The Role of Public Health in Building the Science Base and Translating Science to Practice

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U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Overview

- Definition of injury
- Burden and cost of injuries
- Conceptual models for injury and violence prevention research
- Science base for injury and violence prevention

What is Injury?

- **Injury: Tissue damage resulting from energy transfer**
  - Five forms: Kinetic, chemical, thermal, electrical, and radiation
  - Unintentional and intentional (violence)
- **Example**
  - Kinetic: Motor vehicle crash, fall out of a window, firearm injury, assault with a blunt object

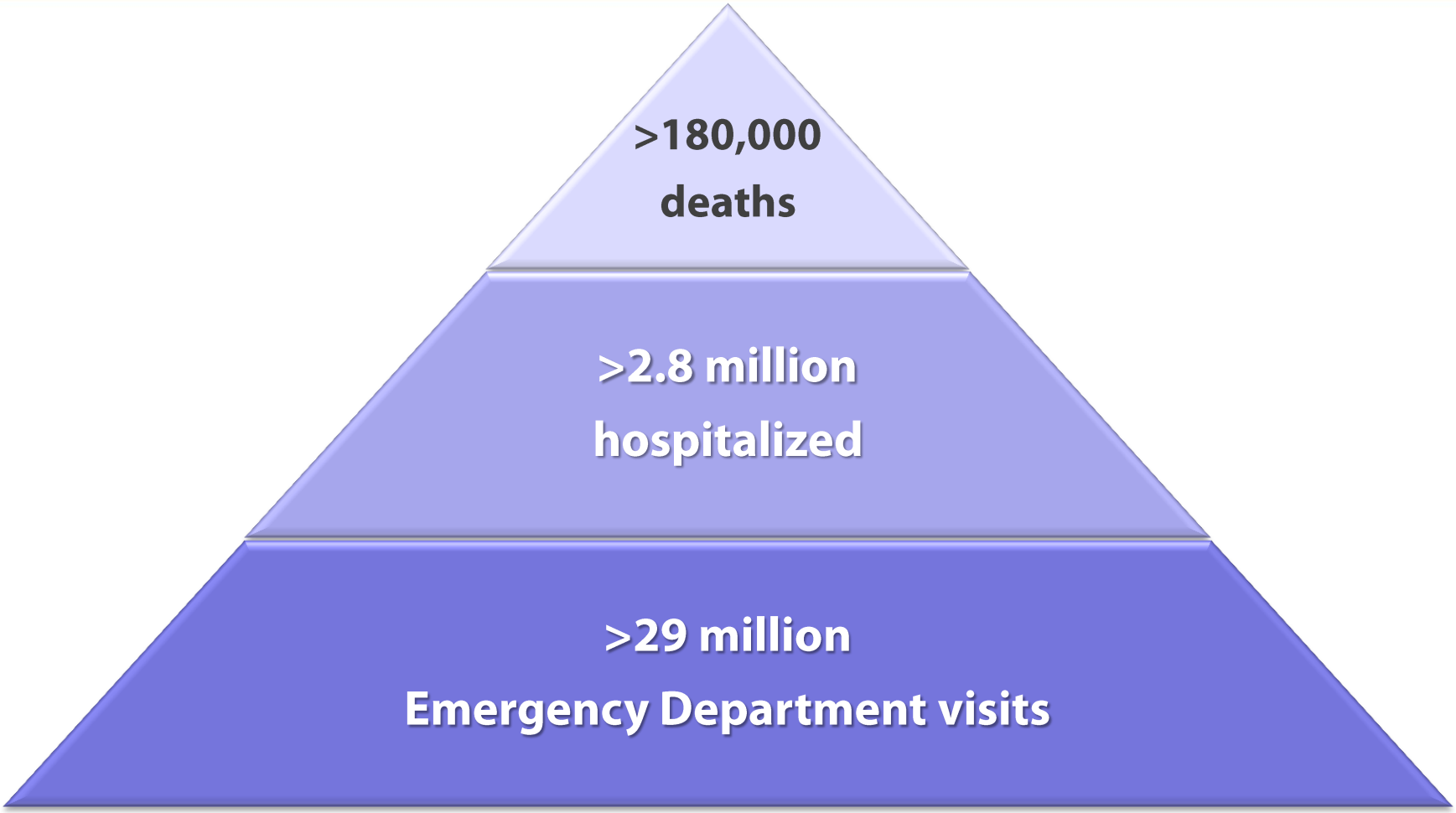
Global Impact of Injury

- **5.8 million deaths each year**
  - 10% of deaths worldwide
  - 32% more deaths than malaria, TB, and HIV/AIDS combined
- **Leading causes of death**
  - Road traffic crashes
  - Homicide
  - Suicide

- **Road traffic crashes**
  - Cost is $518 billion
  - Leading cause of death for healthy U.S. citizens traveling outside the United States

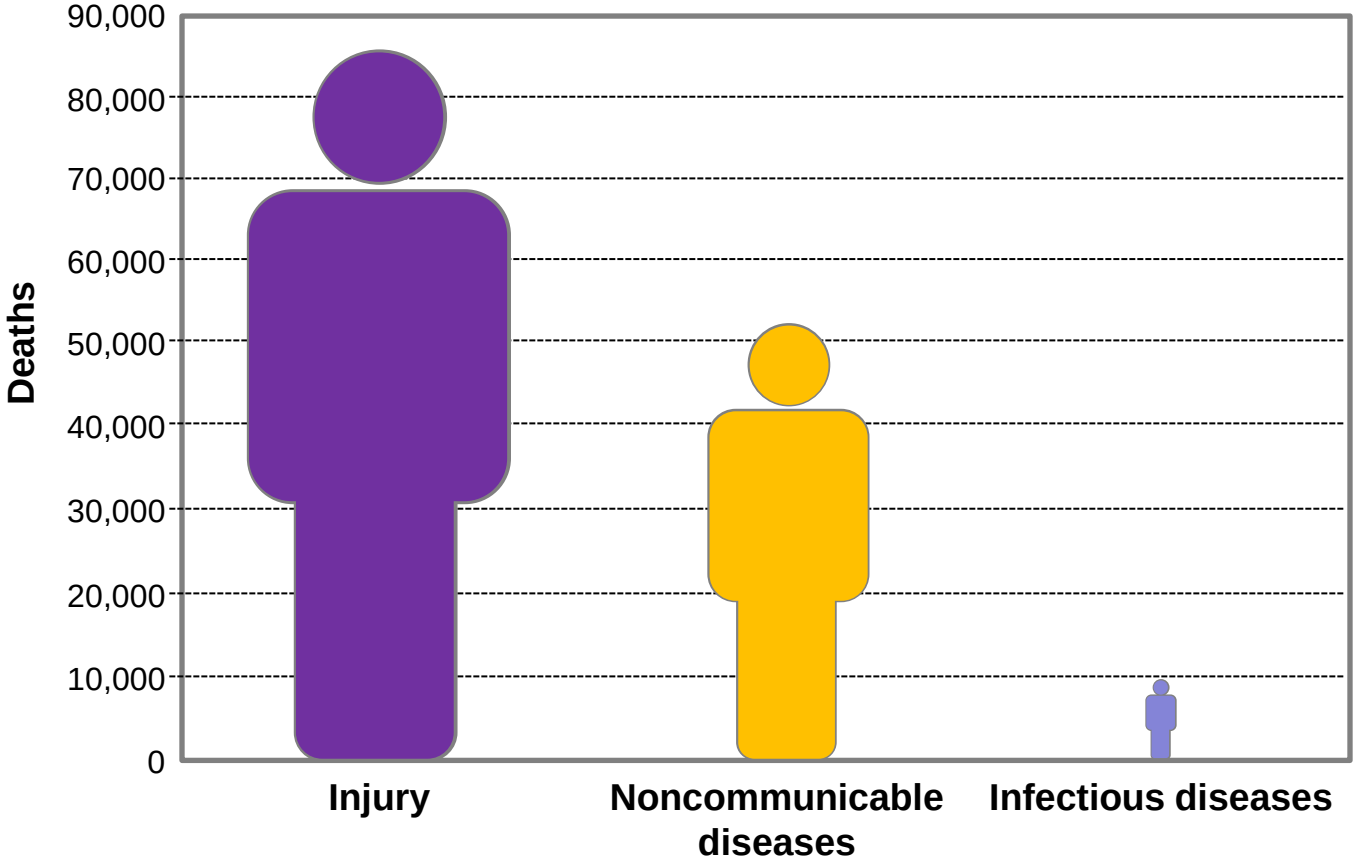
WHO (2010). Injuries and violence: The facts
WHO (2008). The global burden of disease: 2004 update

Burden of Injury in the United States



NCIPC, Web-based Injury Statistics Query and Reporting System (WISQARS). http://www.cdc.gov/injury/wisqars
NCHS. National hospital discharge survey: 2007 summary
National health statistics reports, no. 29. Atlanta, GA, 2010

