Principles to Injury Prevention

Presented by:

Stewart Williams and Kimberly Everett
Disclaimer

The following material in this presentation has been collected from various professional sources, in no way do the presenters of this presentation claim it to be their own:

Sources:

- World Health Organization TEACH-VIP E-Learning Curriculum
- Spectrum of Prevention, Injury Research Center
- National Action Plan for Child Injury Prevention, CDC
- John Hopkins Bloomberg School of Public Health, Summer Institute
- Center of Disease Control and Prevention, Wisqars
Learning Objectives

Participants should have a basic understanding of the following:

- Important definitions used in injury and violence prevention
- The national & state burden of injury
- Epidemiological and ecological models and the application to injury prevention
- William Haddon’s contribution to the field of injury prevention
- Selecting, applying, and implementing interventions
- The public health approach to injury prevention
- Introduction to logic modeling
OVERVIEW OF THE BURDEN
What is this?

10 Leading Causes of Death by Age Group, United States – 2008

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause 1-4</th>
<th>Cause 5-9</th>
<th>Cause 10-14</th>
<th>Cause 15-24</th>
<th>Cause 25-34</th>
<th>Cause 35-44</th>
<th>Cause 45-54</th>
<th>Cause 55-64</th>
<th>Cause 65+</th>
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<tbody>
<tr>
<td>1</td>
<td>Congenital Anomalies</td>
<td>Unintentional Injuries</td>
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<td>Heart Disease</td>
<td>Unintentional Injuries</td>
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<td>657,238</td>
</tr>
</tbody>
</table>

Source: National Vital Statistics System, National Center for Health Statistics, CDC.
Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.
### 10 Leading Causes of Death, United States
#### 2009, All Races, Both Sexes

<table>
<thead>
<tr>
<th>Rank</th>
<th>&lt;1</th>
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<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65+</th>
<th>All Ages</th>
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<tr>
<td>1</td>
<td>Congenital Anomalies 5,319</td>
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<td>Malignant Neoplasms 419</td>
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<td>SIDS 2,226</td>
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<td>Heart Disease 11,081</td>
<td>Chronic Low. Respiratory Disease 14,100</td>
<td>Chronic Low. Respiratory Disease 137,353</td>
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<td>4</td>
<td>Maternal Pregnancy Comp. 1,084</td>
<td>Homicide 119</td>
<td>Homicide 138</td>
<td>Malignant Neoplasms 1,056</td>
<td>Malignant Neoplasms 3,659</td>
<td>Suicide 6,677</td>
<td>Suicide 5,898</td>
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<td>5</td>
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<td>Heart Disease 154</td>
<td>Influenza &amp; Pneumonia 106</td>
<td>Congenital Anomalies 169</td>
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<td>Heart Disease 3,174</td>
<td>Homicide 2,762</td>
<td>Liver Disease 8,877</td>
<td>Alzheimer’s Disease 61,069</td>
<td>Unintentional Injury 118,021</td>
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<td>Placenta Cord Membranes 1,084</td>
<td>Influenza &amp; Pneumonia 146</td>
<td>Heart Disease 97</td>
<td>Influenza &amp; Pneumonia 122</td>
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<td>Bacterial Septic 852</td>
<td>Septicemia 71</td>
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<td>Respiratory Distress 595</td>
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<td>Chronic Low. Respiratory Disease 59</td>
<td>Complicated Pregnancy 227</td>
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<td>Nephritis 40,485</td>
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<td>9</td>
<td>Circulatory System Disease 651</td>
<td>Perinatal Period 58</td>
<td>Septicemia 59</td>
<td>Benign Neoplasms 45</td>
<td>Cerebrovascular 183</td>
<td>Cerebrovascular 537</td>
<td>Diabetes Mellitus 1,872</td>
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<td>Nephritis 4,792</td>
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<td>Neonatal Hemorrhage 517</td>
<td>Benign Neoplasms 83</td>
<td>Carboxyvasceral 42</td>
<td>Chronic Low. Respiratory Disease 187</td>
<td>Liver Disease 489</td>
<td>Influenza &amp; Pneumonia 1,314</td>
<td>Influenza &amp; Pneumonia 2,918</td>
<td>Septicemia 4,628</td>
<td>Septicemia 25,703</td>
<td>Suicide 30,909</td>
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</tbody>
</table>
Across the spectrum of life (<1 to 65+ years) unintentional injury-death is a leading cause.

