Moving Towards Competency in Injury Prevention

Identifying Factors Underlying Injury

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Lecture Objectives

On completion of this lecture, …
you as a reader and listener should be able to:

1. Describe how conceptual models can be used to investigate and portray the multiple factors underlying injury and/or violence
2. Explain the importance of collaboration in prevention efforts
3. Describe the influence of a variety of factors on injury prevention

Core Competencies for Injury and Violence Prevention

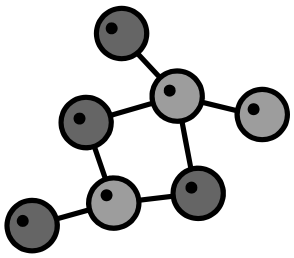
www.injuryed.org

Core Competency #1:

Ability to describe and explain injury and/or violence as a major social and health problem.

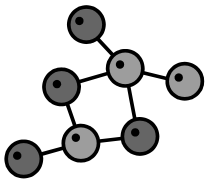
I. Using Models to Identify Risk Factors for Injury and Approaches to Injury Prevention

What comes to mind when you see or hear the term “model”?



- Model - (def): schematic description of a system, theory, or phenomenon that accounts for its known or inferred properties and may be used for further study of its characteristics

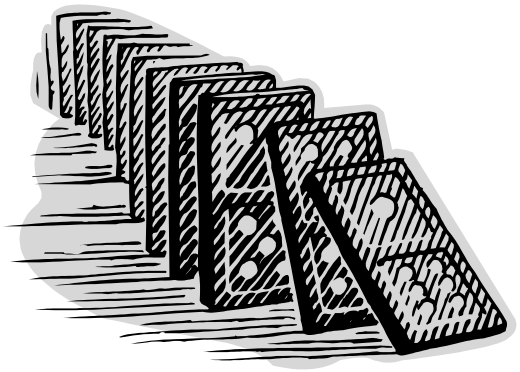
Injury as a complex system



- An injury (event) can be viewed as involving several factors and processes
- Thus, injury prevention can be approached by using multiple types of interventions that focus on one or more of these events

Domino Theory of Accidents

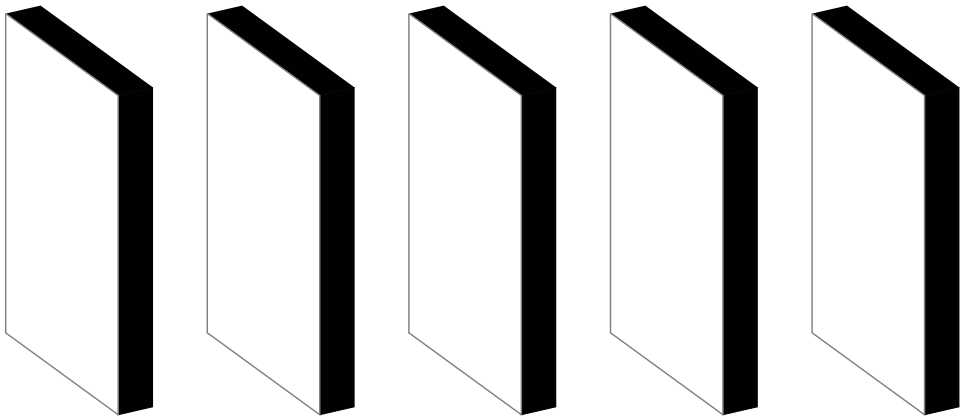
- HW Heinrich; “injury is the natural culmination of a series of events or circumstances which occur”



In Heinrich’s Domino Theory, accidents are viewed to result from a chain of sequential events, similar to a line of dominoes falling over. Removing one of the key events prevents the full chain reaction, and the occurrence of an injury.