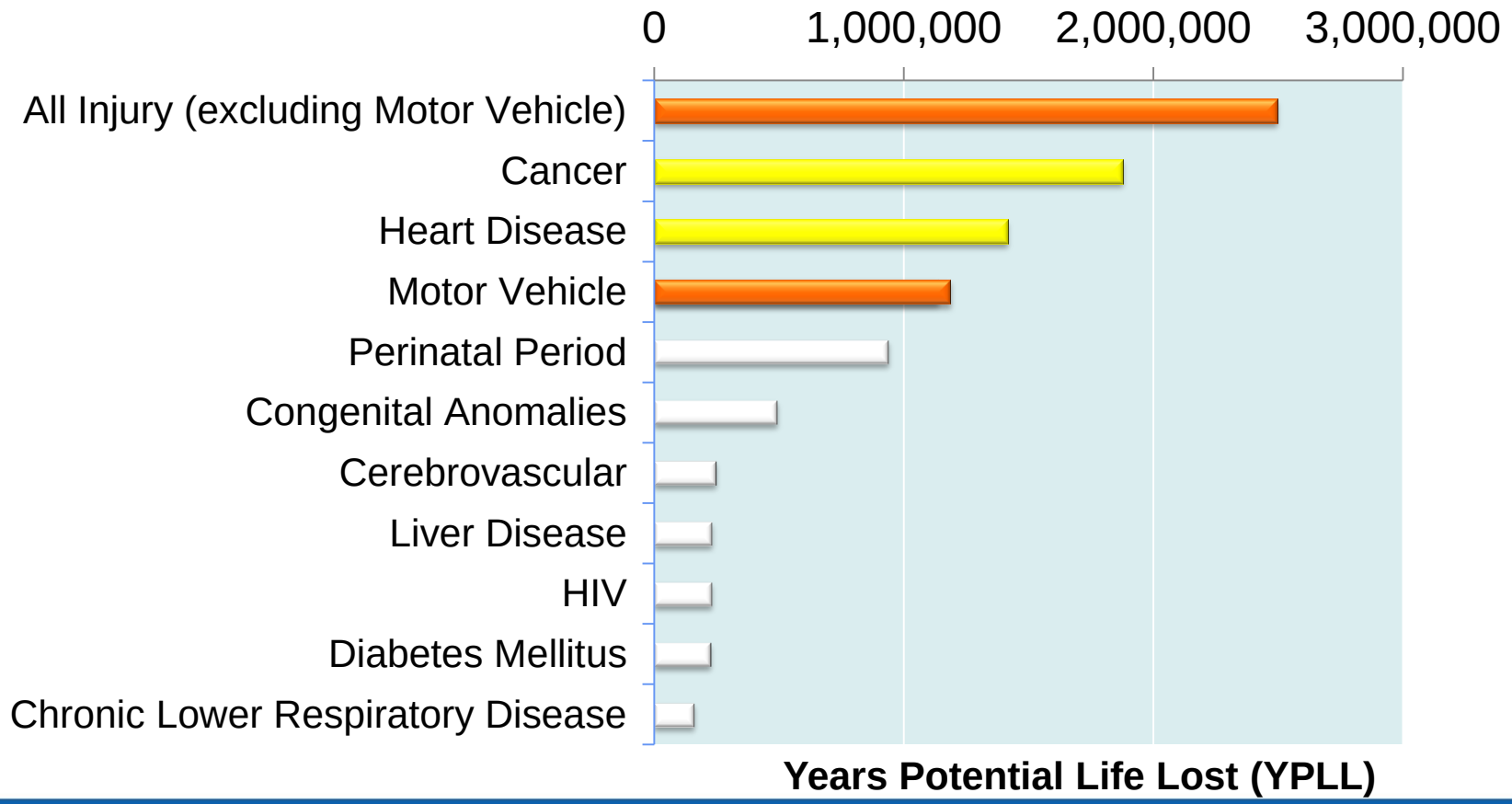
Leading Causes of Death for Persons Ages 1–44 United States, 2007



Note: Injury includes unintentional injury, homicide, suicide, legal intervention, and those of undetermined intent. Non-communicable diseases include cancer, cardiovascular, kidney, respiratory, liver, diabetes, and other diseases. Infectious diseases include HIV, influenza, pneumonia, tuberculosis, and other infectious diseases

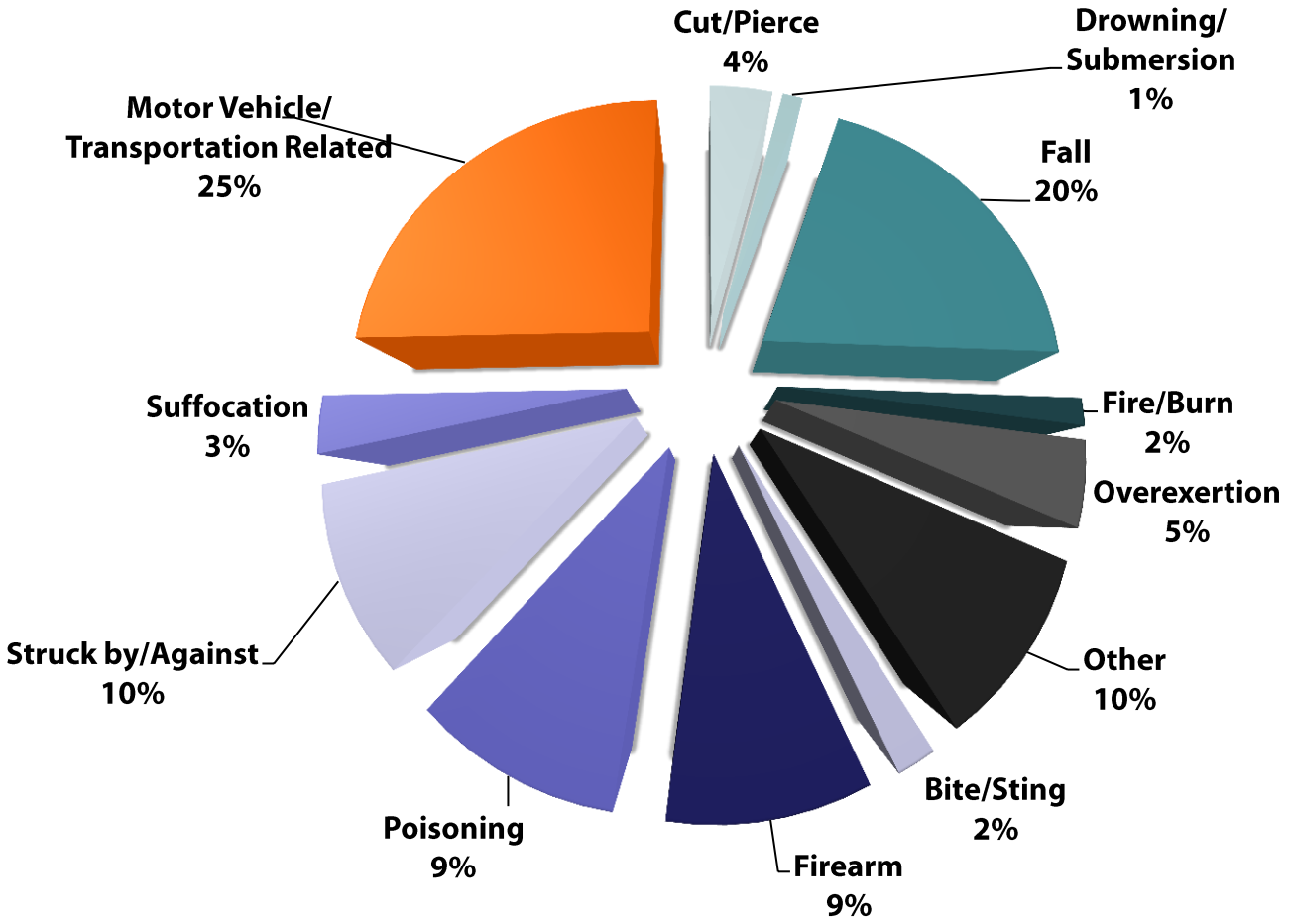
National Vital Statistics System using CDC Wonder (http://wonder.cdc.gov)

Injuries and Violence are Leading Causes of Years of Potential Life Lost before Age 65 in the U.S.



CDC, Web-based Injury Statistics Query and Reporting System, non-published data, WISQARS http://wisqars.cdc.gov
CDC, NCHS, National Vital Statistics System

Cost of Injury by Cause
Total Cost: $355 Billion/year



Note: Motor Vehicle /Transportation Related category includes motor vehicle/traffic, pedestrian, motorcyclist and pedal cyclist. Other category includes other non-motor vehicle transport injuries, machinery, natural environment, foreign body, other specific, and unknown.
CDC, Web-based Injury Statistics Query and Reporting System, non-published data WISQARS, http://wisqars.cdc.gov:8080/costT

Challenges of Injury and Violence Prevention Research

Injury and violence prevention research does not readily lend itself to standard laboratory research models/infectious disease model

Different research frameworks are used to identify solutions that largely can only be done in real-world settings

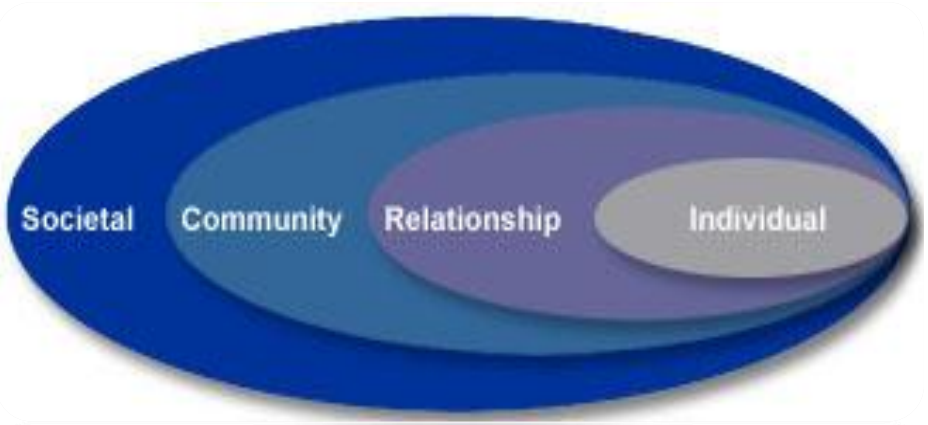
Frameworks for Injury and Violence Prevention Research and Interventions

