Firearm Injuries As a Major Cause of Death among Children and Teens

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FACTS
FIREARM SAFETY AMONG CHILDREN AND TEENS

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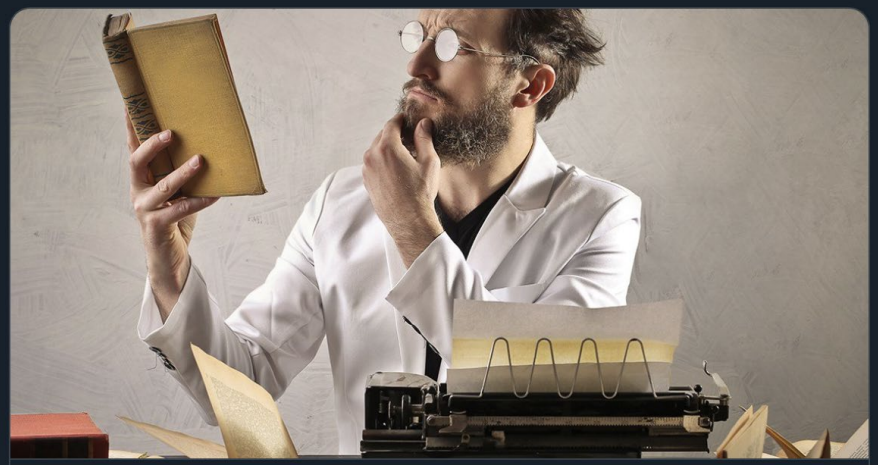
- CDCP U01CE002698 (Zimmerman)
- NIAAA R01 AA024755 (Walton)
- CDCP R49 CE003099 (Cunningham)

Where is our lane when it comes to firearm injury prevention?

NRA
@NRA

Someone should tell self-important anti-gun doctors to stay in their lane. Half of the articles in Annals of Internal Medicine are pushing for gun control. Most upsetting, however, the medical community seems to have consulted NO ONE but themselves.



NRA-ILA | Surprise: Physician Group Rehashes Same Tired Gun Control Policies
Everyone has hobbies. Some doctors' collective hobby is opining on firearms policy. Half of the articles in the "Latest from Annals" email from the Annals of...
nraila.org

2:43 PM · Nov 7, 2018 · Twitter Web Client

Follow

Do you have any idea how many bullets I pull out of corpses weekly? This isn't just my lane. It's my ****** highway.

'Stay in your lane,' NRA tells doctors who want to reduce gun deaths
nbcnews.com/health/health- ... via @nbcnews

7:12 AM - 9 Nov 2018

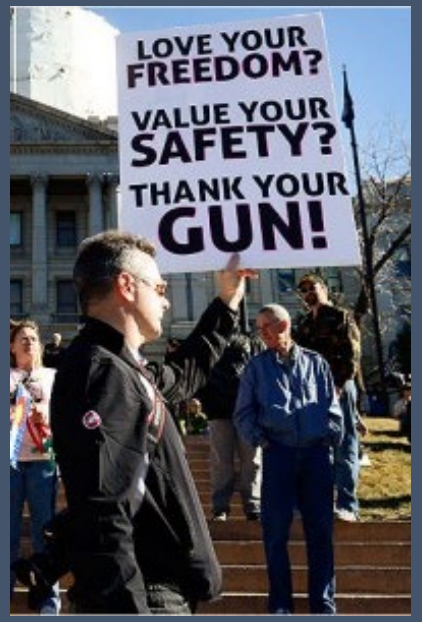
161,503 Retweets **540,780** Likes

5.3K 162K 541K

To the @NRA, this is what it looks like to stay in #mylane. We will not be silent about the toll of #gunviolence. I speak out for this patient, for their parents who will never be the same, for every person who came after this one and didn't have to #thisiseveryoneslane

Goal: Disengage from the culture war - Focus on the Science of Firearm Safety

Maybe we could focus on the science!



Firearms as a Public Health Disease

Firearms as a Public Health Disease

“If it’s not a health issue, why are people dying from it?”