H. W. Heinrich, “Industrial Accident Prevention: A Scientific Approach” (1950).

Heinrich Domino Theory



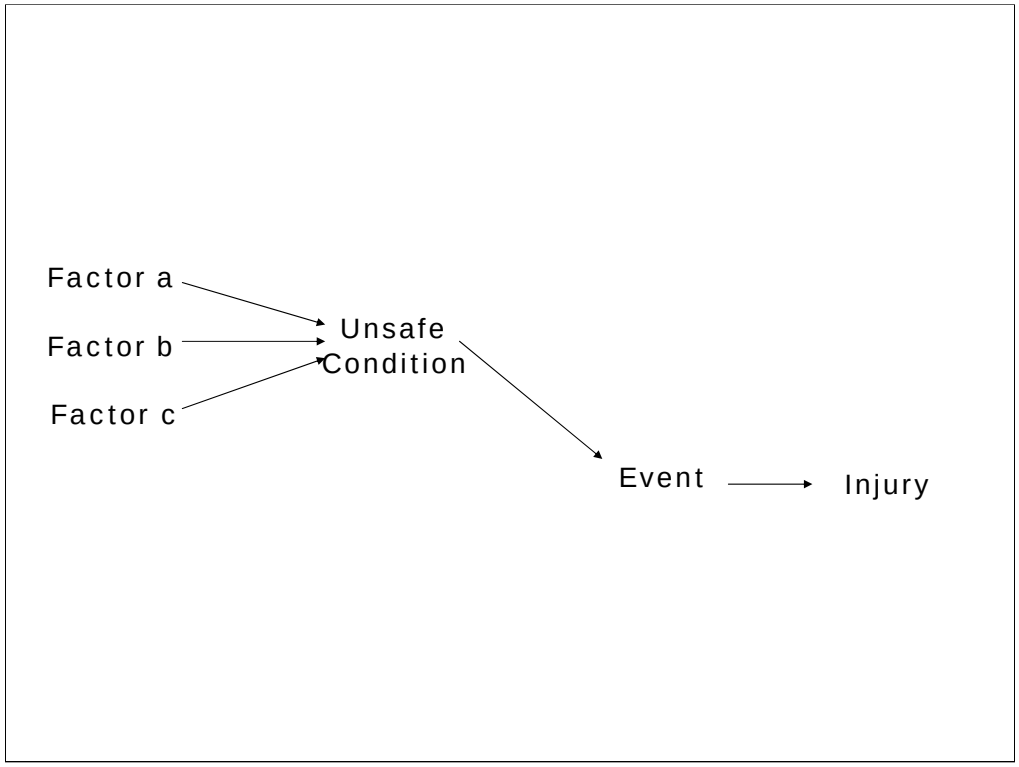
Ancestry & Social Environment

Fault of Person

Unsafe Act or Condition

Accident

Injury


Factor a
Factor b
Factor c
Unsafe
Condition
Event
Injury

Conceptual Models in Injury Prevention

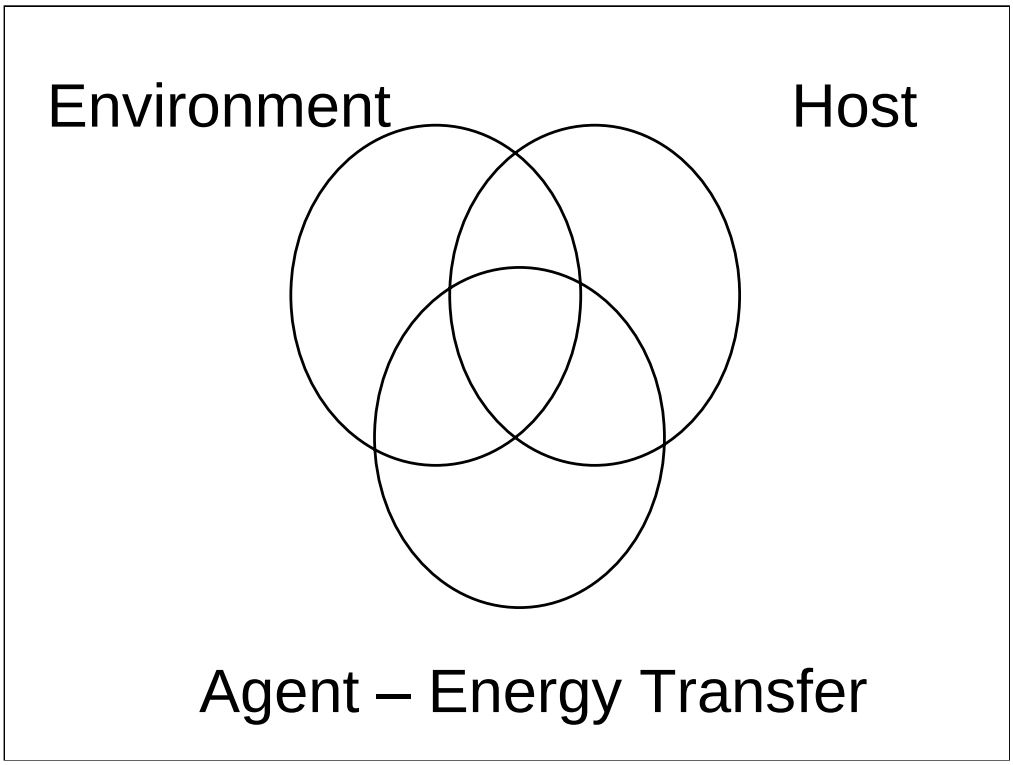
Theory/Models Guiding Injury and Violence Prevention

- Epidemiologic Model
- Public Health Model
- Haddon Model/Matrix