Haddon's Matrix

	Host	Agent	Physical Env't	Social Env't
Pre-Event				
Event				
Post-Event				

Haddon's Matrix

Socioecological Model

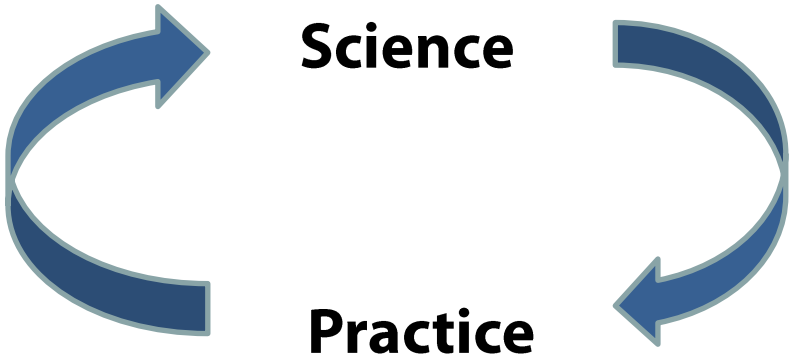


Building the Science Base for Prevention of Injury and Violence

Challenges

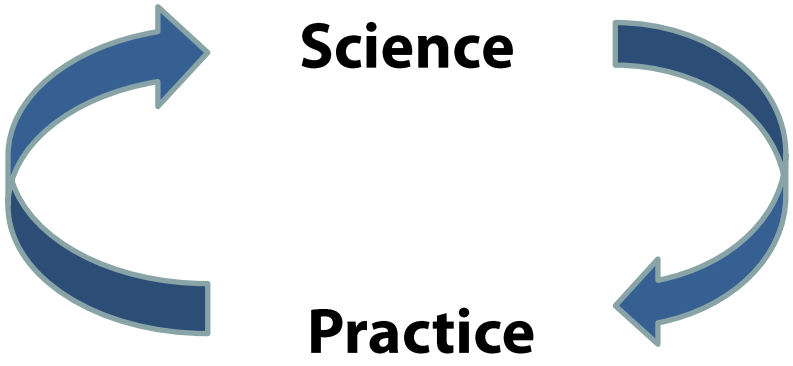
- Policy impact analysis
- Assessment of behavior change
- Economic impact analysis

Science and Practice



- **Community involvement**
  - Identify problems
  - Propose interventional models
  - Test interventions
  - Refine and adapt interventions
  - Ensure feasibility, acceptability, uptake, and sustainability

Science and Practice

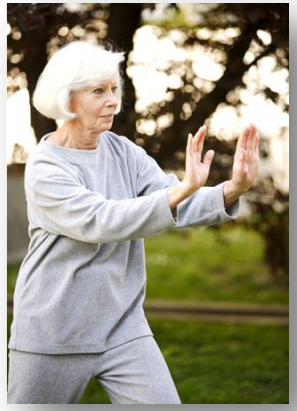


- **Critical role of partnerships**
  - State and local governments
  - State injury programs
  - Academia
  - Community organizations
  - Nongovernmental organizations

Translating Science to Practice

CDC and falls prevention

- Identified and published a compendium of 22 effective interventions from around the world that address prevention of falls in older adults
- Funded U.S. researchers to translate several interventions into programs for specific communities and delivery systems
- 3 programs chosen and currently being piloted in NY, CO, and OR for those ≥65 years old (focus on improving leg strength and balance)
  - Stepping ON
  - Tai Chi
  - Otago



CDC. NCIPC. Preventing Falls: What Works A CDC Compendium of Effective Community-based Interventions from Around the World. http://www.cdc.gov/HomeandRecreationalSafety/Falls/preventfalls.html
http://www.cdc.gov/HomeandRecreationalSafety/Falls/FallsPreventionActivity.html#5

Injury Prevention Works!

Policy or Intervention	Injuries Prevented or Lives Saved
Energy-absorbing steering columns	1,300 fewer driver deaths, 24,200 fewer serious injuries (1978)
Air Force reduced stigma to seek mental health help	USAF suicides fell 33%
Home smoke alarms	Home fire death rate fell from 2.4 to 1.0 deaths per 100,000 people
Maintaining minimum legal drinking age of 21	>600 lives saved each year
Infant walkers redesign	76% reduction in injuries to infants in walkers
Hot water heaters preset to 120°	Hospital admissions for tap water burns in children fell from 5.5 to 2.4 admissions/year

USAF, United States Air Force

Hemenway D. While we were sleeping. Success stories in injury prevention. Berkeley (CA): University of California Press; 2009

Using Surveillance to Drive Interventions: Suicide Prevention in Oregon

Mel Kohn, MD, MPH

State Health Officer and Director

Public Health Division

Oregon Health Authority

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Suicide Touches All of Our Lives

The Toll of Suicide in Oregon in 2010

- 678 deaths
- 8th leading cause of death overall
- More deaths by suicide than motor vehicle crashes
- 2nd leading cause of death in 14–34 year-olds
- 3rd leading cause of death in 35–44 year-olds
- Highest suicide death rates in older males

Deaths are the Tip of the Pyramid

- **For each death there are roughly 11 suicide attempts and many more with suicidal thoughts**
- **Enormous impact on bereaved loved ones ("survivors") and communities**
  - Mental and physical health
  - Quality of life

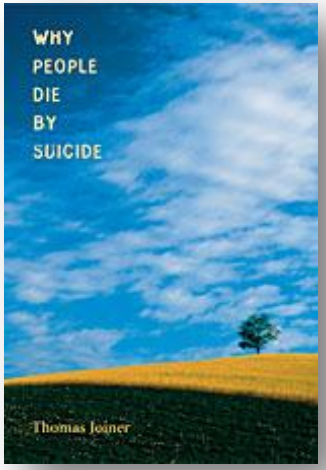
Suicide death rates overall have increased ~10% nationally during past 10 years

CDC Web-based Injury Statistics Query and Reporting System, non-published data WISQARS)

Why Should Public Health Be Involved?

- **Suicide is a public health problem by virtue of huge health burden and rising rates**
- **Public health tools useful for preventing suicide**
  - Epidemiology to describe trends and risk factors
  - Skills for engaging diverse stakeholders
  - Perspective beyond just individual care on social and physical conditions in the community that affect health
  - Ability to develop and implement standards and policy
- **Just as for infectious or chronic diseases, public health plays a complementary role to individual care**

Theories About Why People Die by Suicide



- **T. Joiner proposed 3 key factors**
  - Thwarted belongingness
    (alienation despite trying to connect to others)
  - Perceived burdensomeness
    (feeling like a burden to others)
  - Acquired capability to enact lethal self-injury
    (desensitization to pain and death from repeated exposure)

The risk factor most strongly associated with dying by suicide is having attempted suicide previously

A pattern of increasing lethality of attempts is sometimes observed among suicide decedents

Joiner T. Why people die by suicide. Harvard University Press. 2005

Scientific Evidence for Effectiveness

- **Meta-analysis of 6 systematic reviews (each 6-200 studies)**
  - Identified 2 best practices for clinical, 4 for community settings
- **Best Practices Registry for Suicide Prevention**
  - Maintained by Suicide Prevention Resource Center
  - Funded by SAMSHA
  - 96 items organized into 3 sections based on rigorousness of evidence supporting effectiveness
- **Examples**
  - Training general practitioners to recognize and manage suicide risk
  - Restricting access to lethal means
  - Recommendations for media reporting about suicide

SAMHSA, Substance Abuse and Mental Health Services Administration
Van der Feltz-Cornelis, CM et al. Crisis. 2011; DOI: 10.1027/0227-5910/a000109
Suicide Prevention Research Center Registry, http://www2.sprc.org/bpr/index

Scientific Evidence for "Upstream" Prevention

- **Adverse Childhood Experiences Study**
  - CDC-funded study of over 17,000 adults
  - Strong, graded relationship between the number of adverse experiences in childhood and suicide attempts
  - Percentage of suicide attempts in this population attributable to having ≥1 adverse experience in childhood was 67%
- **Preventing adverse experiences in childhood may be a powerful way to prevent suicides**
- **Expanding programs like nurse home visiting may be a feasible and effective way to enhance suicide prevention in the public health system**

http://acestudy.org
Dube, SR et al. JAMA. 2001:26;286(24):3089-96

Using Surveillance to Apply Best Practices for Suicide Prevention in Oregon

- **National Violent Death Reporting System (NVDRS)**
  - Deaths by suicide, homicide, legal intervention, and deaths of undetermined intent
  - Links data from death certificates, medical examiner, law enforcement and crime laboratory
  - Funded by CDC since 2002
    - 18 states currently funded; intent to make funding nationwide
    - Oregon funded since 2002
  - Provides systematically collected data about circumstances
    - Examples: Substance use, mental health history, etc