Former Surgeon General
David Satcher, MD, PhD
1993

Pediatric Firearm Injury

Firearms are the **second** leading cause of death among children

Fatalities, 2008-2017, 1-18 years old

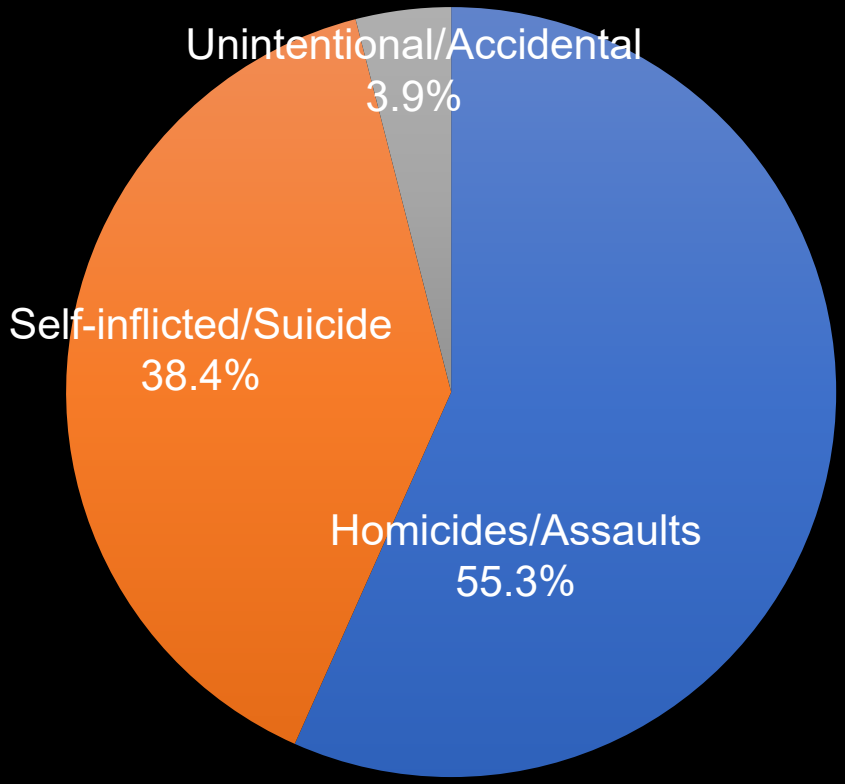
33,577 Motor-Vehicle Crashes

20,719 Firearm-related Injuries

17,111 Malignant Neoplasm

WONDER (2019); Cunningham, Walton, & Carter NEJM (2018)

Mechanism of Firearm Injuries among Children (1-18 y/o)