- Social-Ecologic Model
- Safety Promotion Model

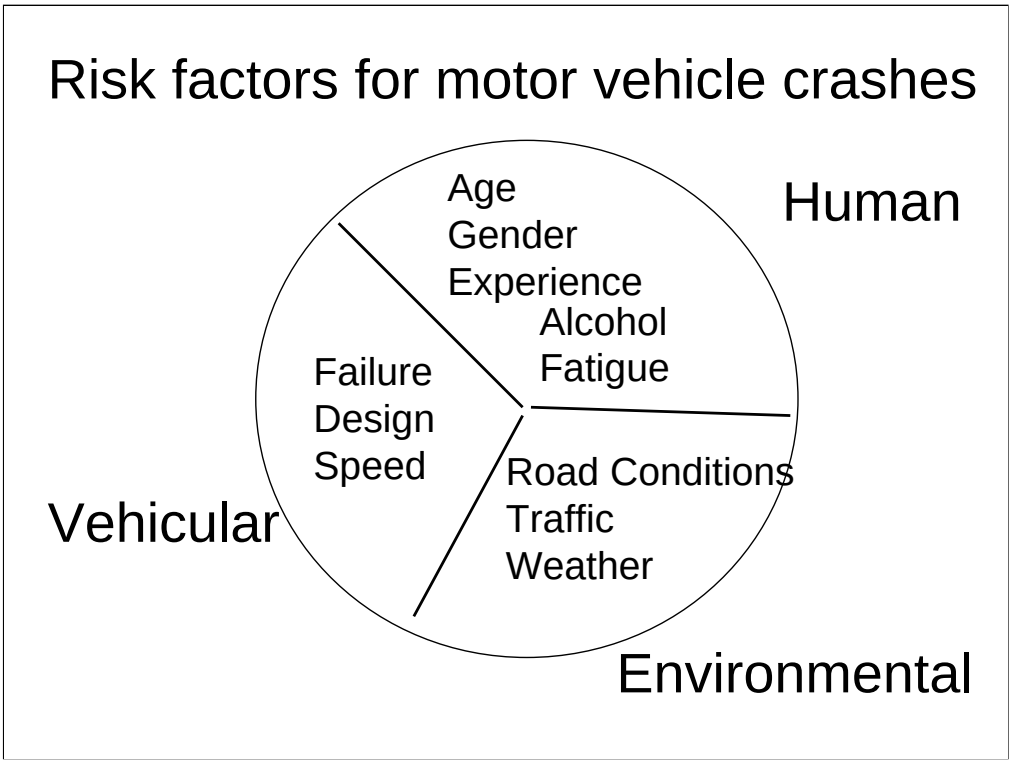
The Factors Underlying Injuries can be examined from an Epidemiologic Framework

The visionary of injury epidemiology and injury control was William Haddon. Dr. Haddon was the director of the National Highway Traffic Safety Administration and the Insurance Institute for Highway Safety in the 1960s and 1970s. He used these positions to play a leading role in the cause of traffic safety.

