

The 5 Public Health Principles

Injuries are not accidents--they do not happen by chance. Like disease, they follow a pattern. By identifying the risks for injury, it is possible to predict and prevent it.

From a public health perspective, we attempt to analyze each risk factor in order to understand and predict patterns of disease and injury.

The goal of this step is to understand and apply basic public health principles and guidelines to identify risk factors and help develop and choosing prevention strategies. Use these tools when planning your injury prevention program and interventions.

Public Health Principles

1. The Epidemiology Triangle
2. Levels of Prevention
3. Passive & Active Approaches
4. Multiple Program Targets
5. Effective Strategies

1. The Epidemiology Triangle

Epidemiology is the study of diseases (and injuries) among populations. Epidemiology focuses on patterns and distributions of disease in order to tailor preventive measures. In simple terms, epidemiology is the science of disease detectives. Just like police detectives try to solve a crime, an epidemiologist tries to solve a "disease crime" by gathering data to answer the questions who, what, why, where, when, and how.

By collecting data, an epidemiologist can determine patterns of a disease such as what population is it affecting, what are the ages, what exposures to they have in common, etc. All of these questions are meant to profile or explain the disease in hopes of finding a cure or effective intervention to prevent the disease or injury from affecting the rest of the population.

Epidemiology was founded for the purpose of disease prevention. But the same rules can apply to injuries too. Many public health and injury prevention practitioners use the same rules and guidelines developed in epidemiology to detect or find the patterns of the injuries happening in their community.

When referring to epidemiology and prevention, epidemiologists often refer to a model called the **epidemiology triangle** to identify the there major risk factor categories for the disease or injury.

Identifying risk factors is the second step in the Public Health approach to injury prevention.

The traditional use of this model is to use it as a tool to identify the risk factors and show the relationship between the three factors that influence the occurrence and prevention of disease and injury. These factors are:

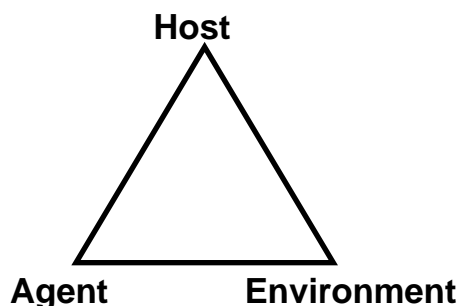
- a) HOST, or the person or population with the disease;
- b) AGENT, or the disease causing organism; and
- c) ENVIRONMENT, or place in which the host and agent interact.

From a public health perspective, we attempt to analyze each factor's characteristics in order to understand and predict patterns of disease and injury. Prevention efforts are designed to change one or more of these characteristics, altering the relationship between the three, and ultimately changing the frequency (how often) or severity (strength) of the disease or injury.

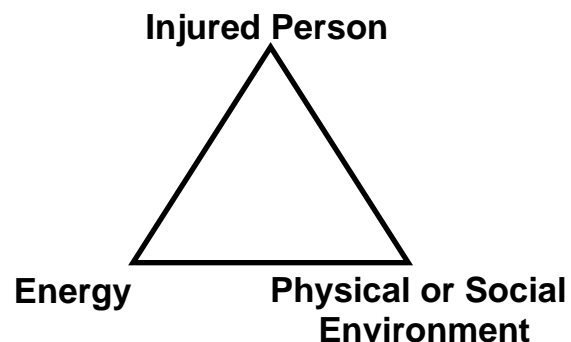
For example, we have learned that a person (HOST) can be vaccinated (HOST characteristic) to prevent illness from certain disease causing organisms (AGENT) such as the virus that causes measles; or that an environment with improved sanitary conditions (ENVIRONMENT) such as protected water supplies and sanitary sewer systems reduce the risk of diseases (AGENT) such as cholera and giardia.

Check out the website for more tools and worksheets on applying these principles to your injury prevention project.

The Epidemiology Triangle: Traditional and Adapted for Injury and Prevention



Traditional Model



Injury Prevention Model

The injury model of the epidemiology triangle is very similar to that of the traditional or disease model. The HOST refers to the injured person, the ENVIRONMENT refers to the characteristics of the physical and social environment, and the AGENT is the energy that is transferred to the body at a rate sufficient to cause injury.

The parallel of the HOST and ENVIRONMENT between the traditional model and injury model has been relatively easy to understand. Simply put, there are characteristics and behaviors of a person that can help contribute to injury (like drunk driving) or that can help prevent injury (like wearing a seatbelt). Likewise there are characteristics in the physical environment (like smoke detectors in the home) and in the social environment (like laws and society's unacceptance of drunk driving) that are important to injury prevention.