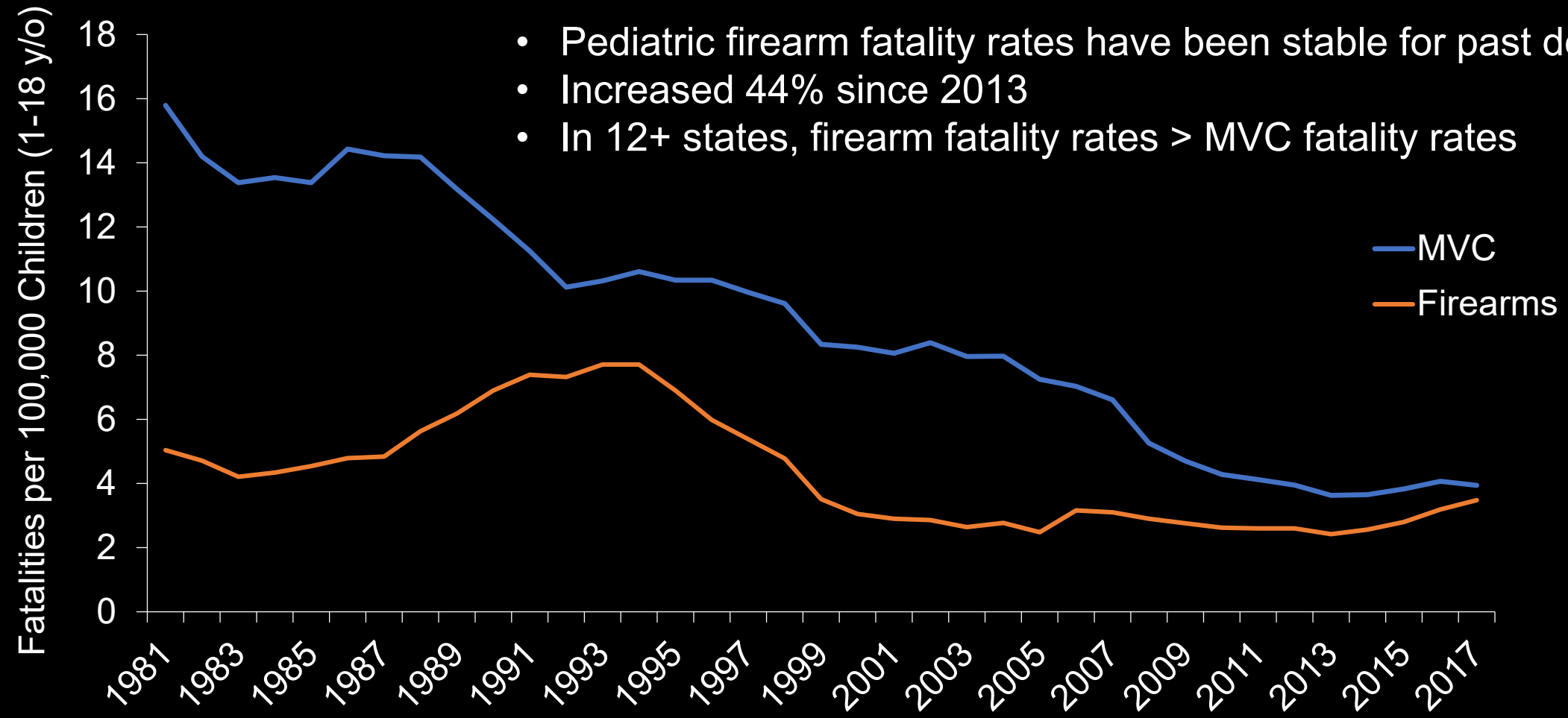


*2.4% Undetermined Intent

WONDER (2019)

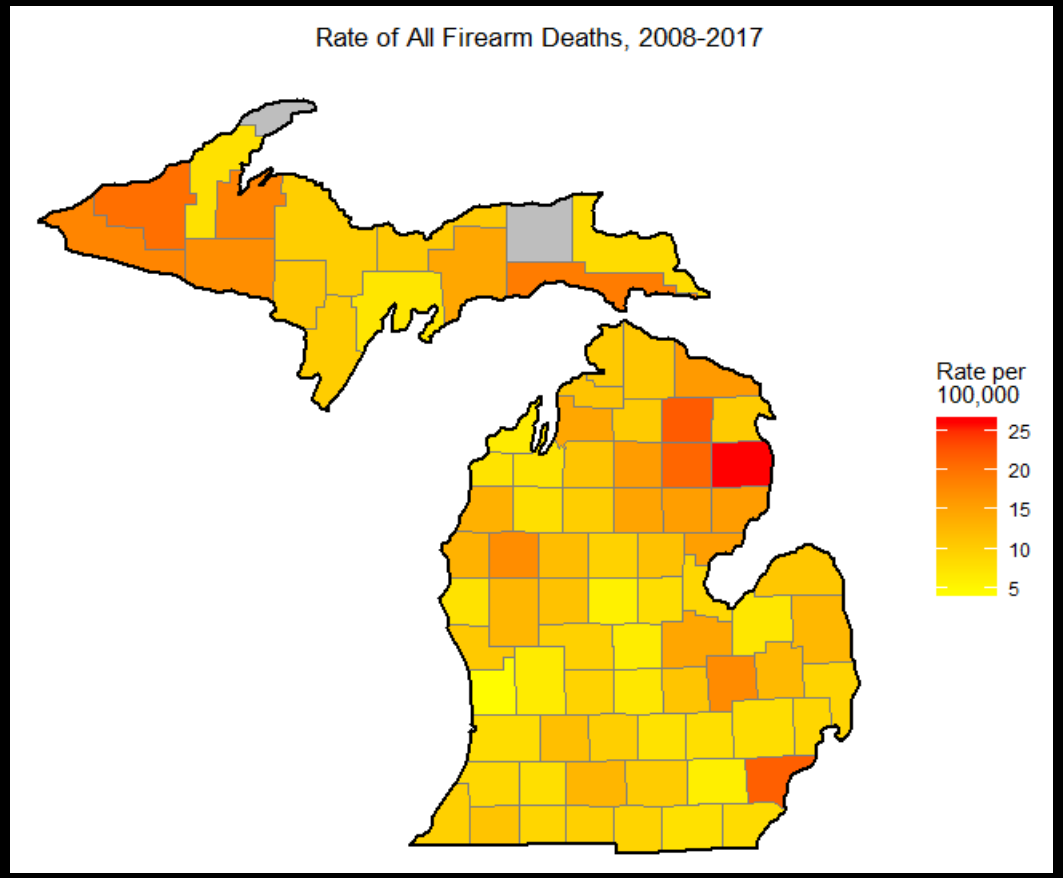
Pediatric Injury Trends Over Time (1981-2017)