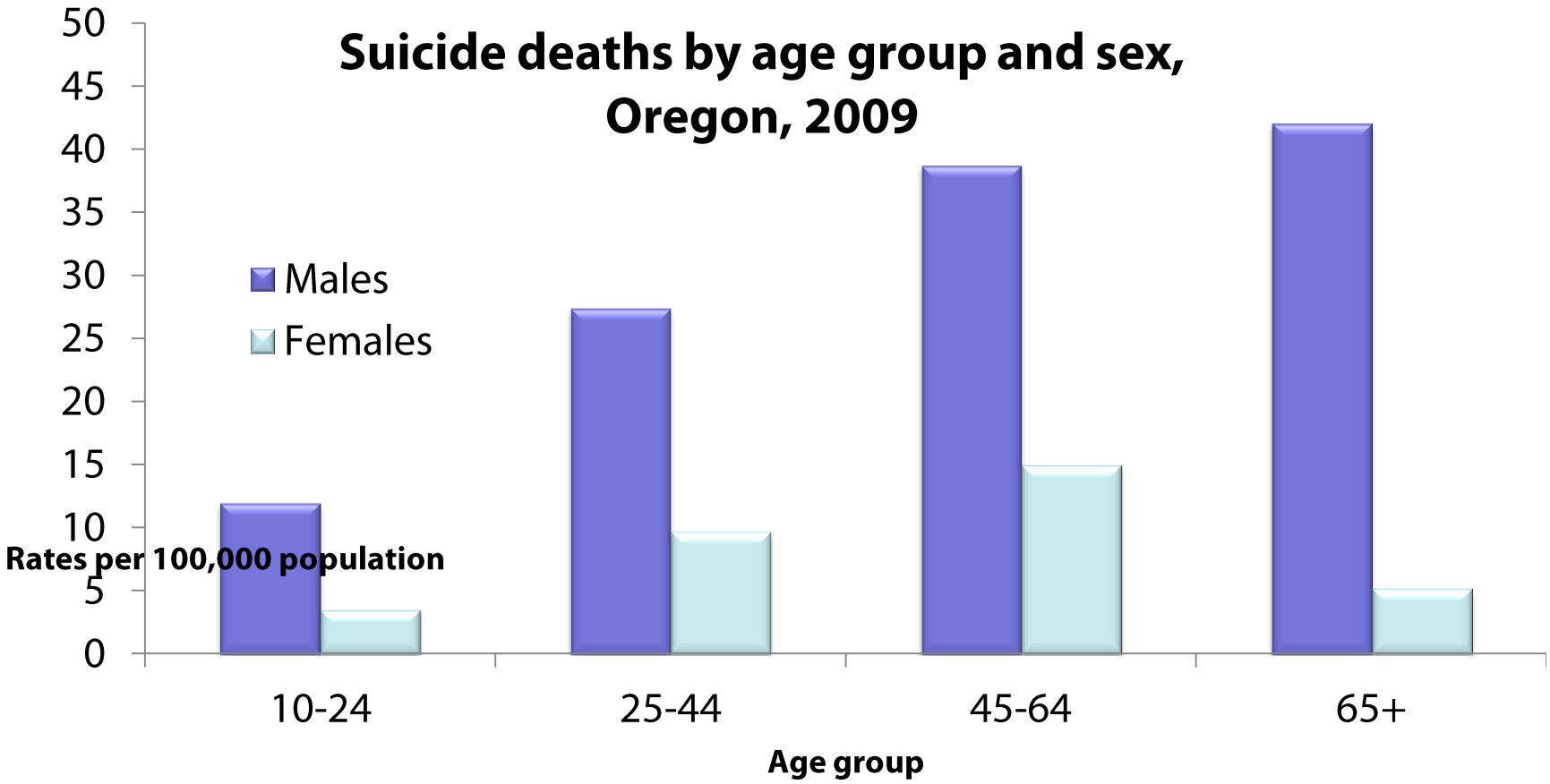
Analyses of Oregon NVDRS data provides menu of prevention opportunities tailored to Oregon

Selected Circumstances Among Suicide Decedents, Oregon, 2009

Circumstances	10-24 yrs (N=59)	25-44 yrs (N=193)	45-64 yrs (N=277	>65 yrs (N=111)
Depressed mood	16 (27%)	67 (35%)	93 (34%)	33 30%)
Alcohol or substance abuse	14 (24%)	66 (34%)	80 (29%)	10 (9%)
Relationship problem	21 (36%)	93 (48%)	74 (27%)	12 11%)
Job or financial problem	6 (10%)	52 (27%)	82 (30%)	7 (6%)
Lived alone	NA*	NA*	NA*	49 (44%)
Chronic disease or declining health	13 (22%)	45 (23%)	94 (34%)	75 (68%)
Saw HCP in <30 days before death	NA*	NA*	NA*	19 (17%)
Disclosed intent	22 (37%)	96 (50%)	106 (38%)	44 (40%)

Data suggest that different interventions and settings for interventions should be used for different age groups

Highest Rates of Suicide Deaths in Older Males



Older Adult Suicide Prevention Plan

- **Funding: CDC and SAMHSA**
- **Process**
  - Literature review, epidemiology review, interviews with experts
  - Steering committee,13 multidisciplinary community forums
- **Strategies: 3 categories that help illustrate the role of public health in suicide prevention**
  - Clinically based
  - Community based
  - Public health surveillance, evaluation, and research

SAMHSA, Substance Abuse and Mental Health Services Administration
Http://public.health.oregon.gov/PreventionWellness/SafeLiving/SuicidePrevention/Documents/OlderAdult/plan.pdf

Results and Ongoing Activities

- **Raised awareness about older adult suicide and profile of injury program**
  - Numerous presentations to legislature
  - Testimony before US Senate Select Committee on Aging
  - Local media coverage
  - Widely read Health Department newsletter for health care providers
- **Began integration of suicide prevention into other services**
  - Tai Chi program for falls prevention among veterans
  - Included in broader discussions about promoting "healthy aging"
- **Developed training for primary care providers on recognizing and managing suicide risk**

Vannoy, SD et al. J Gen Intern Med 26(9):1005–11
Training for primary care providers:
http://public.health.oregon.gov/DiseasesConditions/InjuryFatalityData/Documents/Elder%20suicide%20prevention%20healthcare%20training2008.pdf

From Evidence to Policy:
0.08 Blood Alcohol Concentration Laws in the United States

David Sleet, PhD, MA

Associate Director for Science

Division of Unintentional Injury Prevention

National Center for Injury Prevention and Control

Centers for Disease Control and Prevention

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

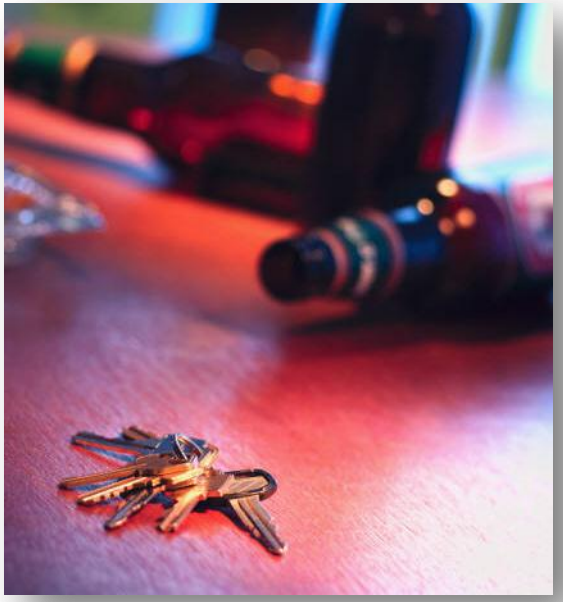
Overview

- **A success story – public health in action**
  - From scientific evidence to policy to saving lives
  - Lowering the legal limit of blood alcohol concentration (BAC)
    - From .10 g/dL to .08 g/dL (or from .10% to .08%)

BAC, Blood alcohol concentration
g/dL, Grams per deciliter

Public Health Problem

- **Impact of alcohol-impaired driving**
  - 10,228 deaths each year
    - 1/3 of all traffic deaths
    - 30 deaths every day
  - Costs >$51 billion a year



1 in 10 Americans will be involved in an alcohol-related crash in their lifetime

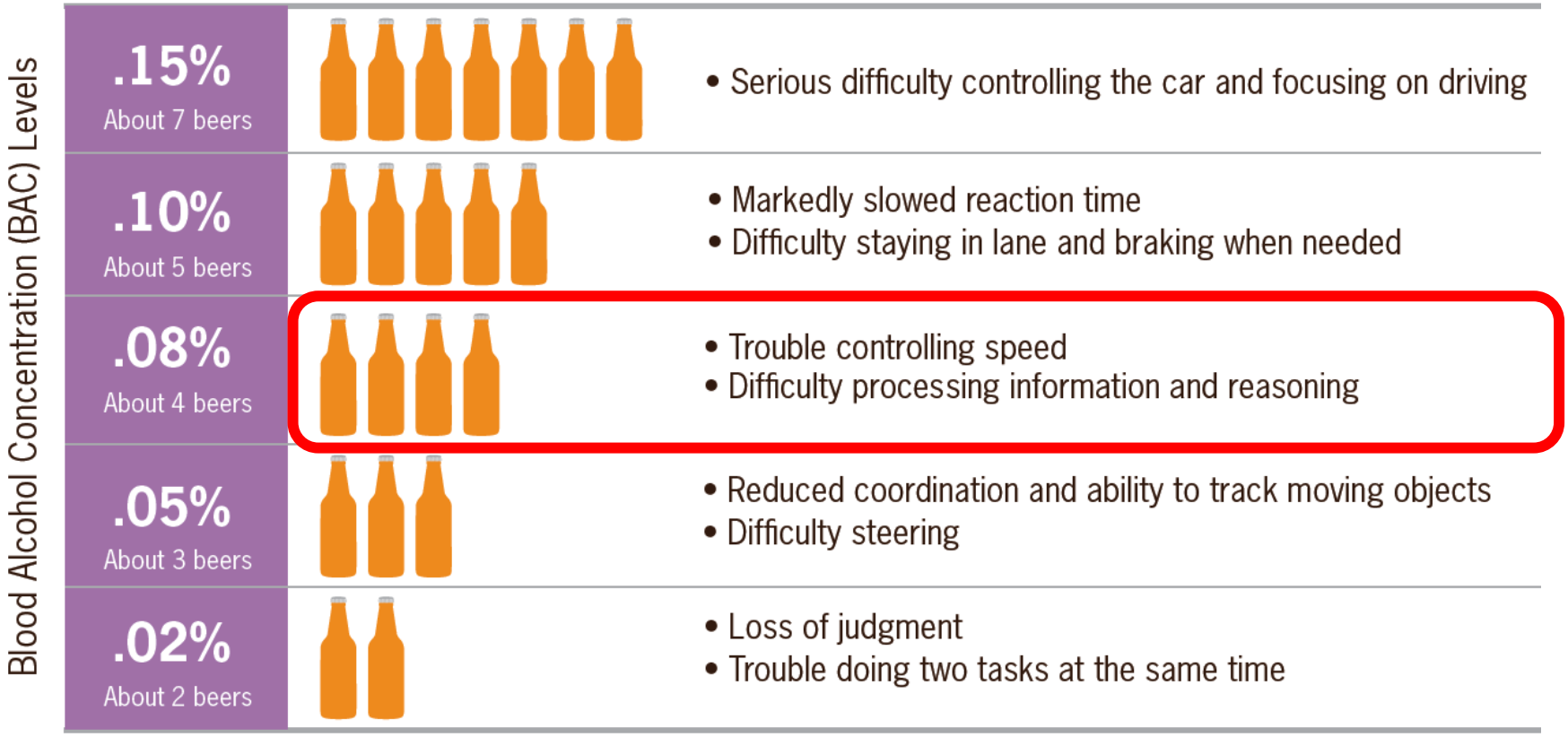
National Highway Traffic Safety Administration (NHTSA).Traffic Safety Facts 2009: http://www-nrd.nhtsa.dot.gov/Pubs/811385.pdf
Blincoe L, et al. Dept of Transportation (US), NHTSA), 2002
CDC. MMWR Vital Signs, 2011. http://www.cdc.gov/mmwr/pdf/wk/mm60e1004.pdf