For individuals 1 to 44 years old it is the leading cause.
# National Burden of Injury

## 10 Leading Causes of Injury Deaths by Age Group Highlighting Unintentional Injury Deaths, United States – 2008

<table>
<thead>
<tr>
<th>Rank</th>
<th>&lt;1</th>
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<th>55-64</th>
<th>65+</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1,058</td>
<td>Unintentional Suffocation 1,058</td>
<td>Unintentional Drowning 443</td>
<td>Unintentional MV Traffic 365</td>
<td>Unintentional MV Traffic 532</td>
<td>Unintentional MV Traffic 6,647</td>
<td>Unintentional MV Traffic 6,358</td>
<td>Unintentional Poisoning 7,842</td>
<td>Unintentional Poisoning 9,406</td>
<td>Unintentional MV Traffic 4,137</td>
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<td>3</td>
<td>Homicide Unsuspected 192</td>
<td>Unintentional Fim/Burn 111</td>
<td>Suicide Suffocation 141</td>
<td>Homicide Firearm 3,612</td>
<td>Suicide Firearm 2,796</td>
<td>Suicide Firearm 3,789</td>
<td>Suicide Poisoning 3,079</td>
<td>Suicide Poisoning 4,768</td>
<td>Suicide Poisoning 24,013</td>
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<tr>
<td>4</td>
<td>Unintentional MV Traffic 98</td>
<td>Unintentional Fire/Burn 199</td>
<td>Homicide Firearm 44</td>
<td>Unintentional Drowning 123</td>
<td>Suicide Firearm 2,009</td>
<td>Suicide Firearm 2,357</td>
<td>Homicide Firearm 1,966</td>
<td>Suicide Poisoning 2,004</td>
<td>Suicide Poisoning 1,809</td>
<td>Suicide Poisoning 4,143</td>
<td>Suicide Firearm 10,223</td>
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<td>5</td>
<td>Undetermined Sufocation 46</td>
<td>Unintentional Suffocation 145</td>
<td>Unintentional Poisoning 64</td>
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<td>Suicide Suffocation 1,732</td>
<td>Suicide Suffocation 1,855</td>
<td>Suicide Poisoning 1,772</td>
<td>Suicide Poisoning 1,164</td>
<td>Unintentional Suffocation 3,200</td>
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<td>6</td>
<td>Unintentional Poisoning 41</td>
<td>Unintentional Solar Pedestrian, Other 115</td>
<td>Unintentional Other Land Transport 28</td>
<td>Unintentional Other Land Transport 64</td>
<td>Unintentional Poisoning 659</td>
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<td>Suicide Poisoning 818</td>
<td>Suicide Poisoning 818</td>
<td>Suicide Suffocation 9,576</td>
<td>Suicide Poisoning 842</td>
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<td>7</td>
<td>Homicide Sufocation 32</td>
<td>Homicide Other Spec., Classifiable 77</td>
<td>Suicide Firearm 21</td>
<td>Homicide Firearm 304</td>
<td>Homicide Firearm 306</td>
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<td>Suicide Poisoning 456</td>
<td>Suicide Poisoning 1,116</td>
<td>Suicide Poisoning 6,125</td>
<td>Suicide Poisoning 507</td>
<td>Suicide Poisoning 5,911</td>
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<td>Unintentional Struck by or Against 15</td>
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<td>Homicide Poisoning 37</td>
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<td>Homicide Poisoning 5,911</td>
<td>Homicide Poisoning 5,911</td>
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<td>Unintentional Poisoning 3,548</td>
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Source: National Center for Health Statistics (NCHS), National Vital Statistics System.  
Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.
Pennsylvania
Deaths by Age Group (2006-2010)

PREVENTION DEFINITIONS
Definitions

• **Accident** – Events that are unpredictable and unpreventable.