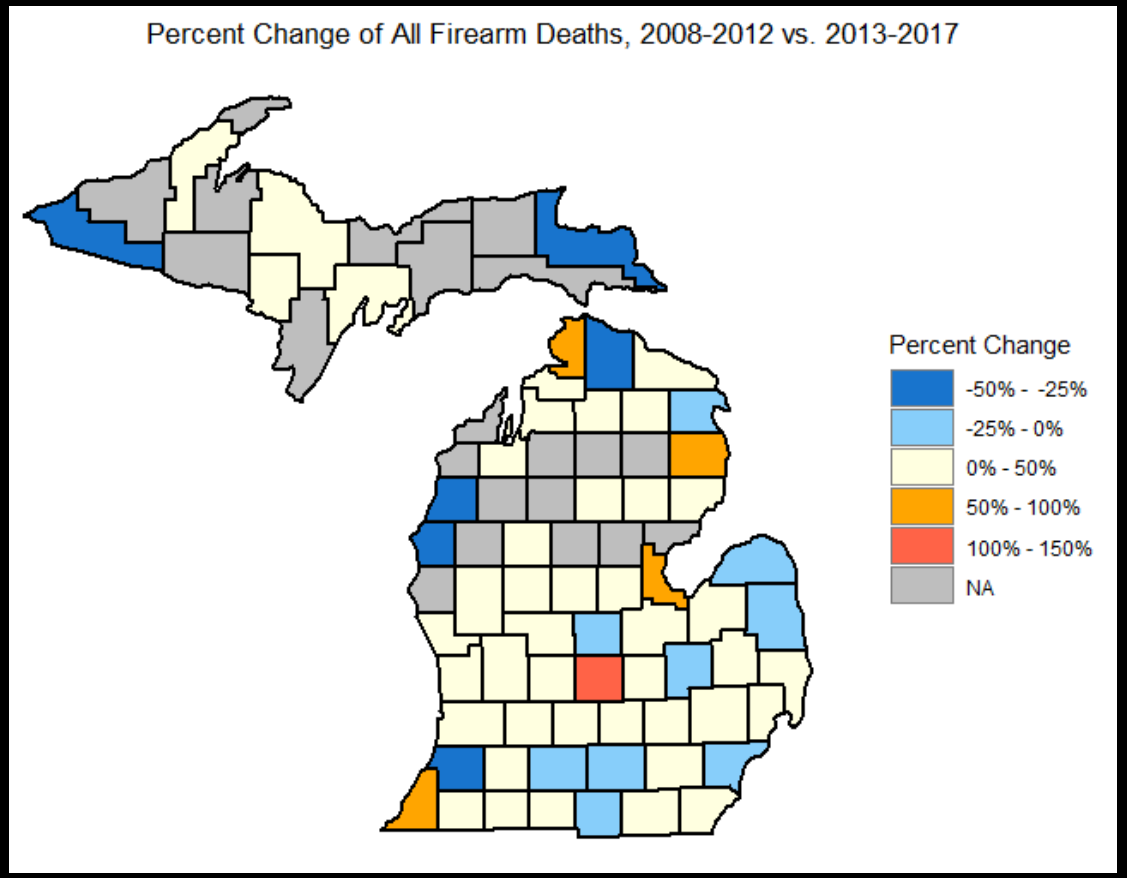
- Pediatric firearm fatality rates have been stable for past decade
- Increased 44% since 2013
- In 12+ states, firearm fatality rates > MVC fatality rates



WONDER (2019)

Michigan Firearm Injury Trends





WONDER (2019)

How does the U.S. Compare Globally?

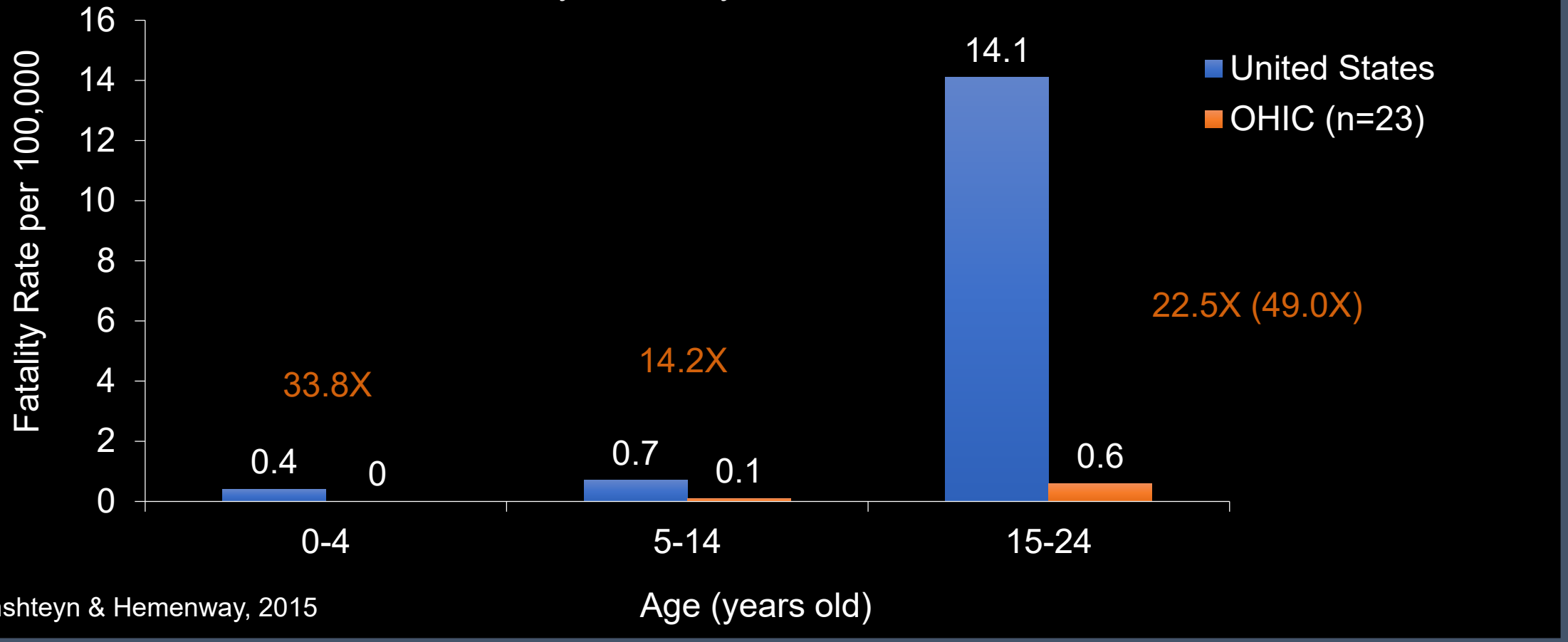
U.S. is average among OECD nations in the following:

- Non-firearm homicide rates
- Urban crime rates
- Adolescent fighting and bullying
- Overall completed suicide rates
- Mental Illness
- Teen alcohol abuse/dependence
- Use of violent media

Grinshteyn & Hemenway, 2015

For firearms, we are above average…

- 91% of all 0-14 y/o killed by a firearm are killed in the US
- 92% of all 15-24 y/o killed by a firearm are killed in the US

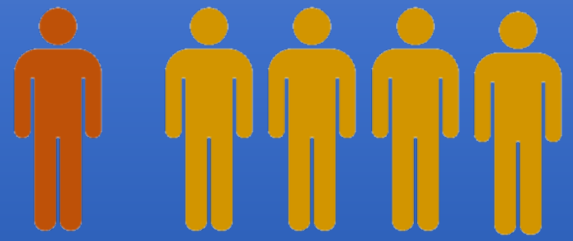


Grinshteyn & Hemenway, 2015

High-Risk Subgroups of Children

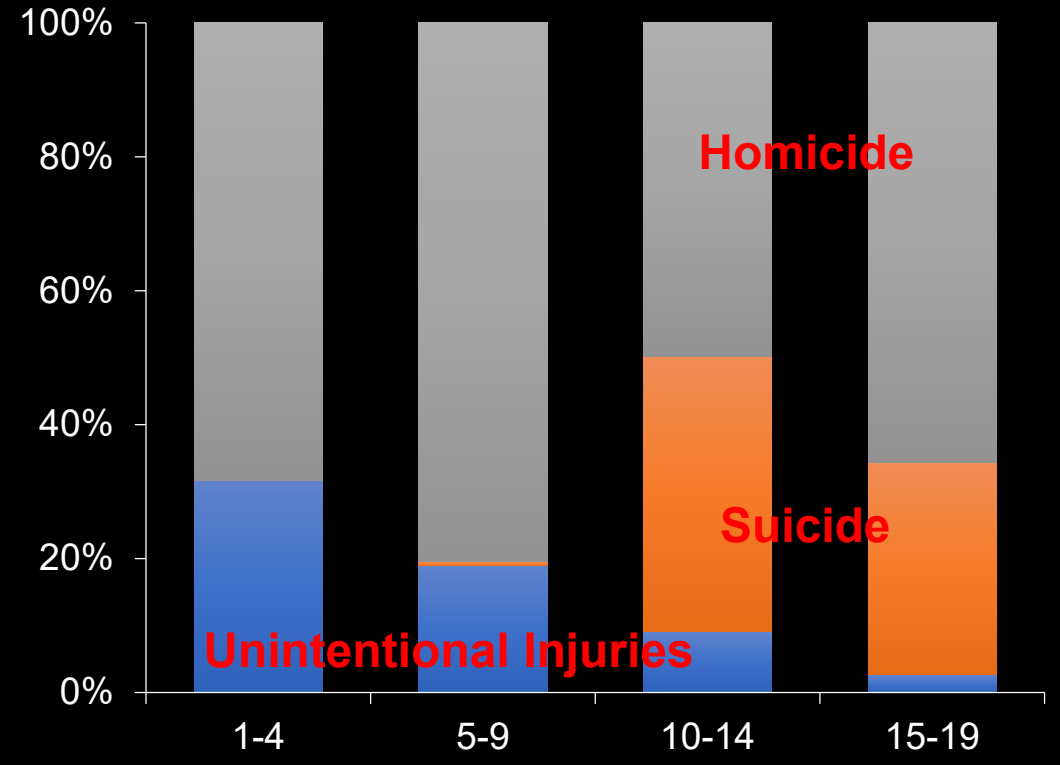
Adolescents (15-19 y/o) are at the highest risk for firearm death