Blood Alcohol Concentration

- **Blood alcohol concentration (BAC)**
  - The measure of the amount of alcohol in a person's bloodstream
- **BAC can be detected by testing**
  - Blood
  - Breath
  - Urine
- **BAC of .08% means that a person has .08 grams of alcohol per deciliter of blood (.08 g/dL)**

BAC, Blood alcohol concentration
g/dL, Grams per deciliter

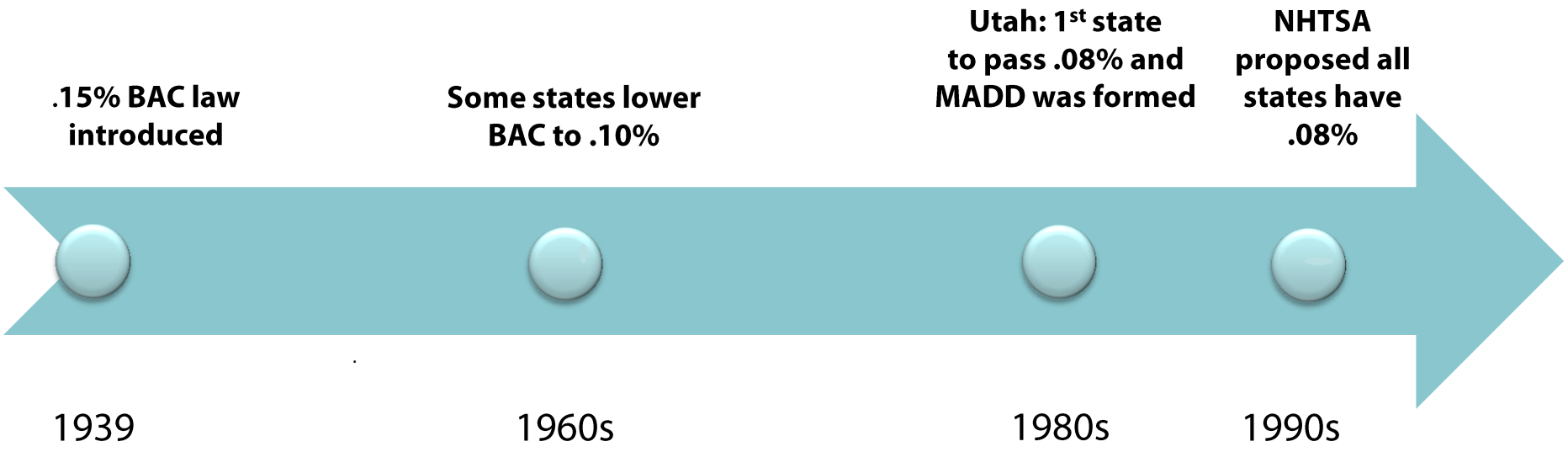
Alcohol, BAC, and Effects on Driving



Number of beers represents the approximate amount of alcohol that a 160-lb man would need to drink in 1 hour to reach the listed BAC in each category.

BAC, Blood alcohol concentration
http://www.cdc.gov/Motorvehiclesafety/Impaired_Driving/bac.html

History of BAC Laws and Related Developments in the United States



BAC, Blood alcohol concentration
MADD, Mothers Against Drunk Driving
NHTSA, National Highway Traffic Safety Administration
http://www.nhtsa.gov/nhtsa/whatsup/tea21/GrantMan/HTML/18f_154-164QAs.html

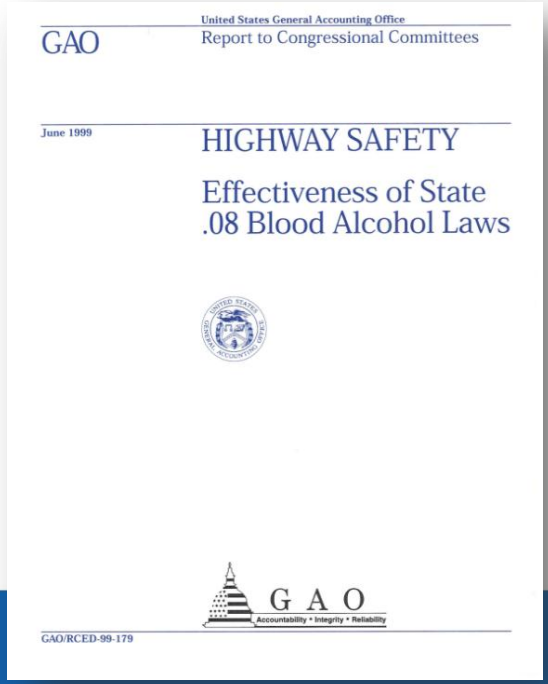
Status of Policy and Scientific Evidence, 1998

- **Legislative proposal was introduced requiring states to enact and enforce .08% BAC laws or face cuts in federal highway funds**
  - Proposal did NOT pass
- **Evidence at the time**
  - 4 studies on effectiveness of BAC laws in 5 states

BAC, Blood alcohol concentration

Updated Scientific Evidence, 1999

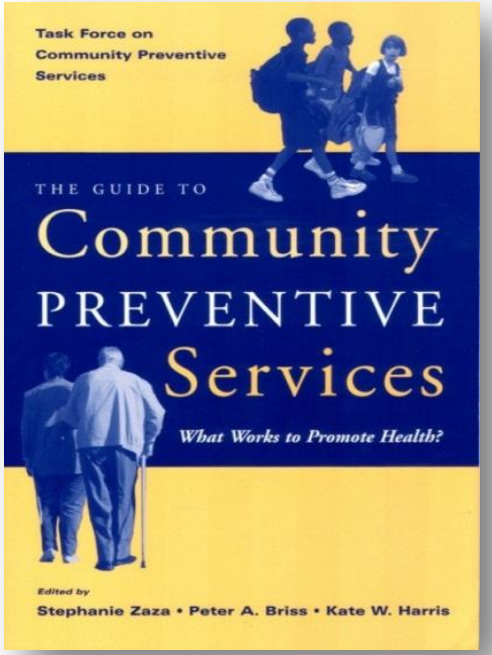
- **GAO report released in June 1999**
  - Conclusion: "Overall, the evidence does not conclusively establish that .08% BAC laws, by themselves, result in reductions in the number and severity of alcohol-related crashes."



BAC, Blood alcohol concentration
GAO, Government Accountability Office
GAO Report: http://www.gao.gov/archive/1999/rc99179.pdf

Systematic Review of the Evidence, 1999

- **The Task Force** on Community Preventive Services**, began a systematic review of the effectiveness of .08% BAC laws**
  - Assembled a review team
  - Evaluated all available studies
  - Selected those of high quality
  - Synthesized results



http://www.thecommunityguide.org/index.html

Results and Recommendations of the Task Force on Community Preventive Services, 2000

- **Systematic review results**
  - A median 7% decline in fatalities, estimated to save 400–600 lives annually
- **Task Force recommendations**
  - .08% BAC laws are effective in reducing alcohol-related traffic fatalities, and are recommended based on strong evidence of their effectiveness

Shults, R et al. Am J Prev Med 2001;21:4S
Hingson, R et al. Inj Prev 2000;6:109-114
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5007a1.htm
www.thecommunityguide.org/mvoi/AID/BAC-laws.html

From Science to Policy

- **Task Force communicated its findings and recommendations to partners and policy makers**