• **Intentional Injury** – Injuries that are purposely inflicted, either by the victims themselves or by other persons.

• **Unintentional Injury** – Injuries that are not intentionally inflicted.
Definitions

• **Violence** – The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation.
Definitions

• Injury Mechanism (event) – Incidents that lead to injuries (e.g., motor vehicle collision, falls, fire, assault, drowning).
The Injury Pyramid

Injuries resulting in death

Injuries resulting in hospitalization

Injuries treated in the emergency rooms, physician’s offices, and other health care settings

Injuries treated at home, in non-medical settings, or not treated
Prevention Models & Frameworks

THE EPIDEMIOLOGICAL MODEL
The Epidemiological Model

Legal-Social Environment

Physical Environment

AGENT

VECTOR

HOST
The Epidemiological Model

Legal-Social Environment

AGENT

VECTOR

HOST

Physical Environment

\[ K = \frac{1}{2} (mv^2) \]
WHO Definition of Injury

The physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. It can be a bodily lesion resulting from acute exposure to energy in amounts that exceed the threshold of physiological tolerance, or it can be an impairment of function resulting from a lack of one or more vital elements (i.e., air, water, warmth), as in drowning, strangulation, or freezing.

James Gibson, 1961
Prevention Models & Frameworks

THE ECOLOGICAL MODEL
Ecological Models

Urie Bronfenbrenner, 1970
Ecological Model

• Used to understand the causes of injuries in which individual human behavior plays a large role
Ecological Models

- Micro-lending programs to de-concentrate poverty
- Alcohol sales control
- Parenting programs
- Social development programs
## Ecological Models Exercise

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>A park is closed at sunset</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>A person is abusing alcohol</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>Laws prohibiting domestic violence and passed and enforced</td>
<td>D</td>
</tr>
<tr>
<td>4</td>
<td>A person’s friends are gang-members</td>
<td>B</td>
</tr>
</tbody>
</table>

Choose from the following.

- a. Individual
- b. Relationship
- c. Community
- d. Society
Prevention Models & Frameworks

THE SPECTRUM OF PREVENTION
Spectrum of Prevention*

- Influencing Policy and Legislation: Developing strategies to change laws and policies to influence outcomes
- Changing Organizational Practices: Adopting regulations and shaping norms to improve health and safety
- Fostering Coalitions and Networks: Bringing together groups and individuals for broader goals and greater impact
- Educating Providers: Informing providers who will transmit skills and knowledge to others
- Promoting Community Education: Reaching groups of people with information and resources to promote health and safety
- Strengthening Individual Knowledge and Skills: Enhancing and individual’s capability of preventing injury or illness and promoting safety

Spectrum of Prevention Exercise

Instructions:

• Working in groups provide two intervention strategies for each level of the spectrum of prevention for the injury risk area provided.

• List these on your flip chart.

• Post when completed.
Prevention Models & Frameworks

THE HADDON FRAMEWORK
## Haddon Matrix

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>HOST</th>
<th>VECTOR</th>
<th>PHYSICAL ENVIRONMENT</th>
<th>SOCIAL ENVIRONMENT</th>
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</thead>
<tbody>
<tr>
<td>PHASES</td>
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<td></td>
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</tr>
<tr>
<td>PRE-EVENT</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>EVENT</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>POST-EVENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*William Haddon, 1960*
Phases

• **Pre-Event:** the time period prior to the exposure to the energy that can produce injury.

• **Event:** the time period during which an exposure to the energy that can produce injury occurs.