Firearm injuries are responsible for 1 out of every 5 deaths that occur among older adolescent youth (age 15-19)



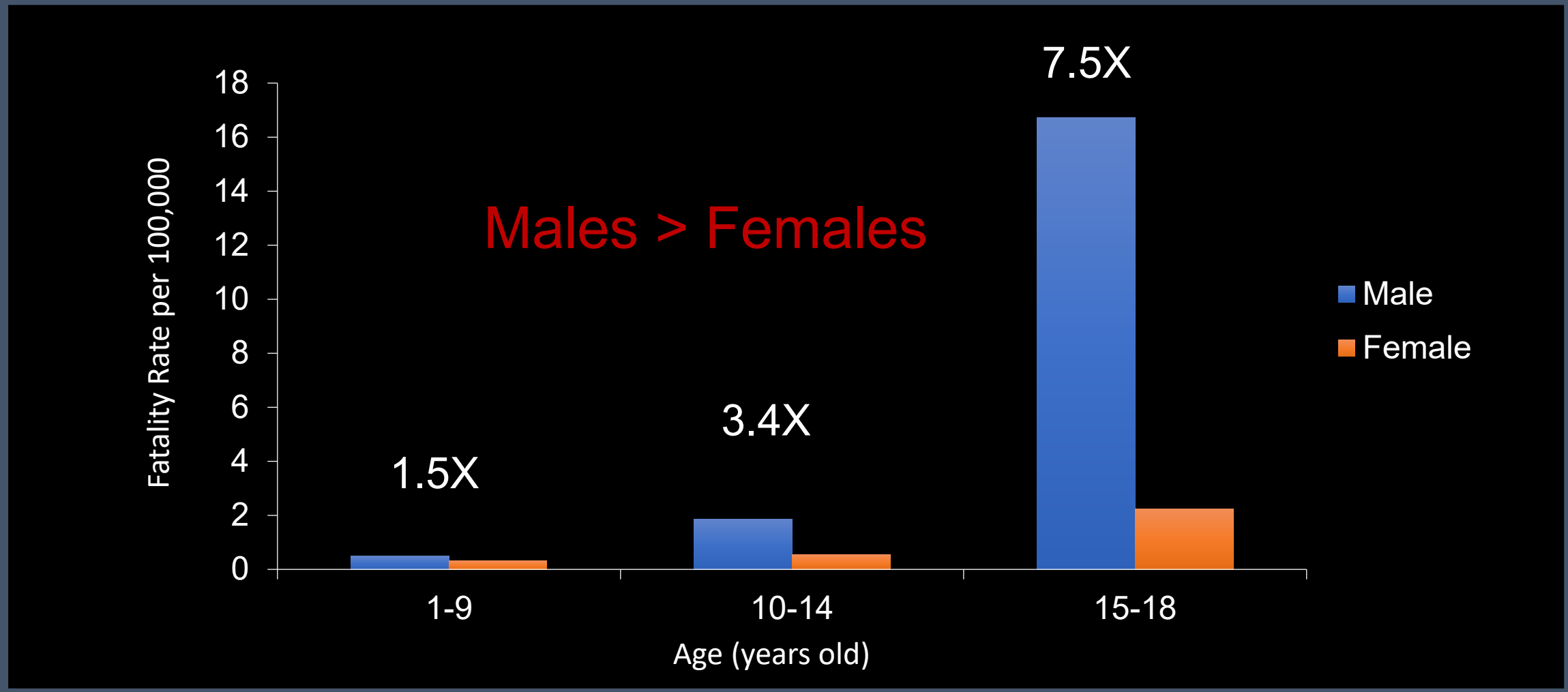
WONDER (2018)