The basis behind his work was the simple argument that injuries can be examined within an epidemiologic framework. In it's classic sense, the epidemiology triad considers the interaction of three factors in the development of disease; the host, the agent, and the environment. Dr. Haddon maintained that these factors also were key elements in the development of injuries.



John Gordon was also one of the first investigators to view injuries from the epidemiologic triad of host, agent, environment. Initially, the agent of injury was viewed as the object involved (e.g. the car, the piece of machinery, the knife, etc.). In subsequent years, though, the agent of injury was properly understood to be the energy transfer involved in the event. James Gibson generally receives the credit for this insight. The object involved (such as the automobile), then, came to seen as the vehicle through which the energy transfer was enabled. William Haddon subsequently refined this aspect of injury control further.

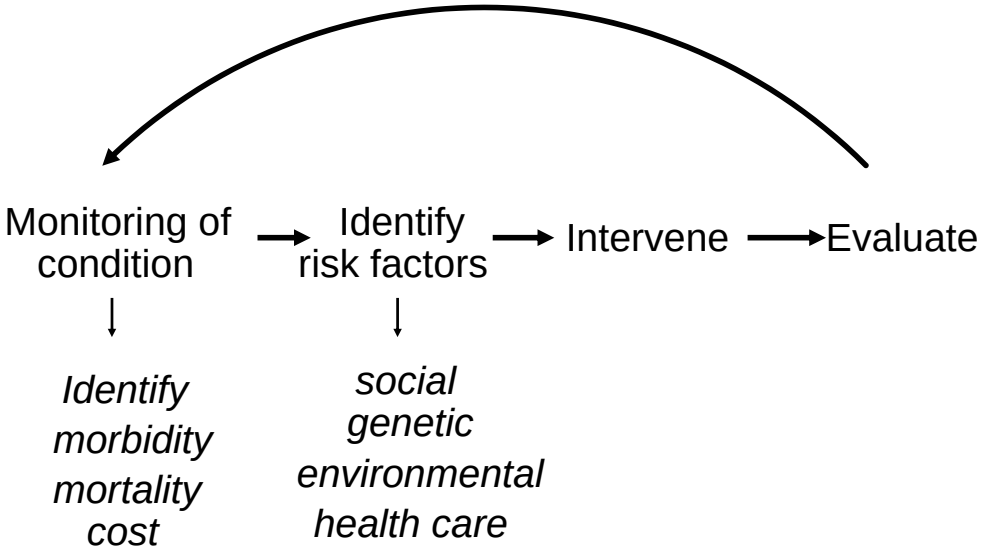


Further illustration of the epidemiology triad and an evaluation of injuries from motor vehicles crashes is presented here. A key element in Dr. Haddon's work was the contention that the epidemiologic framework could be used to identify risk factors for injuries. Moreover, these risk factors were not just those related to the host, but also those pertaining to the vehicle, and the road (environment).

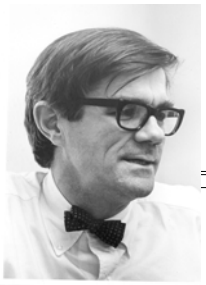
Several programs follow the public model for disease control in understanding injuries; their occurrence and their prevention

A second basic principle of injury epidemiology is the general framework that shapes the work of researchers in the injury epidemiology field. This framework is called the “Public Health Model for Disease Control”.