• **Post-Event:** the time period after the exposure to the energy that can produce injury occurs.
Factors

• **Agent**: The energy

• **Vector**: The mechanism or product that transfers energy to the person.

• **Host**: The person(s) who accrue injury

• **Social Environment**: the social characteristics of both host and vector.

• **Physical Environment**: the surrounding physical conditions of both host and vector.
Haddon Matrix
Exercise

Instructions:

• Working in groups work through the Haddon Matrix using the scenario assigned.

• Post your Matrix when complete.
## Haddon Matrix

<table>
<thead>
<tr>
<th>FACTORS</th>
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<th>PHYSICAL ENVIRONMENT</th>
<th>SOCIAL ENVIRONMENT</th>
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</thead>
<tbody>
<tr>
<td>PHASES</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>PRE-EVENT</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EVENT</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>POST-EVENT</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

William Haddon, 1960
# Haddon Matrix

<table>
<thead>
<tr>
<th>PHASES</th>
<th>FACTORS</th>
<th>HOST</th>
<th>VECTOR</th>
<th>PHYSICAL ENVIRONMENT</th>
<th>SOCIAL ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-EVENT</td>
<td>• Child’s development factors</td>
<td>• Ease with which the package can be opened</td>
<td>• Absence of locking devices in cabinets</td>
<td>• Lack of regulations (e.g., marketing of substance in containers that look like food)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Parent’s characteristics</td>
<td>• Attractiveness of the substance</td>
<td>• Cabinets where poisons are stored are in places easy for child to reach</td>
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<tr>
<td>EVENT</td>
<td>• Child’s secrecy about ingesting.</td>
<td>• Chemical composition of the poison</td>
<td>• Presence of hiding places where child could ingest substances and not be noticed</td>
<td>• Inaccessible health care system that deters parents from seeking guidance about potential ingestion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Parent’s ability to notice unusual behavior or part of child who is ingesting</td>
<td>• Substance easy to swallow in sufficient quantities to do harm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POST-EVENT</td>
<td>• Child’s ability to communicate with adults about what was ingested.</td>
<td>• Chemical agent that does not have antidote</td>
<td>• Lack of accessibility for emergency vehicles</td>
<td>• Lack of poison-control facility or emergency medical care</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Parent’s ability to access and communicate with poison control resources.</td>
<td></td>
<td></td>
<td>• Poor publicity of poison-control resources and how to access them</td>
<td></td>
</tr>
</tbody>
</table>
Haddon’s 10 Basic Strategies

1. Prevent the creation of the hazard in the first place
2. Reduce the amount of hazard brought into being
3. Prevent release of hazard that already exists
4. Modify the rate or spatial distribution of release of the hazard from its source
5. Separate, in time or space, the hazard and that which is to be protected
Haddon’s 10 Basic Strategies

6. Separate the hazard and that which to be protected by a material barrier
7. Modify relevant basic qualities of the hazard
8. Make what is to be protected more resistant to damage from the hazard
9. Move rapidly in detecting and/or removing the hazard
10. Stabilize, repair, and rehabilitate the object damaged by the hazard
Using the 10 Haddon Strategies

Requires the following:

• A **countermeasure**: a device or technique for preventing injury

• An **intervention**: a strategy for using a specific countermeasure

• **Implementation**: the activities used to put an intervention into practice
INTERVENTION STRATEGIES
Interventions are often categorized by the risk status of the people targeted.

- **Universal** – Target broad groups or general populations.
- **Selective** – Target people who are at elevated risk or contribute to the risk.
- **Indicated** – Target individuals who are already involved in risk behavior.
Do individuals have to take action for the intervention to be effective?