> **"…because CDC, the Community Guide, and the Task Force are viewed as the gold standard of objective science, the letter effectively settled the data-debate…"**

www.thecommunityguide.org/mvoi/AID/BAC-laws.html

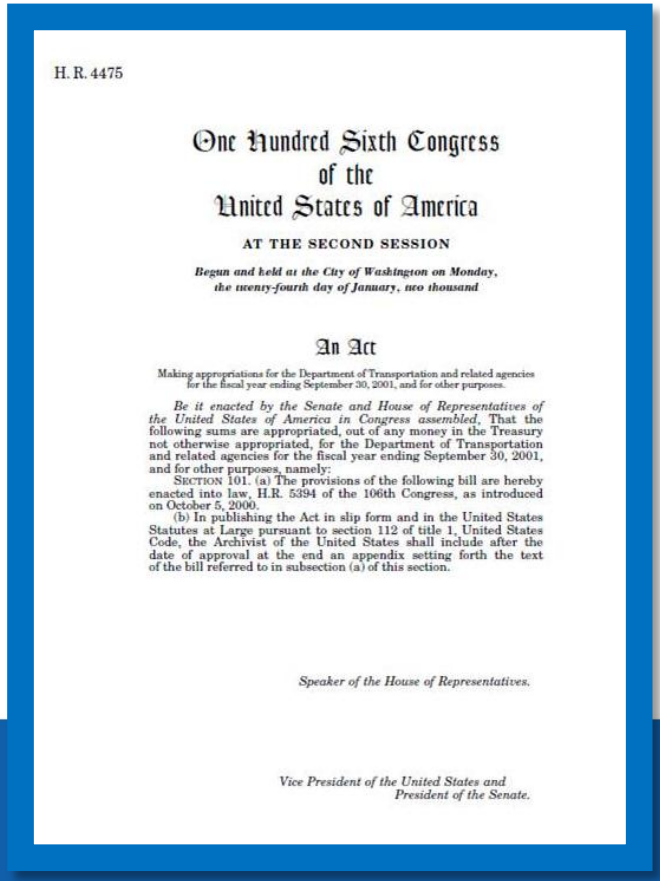
Federal Legislative Success

- **Congress approved the bill that included cuts in highway funds for states without a .08% BAC law,**
  - The bill was signed into law by President Clinton on October 23, 2000

President Clinton Signs Federal .08 BAC Drunk Driving Law

MADD Applauds Passage of .08 Measure Predicted to Prevent 500 Highway Deaths Annually if Every State Passes the Law

WASHINGTON, Oct. 23 /PRNewswire/ -- The nation has a new standard for drunk driving as President Clinton, with the support of Mothers Against Drunk Driving, today signed a federal law that will require each state to pass .08 blood alcohol concentration (BAC) as the legal limit or lose a portion of their federal highway funding. Congress passed the .08 BAC measure on October 6, 2000, as part of the Federal Transportation Appropriations Bill.



H. R. 4475

One Hundred Sixth Congress
of the
United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Monday, the twenty-fourth day of January, two thousand

An Act

Making appropriations for the Department of Transportation and related agencies for the fiscal year ending September 30, 2001, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums are appropriated, out of any money in the Treasury not otherwise appropriated, for the Department of Transportation and related agencies for the fiscal year ending September 30, 2001, and for other purposes, namely:

SECTION 101. (a) The provisions of the following bill are hereby enacted into law, H.R. 5394 of the 106th Congress, as introduced on October 5, 2000.

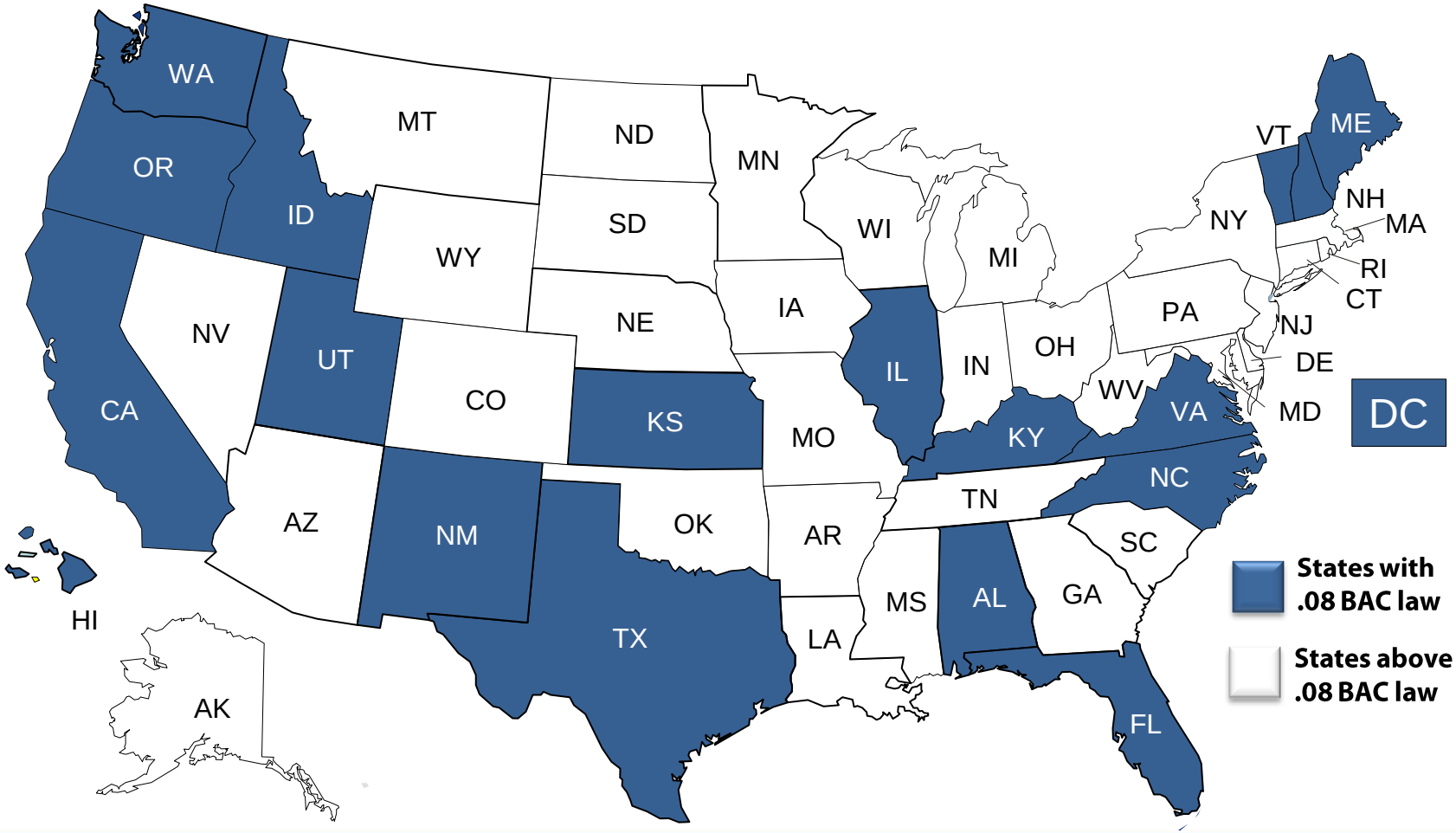
(b) In publishing the Act in slip form and in the United States Statutes at Large pursuant to section 112 of title 1, United States Code, the Archivist of the United States shall include after the date of approval at the end an appendix setting forth the text of the bill referred to in subsection (a) of this section.

Speaker of the House of Representatives.

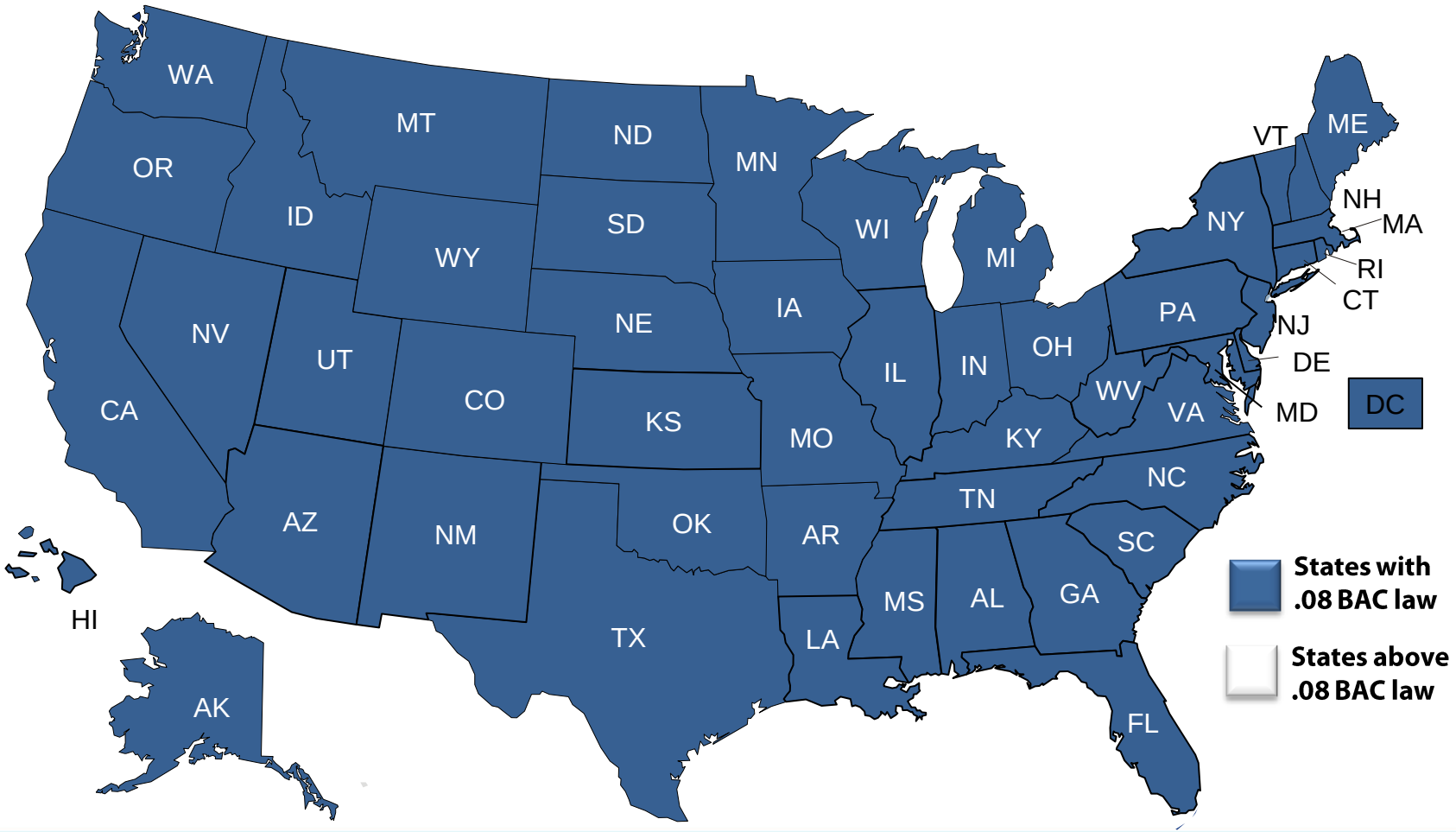
Vice President of the United States and President of the Senate.