The use of the epidemiology triangle to explain the AGENT of injury was a bit more difficult to describe until early injury prevention practitioners clarified that agent of injury was primarily the transfer of energy to the body at rates that cause damage (like the energy transferred when an unrestrained motor vehicle occupant's head strikes the windshield during a crash); or in some cases (like drowning and hypothermia) the agent of injury is the result of the absence of such essentials as oxygen and heat.

Example AGENTS for the Injury Model:

- Mechanical Energy (car crash)
- Thermal Energy (burn)
- Chemical Energy (drugs)
- Electrical Energy
- Radiation Energy
- Absence of Oxygen (drowning)
- Absence/Excess of Heat (hypothermia/burn)

Keep in mind, this is just a brainstorming tool to help you identify the risk factors. This sets the stage for developing prevention strategies in step 3 of the Public Health approach.

2. Levels of Prevention

Understanding the occurrence of injury isn't enough to fully address the design and implementation of preventive measures. We again draw from a basic public health concept - that there are 3 levels of prevention...primary, secondary, and tertiary. The three levels of prevention refer to the **timing** of an injury. For every injury event, there is a time period called the pre-event, a time period when the event is actually happening (during), and a time period after the event (post-event).

When you consider a prevention strategy for a particular injury occurrence, consider a strategy that is comprehensive...employing prevention initiatives at all three levels.

Primary (Pre-Event): Goal is to prevent events that *might* result in injury. What can be done to avoid the injury before the event occurs.

Secondary (Event): Goal is directed at *modifying* the consequences of events in order to prevent or reduce the severity of injury .

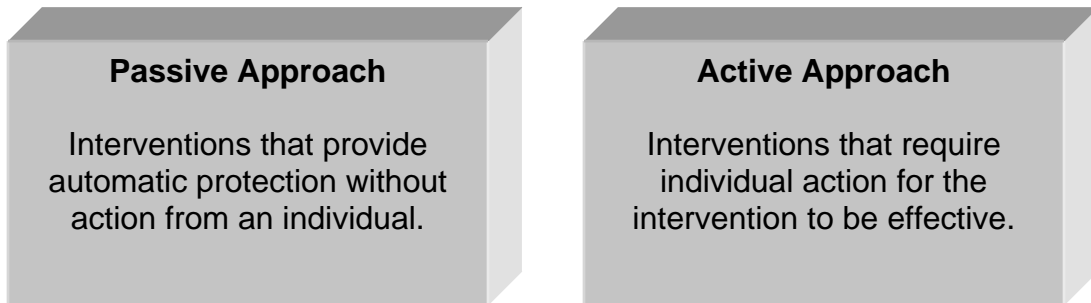
Tertiary (Post-Event): Goal is to *limit* long-term impairments and disability.

Examples of Levels of Prevention:

| | |
|------------------------------|---|
| Primary (Pre-Event) | DUI checkpoint Reduce access to weapons Non-combustible construction material |
| Secondary (Event) | Safety belt use Less lethal bullets Smoke detectors |
| Tertiary (Post-Event) | Access to emergency medical services 911 systems Access to quality healthcare |

3. Passive & Active Approaches

It is also important to note that the preventive measures we employ are categorized as either PASSIVE or ACTIVE strategies.



Passive strategies are often preferred over active strategies because they are automatic and protect everyone, and require no cooperation or action on part of those you intend to protect. In practice, however, interventions are often developed that are often a mix of passive and active interventions. For example, comprehensive motor vehicle injury interventions involve passive interventions (highway engineering; air bags; automatic daytime running lights) and active interventions (seat belts, DUI checkpoints). Sometimes passive strategies cannot be used because there may be insufficient resources, socially unacceptable, and/or no passive strategy available.

Exercise: Passive or Active Approach?

| | |
|--|--|
| <input type="checkbox"/> Seat belt <input type="checkbox"/> Air bag <input type="checkbox"/> Life Vest (PFD) <input type="checkbox"/> Smoke detector <input type="checkbox"/> Anti-lock brakes <input type="checkbox"/> Driving Carefully | <input type="checkbox"/> Child-proof packaging <input type="checkbox"/> Pool fencing <input type="checkbox"/> Guard rail <input type="checkbox"/> Anti-scald device <input type="checkbox"/> Bicycle helmet <input type="checkbox"/> Person in a Fire Watch Tower |
|--|--|

Passive are air bag, smoke detector, anti-lock brakes, child-proof packaging, pool fencing, guard rail, and anti-scald device. All others are active.

4. Multiple Program Targets for Change

Risks for injuries occur at three different levels: the individual level, the societal level, and the environmental/engineering level. Preventing injuries requires different approaches at each level of risk. Some of these approaches include education, public awareness campaigns, legislation and enforcement, engineering, and modifying the environment. Many injuries must be addressed at more than one level, and often all three.