- **Passive** – do not require individuals to take action (e.g., airbags deploy, SRS)
- **Active** – require action on the part of the individual (e.g., using a safety helmet, seat belt)
Categorizing Interventions

- Engineering – Technology, Environmental Change
- Enforcement – Law, Regulation, Policy
- Education – Health Promotion, Health Behavior change, Social Norms
LOGICAL THINKING
## Logic Modeling

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>ACTIVITIES</th>
<th>OUTPUTS</th>
<th>OUTCOMES</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

“Most of the value in a logic model is in the process of creating, validating and modifying the model... The clarity of thinking that occurs from building the model is critical to the overall success of the program.”


“Logic models are only a series of “if ...then” statements that show the relationship between inputs, outputs and outcomes.”

– Carolyn Cumpsty Fowler, PhD, MPH, SI 2011
## How to complete a logic model

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>ACTIVITIES</th>
<th>OUTPUTS</th>
<th>OUTCOMES</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Library Time Homework Study group</td>
<td>Study</td>
<td>Test Grades &gt; 85%</td>
<td>B’s or higher in all classes</td>
<td>Graduate From College</td>
</tr>
</tbody>
</table>

- **If** we want to make this impact, **Then** what outcomes do we need to achieve?
- **If** we want these outcomes, **Then** what activities are necessary?
- **If** we have these activities, **Then** what inputs are required?
- **If** we input these resources into the activities, **Then** what outputs will be accomplished?
THE PUBLIC HEALTH APPROACH
What does a public health approach mean to you?
A Public Health Approach

- Implementation
- Surveillance
- Develop & Evaluate Interventions
- Identify Risk Factors
Why Use A Public Health Approach

• It is multidisciplinary – includes many disciplines (e.g., medicine, epidemiology, engineering, sociology, psychology, criminology, education, economics)
• It is population based (groups vs. individuals)
• It is evidence based
• It emphasizes collective action
• It emphasizes prevention
BEAT DIABETES
BUY 5 JR FROSTYS
FOR $1
If we keep focusing on Low Hanging Fruit

There is always a cost associated with executing on the “low hanging fruit.”

WE MUST REACH FURTHER INTO THE TREE!
Recently Released
“A framework for reducing childhood injuries based on the public health model.”

Areas determined by:
• Burden of injury
• Cost to society
• Existence of programs/policies
• Feasibility for action
• Measurable prevention
• Stakeholder support
Is What We Do

MARKETING

Or

INJURY PREVENTION
Resources

- **World Health Organization TEACH-VIP E-Learning**: is an online self-paced curriculum in violence and injury prevention, designed for health and public professionals and other health care providers; staff of public health ministries and non-governmental organizations; and students in schools of medicine, nursing, and public health. [http://teach-vip.edc.org/](http://teach-vip.edc.org/)

- **CDC Injury Center**: The teaches key concepts of primary prevention, the public health approach, and the social-ecological model. Participants complete interactive exercises to learn to help prevent five types of violence:
  - Child abuse and neglect
  - Intimate partner violence
  - Sexual violence
  - Suicide
  - Youth violence

  [www.cdc.gov/ViolencePrevention/POP.html](http://www.cdc.gov/ViolencePrevention/POP.html)
Resources

• John Hopkins Bloomberg School of Public Health

This is an intensive, competency based course designed to enhance participants’ knowledge and skills in injury and violence prevention. A problem-solving paradigm is used to introduce the principles and practice of injury prevention. Students use class lectures in behavioral, biomechanical, environmental, epidemiological, legislative, policy and community partnership approaches to injury prevention to develop a strategy for addressing a specific injury problem. Students are put in groups for practical application sessions to develop skills learned in the lectures. At the conclusion of the course, the groups present their strategies for addressing the injury problem they have been assigned. [http://www.jhsph.edu/injurycenter/training/summer_institute/SI_CourseDesc](http://www.jhsph.edu/injurycenter/training/summer_institute/SI_CourseDesc)
Resources

Demonstrating Your Program's Worth

A Primer on Evaluation for Programs to Prevent Unintentional Injury, Second Edition

March 2000 (CDC)

http://www.cdc.gov/ncipc/pub-res/demonstr.htm
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