http://www.gpo.gov/fdsys/pkg/PLAW-106publ346/pdf/PLAW-106publ346.pdf

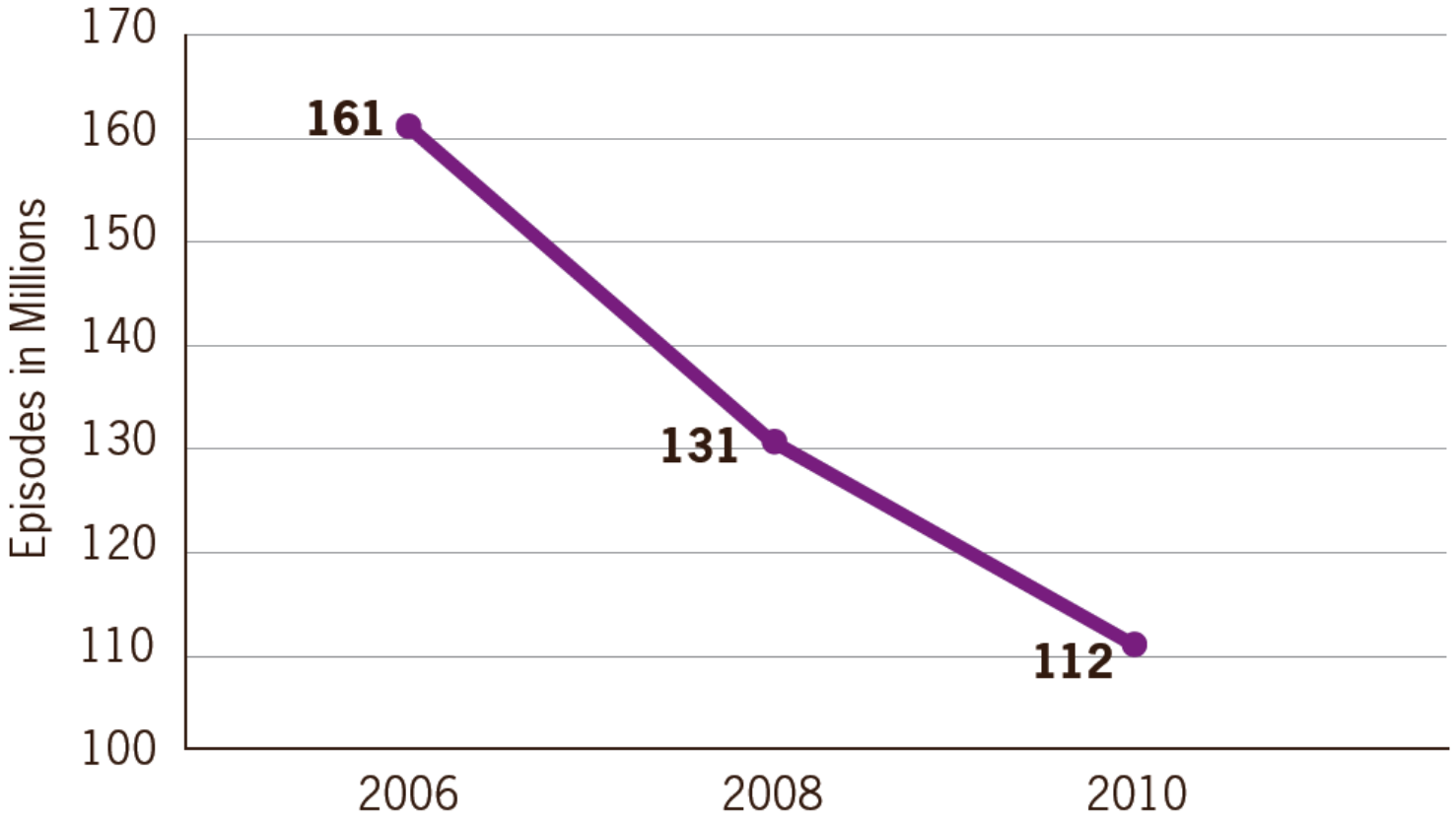
States with .08% BAC Laws in effect by 2000



States with .08% BAC Laws in 2004

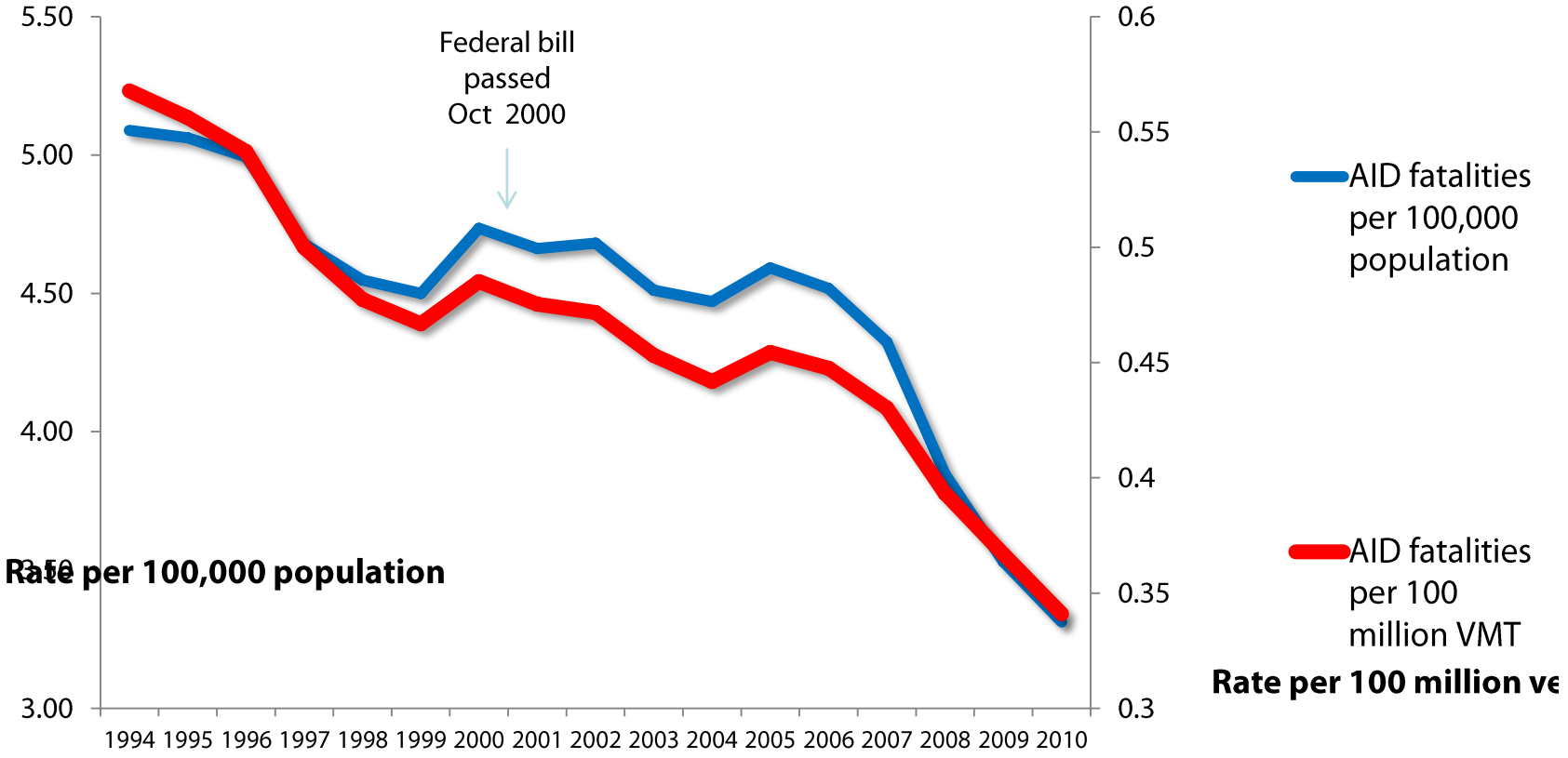


Impact: Self-reported Annual Drinking and Driving Episodes



CDC MMWR. Vital Signs: http://www.cdc.gov/mmwr/pdf/wk/mm60e1004.pdf

Alcohol-impaired Driving Death Rates 1994–2010



AID, Alcohol impaired driving
VMT, Vehicle miles traveled
National Highway Traffic Safety Administration Fatality Analysis Reporting System (FARS): http://www-fars.nhtsa.dot.gov/Main/index.aspx

Lessons Learned for Translating Research to Policy

- **Seek high-quality scientific evidence**
  - The Community Guide process: Organized and thorough
  - Evidence from credible sources
    - CDC
    - The Community Guide Task Force
- **Involve partners**
  - Find champions
- **Use effective policy levers**
  - Carrot vs. stick