Firearm Injury Mechanism Varies by Age in Children and Adolescents



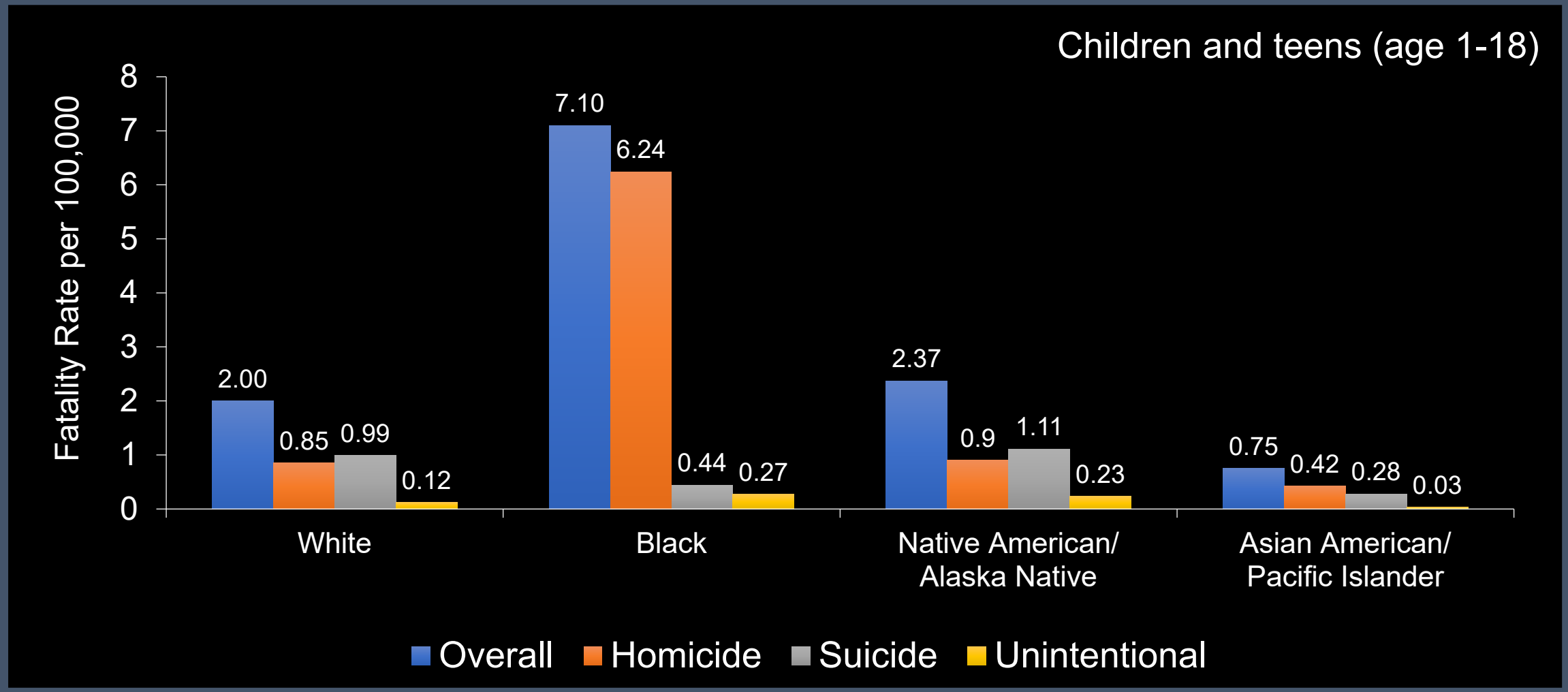
Fatalities (2006-2016), WONDER 2018

High-Risk Subgroups (2006-2016)



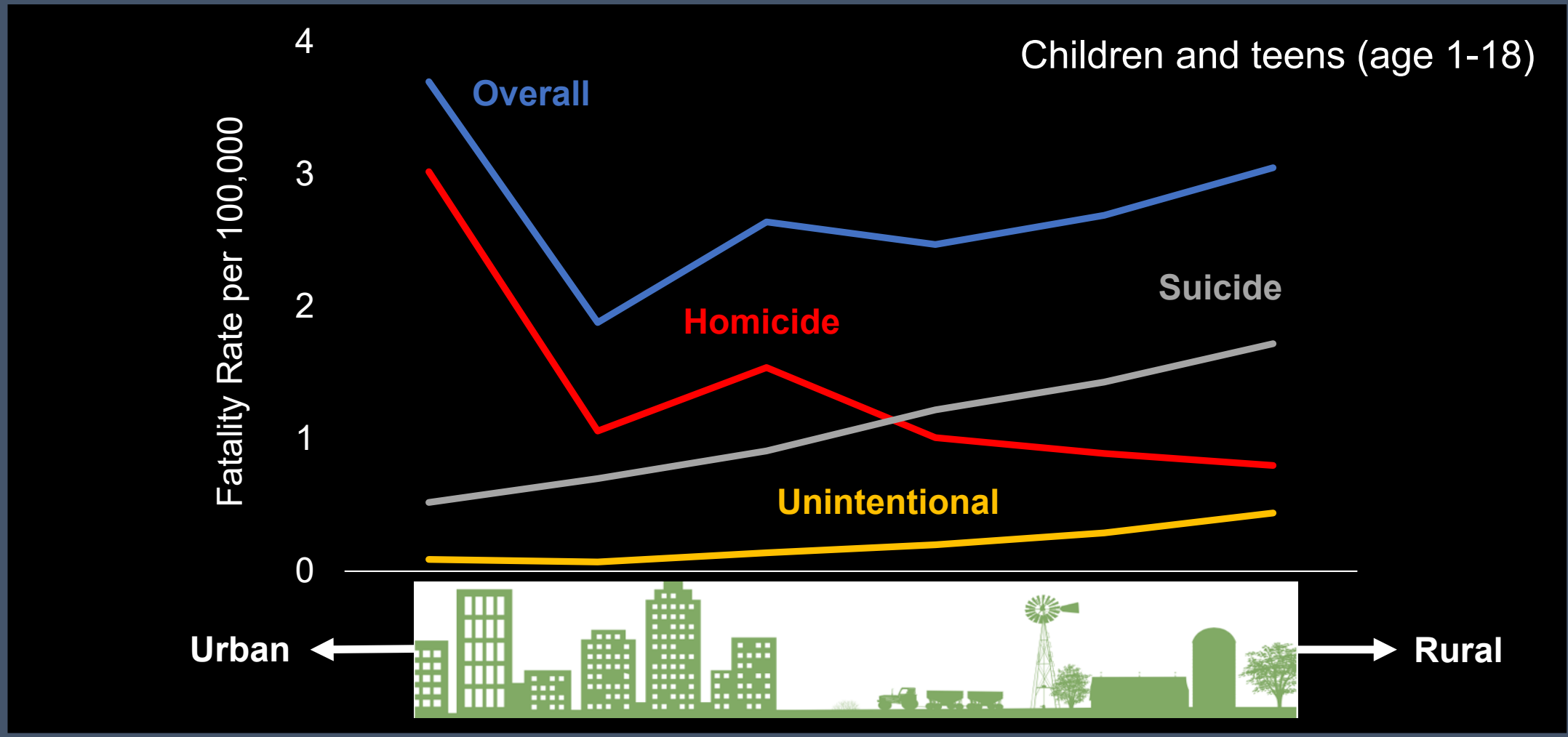
WISQARS (2018)