Public Health Model for Disease Control



Most injury prevention efforts are based on the Haddon Matrix



The Haddon Matrix

	Human	Vehicle	Environment
Pre-event			
Event			
Post-event			

To understand the factors underlying injuries from motor vehicle accidents, Haddon proposed that the elements of the epidemiology triad should be considered in unison with the crash sequence. The crash sequence can be examined in terms of three items; the circumstances surrounding the event prior to the crash occurring, the circumstances involved during the crash, and those involved after the crash.

The Haddon Matrix illustrates how the crash sequence interacts with human, environment, and vehicular factors to define the frequency and severity of injury.

Haddon Matrix

Factors / Phases	Person	Vehicle/ Vector	Physical Environ.	Social Environ.
Pre-event				
Event				
Post-event				

The Haddon Matrix

Phase/ Factor	Host (Human)	Vector (Vehicle)	Physical Environment	Social/ Cultural Env
Pre-Event	**Will an event with the potential to cause injury occur?**			
Event	**Will an injury occur?**			
Post-Event	**What will the outcome be (e.g. how severe)?**			

Haddon's Matrix Slides Adapted From: Community Action Training, Community Health Education Section, San Francisco Department of Public Health, 6/4/02

So the goal in using Haddon's matrix is to identify major modifiable factors that lead to unhealthy outcomes. And when we look at the matrix itself, you can see it is divided into a series of cells. Each of these cells represents an opportunity to think through the prevention possibilities, and encourage you not to devote all of your attention to one or two cells on the matrix.

For Factors, we have the host, vector, physical and social or cultural environment. Then we have the phases in this column. And remember this matrix is to get you thinking about the variety of interventions that occur, and to hopefully help you see that you should not be dedicating all of your resources to one cell, such as pre-event education to the host.

Benefits of Haddon models…

- Recognize that injury is a process
- Employ multi-disciplinary thinking
- Help to develop creative solutions
- Identify range of strategies for prevention planning and resource allocation

Car Strikes Tree Head-On

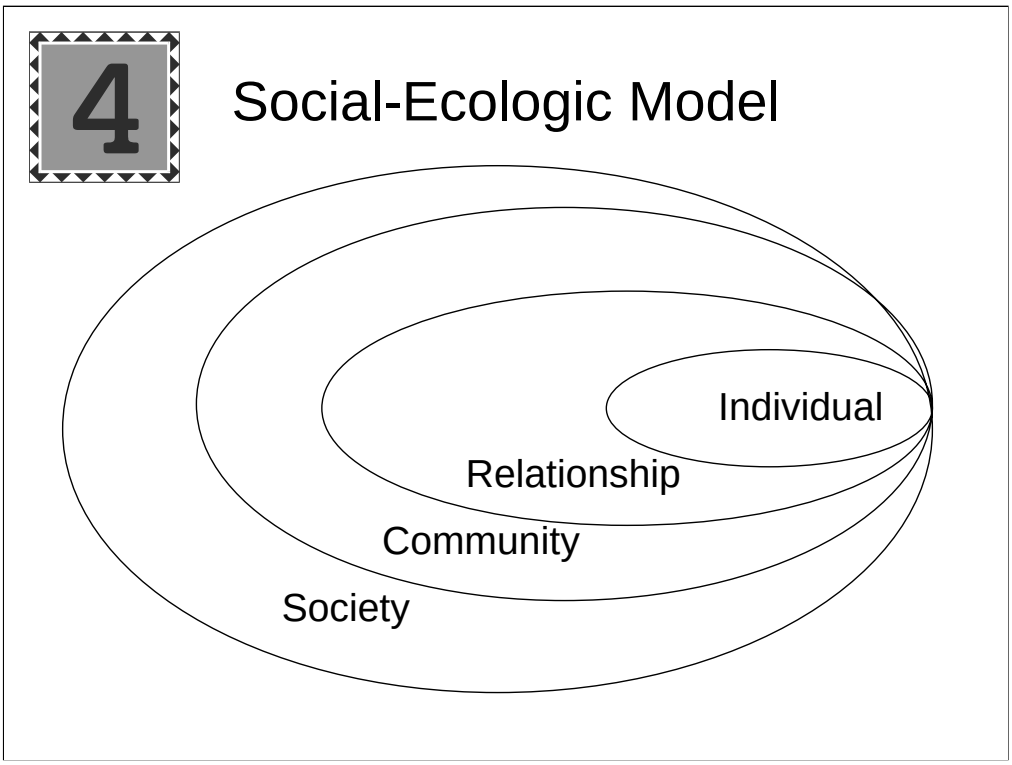
- Three passengers suffered injuries when the 2003 Dodge Neon they were riding in struck a tree head-on on Thursday, March 5, according to state police. The driver reportedly swerved to miss colliding with three deer crossing Patterson Run Road in Todd Township at 11:40 p.m. The southbound car ran off the road and struck a tree before spinning and hitting another tree with its left rear side.
- The driver was wearing a seat belt and escaped injury. However, three passengers, who were also properly secured in the vehicle, suffered injuries. The severity of their injuries is unknown.