Partners: NHTSA, MADD, American College of Preventive Medicine, NIAAA, National Safety Council, Advocates for Highway Safety, Society for Public Health Education, and others

Mercer, et al. Annals of Epidemiology 2010;20:412-20

Lessons Learned for Translating Research to Policy

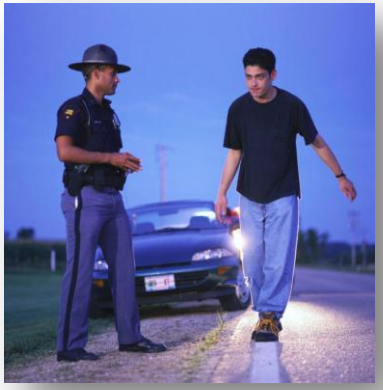
- **Tailor findings**
  - Translate scientific findings into health impact
- **Timeliness**
  - Look for "policy windows"
  - Anticipate future needs
- **Sustainability and impact**
  - Keep partners engaged

Moving Forward

- Translate more evidence into policy and practice
- Improve ways to expedite evidence-based policy
- Enhance the role of public health

Specific Steps to Further Reduce Alcohol Impaired Driving

- **Support and promote**
  - Ignition interlocks
  - Sobriety checkpoints
  - Primary seat belt law enforcement
  - Reducing binge drinking
  - Systematic review of lower BAC limits



The Next 20 Years: Challenges and Opportunities for Injury and Violence Prevention

Georges C. Benjamin, MD, FACP, FACEP(E), FNAPA, Hon FRSPH

Executive Director, American Public Health Association

Ultimate Goal for Injury and Violence Prevention

Normalize injury and violence prevention as a core component within the governmental public health infrastructure

- **Accepting injury and violence as public health issues**
- **Creating a sustainable and effective structure at the state and local level**
  - Putting in place adequate funding and legal authorities
- **Building a robust advocacy network in all states to support efforts to reduce injury and violence**

Challenges and Opportunities for the Future

- Shift emphasis to broad health protections
- Implement health reform and system redesign
- Pay for prevention in a restrained economy
- Address altered needs from changing demographics
- Adapt to the global community
- Manage rapid innovation and disruptive technology
- Utilize social media and fast communication
- Become visible to document value
- Define the role of government and public policy
- Take accountability for healthy outcomes

Shift Emphasis to Broad Health Protections

- **Broaden the focus of interventions that improve health**
  - Chronic diseases
  - Disabilities
  - Disasters/terrorism
  - Patient safety
  - Safe communities
  - Built environment
  - Other social determinates

Implement Health Reform and System Redesign

- **Emergency and trauma centers**
  - Emergency care is an essential health benefit
  - Injury and trauma care system development
- **Poison control centers**
  - A more valued entity

http://www.whitehouse.gov/healthreform/healthcare-overview

Pay for Prevention in a Restrained Economy

- **Emphasis on cost avoidance and savings**
- **Redesign injury services**
- **Increased partnerships**
  - Link public health with clinical communities
  - Enhance public–private partnerships for research and programs
    - Share expertise
    - Expand funding sources

Address Altered Needs from Changing Demographics: Older and More Diverse Populations

- Dementia as a risk factor for injury
- Falls with injury
- Physical disabilities
- Cultural competency
- Injury inequities

Adapt to the Global Community

- Climate change
- Transportation
- Product safety
- Trade policy
- Occupational safety
- Abusive cultural norms
- Weapons and conflict

Manage Rapid Innovation and Disruptive Technology

- **New technology expands opportunities for prevention in**
  - Interventions
    - Motor vehicle safety systems
    - Helmet design and protective equipment for athletes
  - Research
    - Information technology and improved data collection
    - Wireless data entry and communication

- **Technology can also increase the risk of injury**

Utilize Social Media and Fast Communication

Twitter

Facebook

LinkedIn

Blog

YouTube

Flickr

Foursquare

E-mail

With unbrokered health information…
validation becomes the key to good injury prevention

Become Visible to Document Value

***Problem*: Prevention is invisible because when it work nothing happens!**

***Goal*: Prevention must become visible**

In 2009, 1,770 CHILDREN DIED as a reslt of maltreatment = 5 children died every day = 71 classrooms

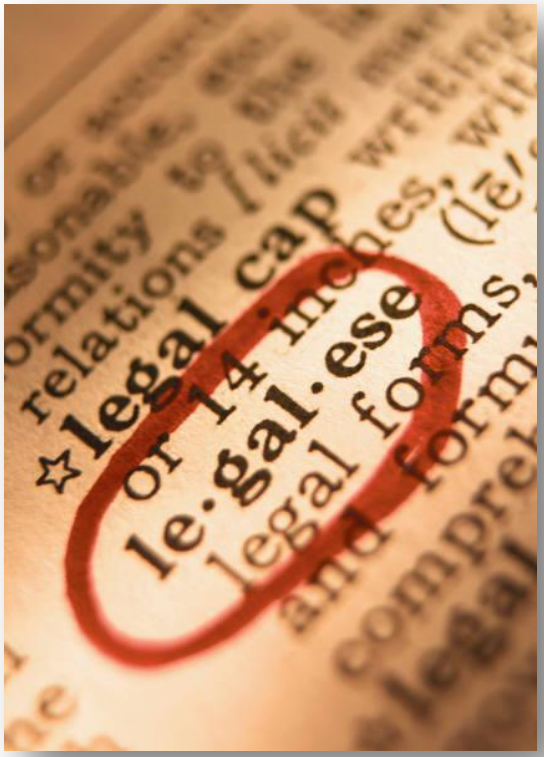
***Task*: Find ways to demonstrate public health's value**

Implementation of the Positive Parenting Program ("triple P") for a population of 100,000 children under 8 years old would prevent nearly 700 cases of child maltreatment and 60 injuries due to maltreatment

Prinz, RJ et al. Prev Sci 2009:10(1):1-12

Define the Role of Government and Public Policy

- **Public policy is what government chooses to do (or not to do) about problems**
  - Laws and regulations
  - Budget
  - Formal policy goals
  - Agency practices



Define the Role of Government and Public Policy towards Reducing Automobile Fatalities

- **Reasons for government intervention**
  - Safety and public welfare
  - Moral/ethical
  - Political
  - Economic: Market failures

Define the Role of Government and Public Policy

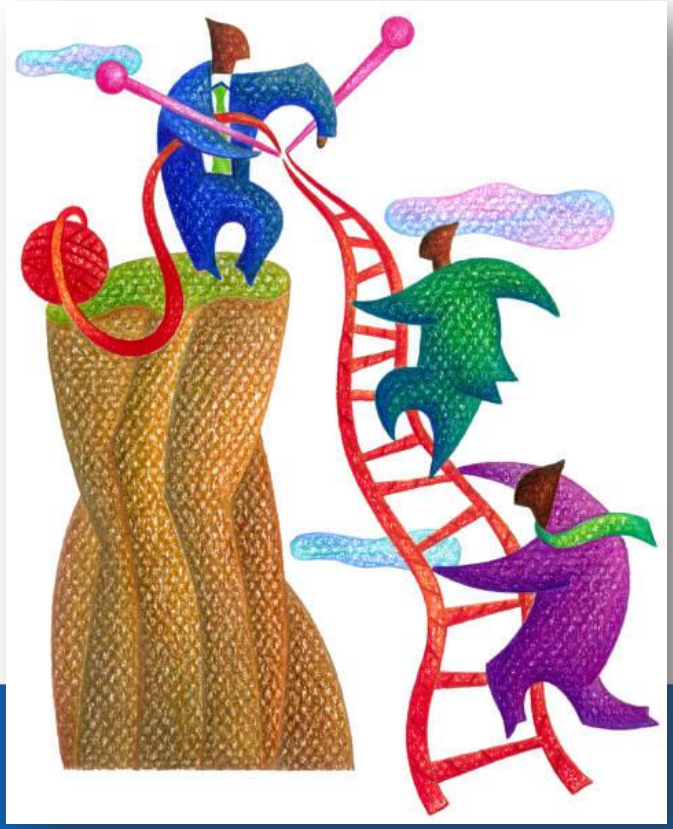
- **Policy as a health improvement tool**
  - **Policy is an effective tool**
    - Smoke free laws
    - Graduated Drivers Licensing policy
    - Seat belt enforcement
    - Motorcycle helmet laws
    - Workplace safety laws
    - Alcohol impaired driving laws
  - **Enforcement is essential**

Taking Accountability for Healthy Outcomes

- **Must demand accountability from all stakeholders**
  - Clinical practitioners
  - Public health practitioners
  - Business
  - Media
  - General public
- **Public officials and leaders have a special responsibility**
  - Legal responsibility for community health and well-being
  - Fiscal responsibility for taxpayer dollars

Taking Accountability for Healthy Outcomes

Accountability means addressing injury throughout the life span



Ultimate Goal for Injury and Violence Prevention

Normalize injury and violence prevention as a core component within the governmental public health infrastructure

- **Accepting injury and violence as public health issues**
- **Creating a sustainable and effective structure at the state and local level**
  - Putting in place adequate funding and legal authorities
- **Building a robust advocacy network in all states to support efforts to reduce injury and violence**

Our Injury and Violence Prevention World by 2032

- **Injury reduction requires broad partnerships with many sectors**
  - Education systems
  - Housing and urban development
  - Transportation systems
  - Business community
  - Media

Our Injury and Violence Prevention World by 2032

A world where safety is no accident!

- Injury is viewed as a preventable event
- All segments of society are engaged in injury prevention and control
- Violence prevention becomes routine for all people and institutions