must be a worldwide public health priority (WHO, 2002).

Various authors in this book review the state of prevention science in child maltreatment, youth violence, sexual violence, IPV, suicide, and elder mistreatment. At first glance, these may appear to be disparate problems requiring divergent solutions. On closer examination, however, there are some notable commonalities.

Certainly, some of the fields are farther along in developing and rigorously testing prevention interventions than other fields. Pillemer, Mueller-Johnson, Mock, Suitor, and Lachs (Chapter 13) remind us that elder mistreatment is a very young field and that, as such, there is still a great need for research on modifiable risk and protective factors. Therefore, these authors could not identify any recommended or even promising strategies for elder abuse prevention. Although still at an early stage, the fields of IPV, sexual violence, child maltreatment, and suicide are a bit farther along the evidence-based continuum than elder abuse. Each of these fields has some base of risk factor research, at least one recommended prevention strategy, and multiple promising strategies. On the other end of the continuum is the field of youth violence (Chapter 9) where the authors were able to identify multiple recommended as well as promising strategies.

One note of caution about the observation that some of the violence fields have a more developed research base on risk and protective factors than others: this does not mean that the etiological work in those fields is complete. Whitaker,

Baker, and Arias (Chapter 11) remind us that there are different types of IPV with different risk and protective factors and thus different prevention needs. This is likely to be the situation for other types of violence as well. The four components of the public health model referred to earlier are not meant to be linear but rather iterative. While intervention strategies are designed and tested based on the best available evidence we have about risk and protective factors, the etiological work must continue—there are intricacies in the even more advanced fields that we do not understand. More in-depth work on risk and protective factors (e.g., which factors are more important than others, under what conditions, and for what segments of the population) will help refine, and we hope improve, our current prevention efforts.

Although there are clear differences in the research base for different types of violence, there are similarities as well. First, almost all of the authors in this book point to the critical need for research on comprehensive approaches. As one surmises after reading these reviews, violence in all its forms results from a complex interaction of factors at multiple levels of the social ecology. Because of this complexity, several of the authors assert that focusing on one strategy is highly unlikely to solve the problem at the population level, no matter how strong the scientific evidence is for that strategy (see Chapter 8, 9, 10, and 12). Daro and McCurdy (Chapter 8) point out that in the field of child maltreatment, approaching the problem in a more ecological way would move us “toward a communitywide system of shared responsibility and mutual support” based on a shared moral responsibility to protect children as well as foster their positive growth. Additional support for investigating comprehensive approaches comes from the observation that similar risk factors are mentioned in several of the chapters. A comprehensive approach to violence prevention could perhaps affect shared risk factors and thus affect several types of violence in the same community. Knox (Chapter 10) presents some suggestive evidence that this may, in fact, happen. The comprehensive suicide prevention program implemented by the U.S. Air Force was associated with a decrease not only in suicides but also in severe and moderate cases of family violence and other violent offenses (Knox, Litts, Talcott, Feig, & Caine, 2003).

Pillemer et al. (Chapter 13) and Whitaker et al. (Chapter 11) point out a common lesson that should be kept in mind as we pursue new and better ways of preventing violence in communities: As violence-prevention strategies are developed and tested, both researchers and practitioners must be open to the possibility that their proposed strategies could have the opposite effect from what they intended or hypothesized. The issue of unintended consequences is not unique to violence-prevention research. However, the costs of increasing the likelihood of perpetration or victimization are so dire that vigilant attention to this potential is critical. This argues, of course, for ongoing effectiveness research that tests interventions in real-world settings and for program evaluation that is designed in a way to detect any negative effects as early as possible.

2.7. LEVELS OF EVIDENCE FRAMEWORK

In each chapter of this book, preventive interventions are described with a critical eye toward the question of whether they actually achieve their intended goals. Although practitioners' decisions about which prevention activities to use are almost

always made in the context of uncertainty, it is helpful to be aware of the extent to which the available scientific evidence supports the use of different options and of any gaps in the evidence. Armed with this knowledge, practitioners can make more informed decisions about interventions that are both feasible to implement in their local context and likely to result in successful outcomes.