Use the Haddon Matrix to sketch out the issues in this event

	Human	Vehicle	Environment
Pre-event			
Event			
Post-event			

Use the Haddon Matrix to sketch out prevention approaches

	Human	Vehicle	Environment
Pre-event			
Event			
Post-event			



The social ecologic model illustrates that an injury (or more commonly) a violence issue has multiple components to explain its occurrence. As shown in this slide, there are several layers of issues that can influence a situation and lead to an injury. For example, individual (or host) factors) have a role to play in injuries and violence. These individual factors may be influences by family factors, which in turn, may be influenced by community factors, ….which can be set by societal norms and standards. The social ecologic model is now gaining widespread acceptance as a perspective to consider violence in communities.

Safety Promotion

Actions that lead to a defined state in which hazards leading to physical, psychological, and material harm are controlled in order to preserve the health and well being of individuals in the community.

Actions directed to:

- Structures
- Environment
- Attitudes and behaviours

II. Multiple Disciplines are Involved in Injury Prevention

Multi-disciplinary Nature of Highway Safety

- Engineering
- Public Health
- Law Enforcement
- Emergency/Acute Care
- Biomechanics
- Policy/Planning
- Transportation Industry
- ….. and others

Many, many disciplines have a role to play in ensuring highway safety. The major groups which contribute to road safety are listed here. Effective programs to improve road safety require the integration of these disciplines. Unfortunately, many individuals do not yet recognize the contributions that all of these fields make to road accident prevention.

Match the Type of Intervention to the Discipline Involved

1. Primary seat-belt law
2. Level I trauma center
3. Roundabouts
4. Traffic Signaling
5. Trigger locks
6. Airbags
7. 911 call system
8. Smoke detectors
9. Wood chips on playgrounds