To the right is an example of how the 3 levels were applied using Childhood Poisoning from medicines. Before 1970, childhood poisoning prevention was primarily directed at individuals in terms of education to parents and public awareness about the risks to young children of medicines and hazardous substances. Due to the raising of awareness about the problem of childhood poisoning in society, the national Poison Prevention Packaging Act of 1970 was passed which required drug companies and others to produce medicine and hazardous substances in childproof containers (Societal Level). Finally, through engineering, an Environmental Level change was brought about in the creation of childproof packaging on medicine containers which has essentially solved the problem of young children being poisoned by medicines.

Multiple Program Targets for Change

Childhood Poisoning Example:

| | |
|---------------------|---|
| Individual Level | Education and Public Awareness of the Risks of Poisons to Children |
| Societal Level | Law Passed 1970 Requiring Childproof Packaging of Medicine |
| Environmental Level | Medicine Containers With Childproof Tops Created to Prevent Children From Opening |

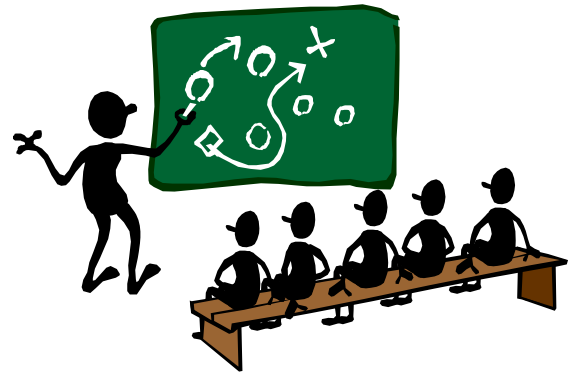
5. Effective Strategies

Effective means producing or capable of producing a desired effect. In this case, the desired effect is to reduce injuries.

Injuries are the most important cause of death and disability for the first half of the human lifespan and are the leading cause of years of potential life lost before age 65. Hundreds of injury intervention programs have been implemented, but not all strategies have been evaluated. The implementation of prevention strategies of proven effectiveness is of major public health importance. The reason is straightforward: Because staff time and resources are always limited, efforts should be used for those injury prevention strategies that have been evaluated and shown to be effective.

-Dr. Fred Rivara, Editor, Systematic Reviews of Strategies to Prevent Motor Vehicle Injuries, American J. of Preventive Medicine, January, 1999.

It is important to know which injury prevention strategies are proven effective, and those that are less effective, in order to have the greatest impact on your program. Injury prevention and safety strategies have been around in the U.S. for over 40 years. However, some strategies are more useful and effective than others. Why are some effective (seat belts, smoke detectors) and others are ineffective?



**Think Safety.
Don't
Drink and Drive**

For example, safety messages like “Think Safety and Don't Drink and Drive” have been used for many years, but have limited effect in changing behavior. Think Safety is especially bad, for the message is too general. Seat belt use and smoke detectors are proven effective devices. Health fairs are of limited effectiveness, and drivers education classes for teen drivers have actually been proven in the past to increase motor vehicle injuries among young drivers because those classes often allowed teens to obtain a drivers license at an earlier age.

See the Portland Injury website for these resources that go into much more detail on effective strategies..... 1) *Evidence-Based Effective Strategies for Preventing Injuries*” compiled by David Wallace, NCIPC, CDC, 2002. 2) CDC “Motor vehicle occupant injury: strategies for increasing use of child safety seats, increasing use of safety belts, and reducing alcohol-impaired driving. CDC MMWR May 2001 (Volume 50)



References

Baker, Susan P. *The Injury Fact Book*. 2nd ed. Oxford UP, 1991.

Bonnie, Richard J., Carolyn Fulco, and Catharyn T. Liverman. *Reducing the Burden of Injury: Advancing Prevention and Treatment*. National Academy P, 1999.

Christoffel, Tom, and Susan S. Gallagher. *Injury Prevention and Public Health*. 2nd ed. Jones & Bartlett, 2005.

National Committee For Injury Prevention And Control. *Injury Prevention: Meeting the Challenge*. Oxford UP, 1989.

National Center for Injury Prevention and Control. *CDC Injury Fact Book*. Atlanta (GA): Centers for Disease Control and Prevention; 2006.

"Evidence-Based Effective Strategies for Preventing Injuries" compiled by David Wallace, NCIPC, CDC, 2002.

CDC. "Motor vehicle occupant injury: strategies for increasing use of child safety seats, increasing use of safety belts, and reducing alcohol-impaired driving. A report on recommendations of the Task Force on Community Preventive Services. *MMWR* 2001;50(No. RR-7).