The strongest evidence for effectiveness of interventions comes from systematic reviews of the research literature, such as those presented in the *Guide to Community Preventive Services* (Zaza et al., 2005), and the Cochrane Library (Cochrane Collaboration, 2005). Such reviews have the strong advantage that they consider all of the available literature in a manner designed to minimize bias. Thus they reduce the possibility that results from a single anomalous study—arising from either chance factors or unusual conditions—will provide misleading information. Systematic reviews also provide useful information on the consistency of intervention effects across settings, generalizability issues, and factors that may influence an intervention's effectiveness (Zaza et al., 2001). This information can be valuable both for guiding implementation efforts and for highlighting future research questions. Many of the chapters in this volume describe the results of systematic reviews in various topic areas.

For many interventions, systematic reviews of the evidence have yet to be conducted. In these situations, the results of one or several large and well-designed studies (that are not contradicted by other evidence) may provide a reasonable level of confidence in an intervention's effectiveness, sometimes labeled as "promising interventions." As empirical evidence of effectiveness becomes sparse, theoretical or rational considerations increase in prominence as a means for assessing the likely effectiveness of interventions. These considerations may fall into several categories, including (1) chemical and physical principles as they are applied to product improvements and safety devices, (2) a close analogy between the intervention under consideration and other interventions with demonstrated effectiveness, and (3) a very strong rationale as a solution to a well-documented problem (e.g., use of booster seats to prevent injuries from lap belts). In the absence of evaluation studies, assuming effectiveness based on such considerations is common and generally reasonable. However, evaluation is critical to assess whether the intended effects are achieved and to ensure that there are no unintended negative consequences.

A substantial number of interventions intended to prevent injury and violence do not have a strong evidence base supporting their effectiveness. These should be used only if there are no other feasible and well-supported alternatives or if the primary goal of the intervention is to study its effectiveness. There are situations in which two researchers may interpret similar scientific information on intervention effectiveness in different ways. Some scientists are most comfortable with effectiveness data gathered through a limited set of intervention evaluation methods (e.g., randomized controlled trials), while others are comfortable with a broader set of evaluation methods (see discussions of home visitation interventions in Chapters 8 and 18). In these cases, practitioners must decide the level of evidence they are comfortable with before adopting an intervention. In rare circumstances, there is substantial evidence that interventions are ineffective or even harmful (such as air bags and child passengers). Clearly, such interventions should be avoided. Interventions with each of these levels of effectiveness or ineffectiveness are described in chapters throughout the first two sections of this volume.

2.8. OVERVIEW OF THE BOOK

This book was written for practitioners and researchers who expressed a need for a volume that synthesized the state of the science in unintentional injury and violence prevention. Part I provides an overview of the epidemiology and costs of injury and violence and the concepts and definitions of preventive interventions. The chapters in Part II, “Effective and Promising Interventions,” provide detailed reviews of the scientific literature on unintentional injury and violence prevention interventions, identifying those with strong evidence, those that are promising, and those with little or even negative evidence related to their effectiveness. Part III, “Cross-Cutting Intervention Issues,” focuses on interventions and issues that are relevant to both unintentional injury and violence prevention. The science base for some of these areas is just beginning to emerge (see Chapter 19). Part IV, “Interventions in the Field,” is oriented toward practitioners who wish to use off-the-shelf curricula or to develop their own interventions. It contains practical information and tools on how to select, develop, implement, and evaluate interventions in the field. Part V, “Dissemination and Adoption of Effective Interventions and Policies,” is oriented toward researchers who want to encourage and study the uptake of research findings and practitioners who want to expand the reach of effective interventions to broader audiences and new populations. This volume includes several appendices that provide additional references and resources related to interventions.

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