A. Engineering
B. Public Health
C. Police
D. Acute Care
E. Planning

Approaches to Injury Control

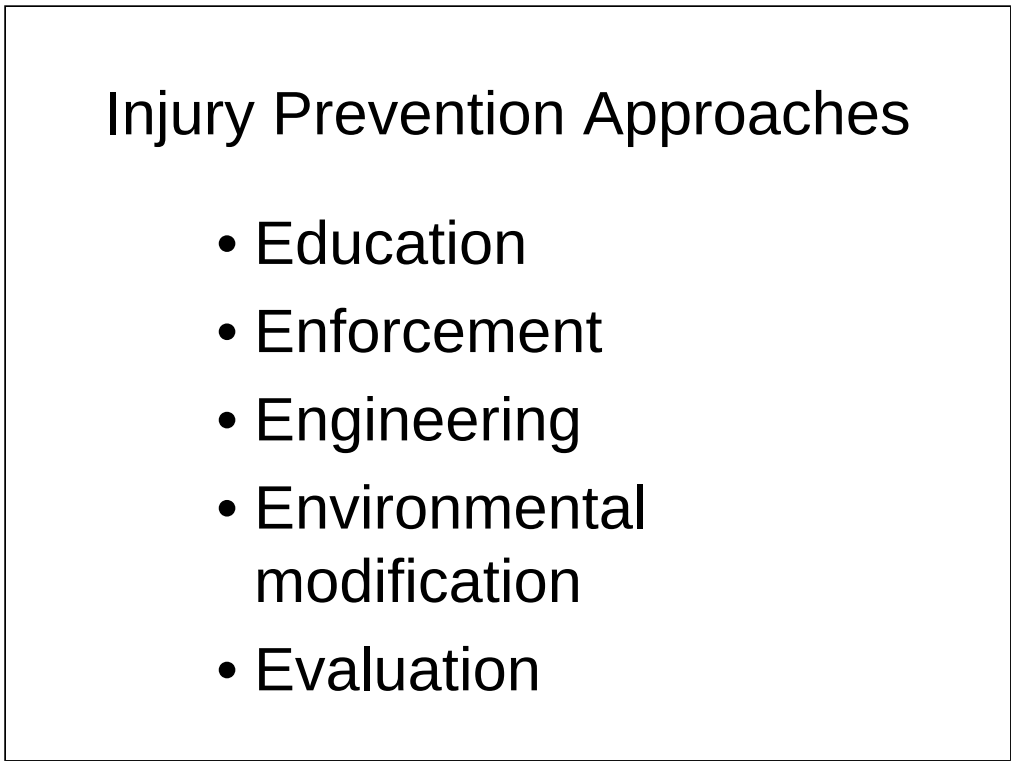
- Education
- Enforcement
- Engineering
- Emergency Services

Injury control initiatives (interventions) have been common practice since the 1950s and 1960s. We can thank both Ralph Nader and William Haddon for this scenario.

Injury control measures gained prominence after a series of events were observed. These circumstances included the development of the interstate highway system in the 1950s, the dangerous designs of automobiles in this period, and a continuing rise in injury deaths from motor vehicle crashes.

Injury control initiatives emerged to consider three areas of focus. The three Es include interventions based on education, law enforcement, and engineering.

Interventions were undertake to better educate the public on the rules of the road and proper driving techniques. Law enforcement initiatives, such as speed limits and traffic control laws, were used to provide a hand of authority to drivers. Most significantly, engineering changes in both road design and automobile design were undertaken to reduce injuries.



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Challenge

- Getting the differing disciplines to work together on injury/violence prevention

- Why is this such a big deal? ….b/c…. Evidence shows that multi-disciplinary interventions have greater impact than interventions focused on only one domain

Prevention of Injuries from Motor Vehicle Accidents

- Changes in Highway Design
- Changes in Vehicle Design
- Seat Belts
- Air Bags
- Speed Limits
- Changes in Licensing

I will end this lecture with a brief mention of the successes seen in reducing injuries from motor vehicle accidents. Research into this area has been underway for well over seventy years now. The injury field is blessed by having had remarkable success in reducing fatalities from traffic accidents (re: slide 3). Several initiatives have led the way in this effort. These include better engineering of roads and cars, the implementation of safety devices in cars, and the active enforcement of traffic laws. Many of the initiatives have been drawn from the work of injury surveillance and injury researchers.

III. Important Factors in Injury

Injury/Violence Risk Factors

- High Risk Groups
  - Age
  - Gender
  - Race/Ethnicity
- Risk Exposure
- Inexperience
- Individual Attitudes
- Societal Attitudes
- and several others

Risk Behaviors and Injury/Violence

- Alcohol
- Drugs
- Aggressive driving
- Seat belt use
- Helmet use
- Weapon carrying
- Smoke detector use
- and several others

Key Lecture Points

- Injury develops through a process.
- Identifying factors underlying injury can be aided by using conceptual models.
- Conceptual models can guide the development of interventions.
- Injury prevention involves several disciplines.
- Multi-disciplinary interventions are often more successful.