Health Disparities (2006-2016)



CDC WONDER (2018)

Rural-Urban Disparities (2006-2016)



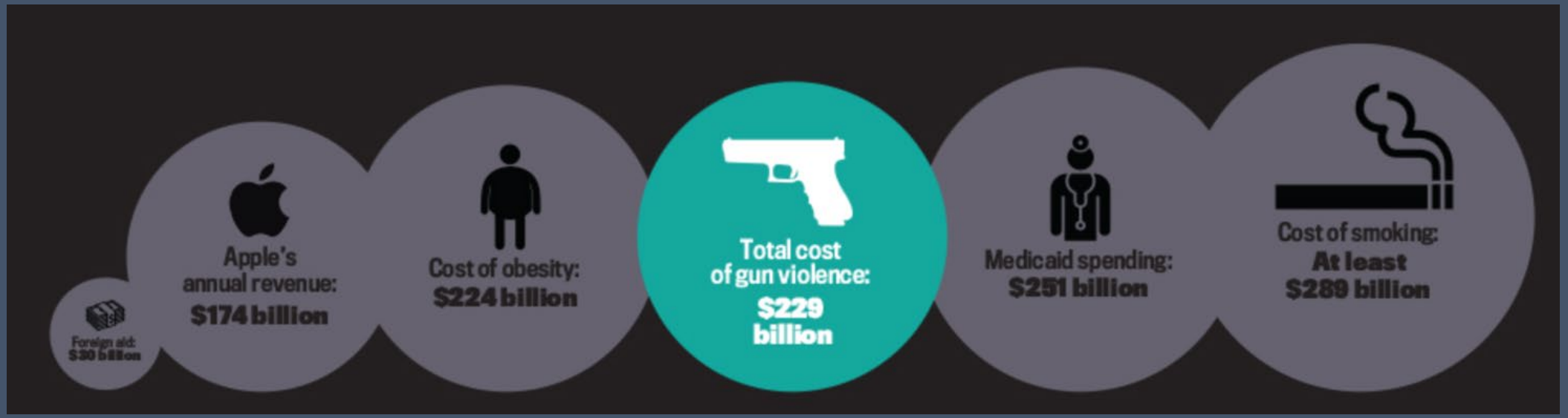
CDC WONDER (2018)

School Shootings

- <1 % of pediatric homicides & suicides occur in schools
- Among on-site school homicides/suicides:
  - 27% Suicides; 69% Homicides; 4% Homicide & Suicide
  - 68% acquired the weapon from their home or that of a relative
  - Weapon type: 61% handgun; 49% rifle/shotgun
- 2000-2017: 52 active shooter incidents at elementary, secondary and post-secondary institutions
  - 67 fatalities & 86 non-fatal firearm injuries
  - 2/3 involved single firearm (60% handguns)
  - Perpetrators were all male, majority prior or current students

Robers, Zhang & Truman, 2012; Modzelenski et al 2008; CDC 2012

Societal Costs of Firearm Injuries

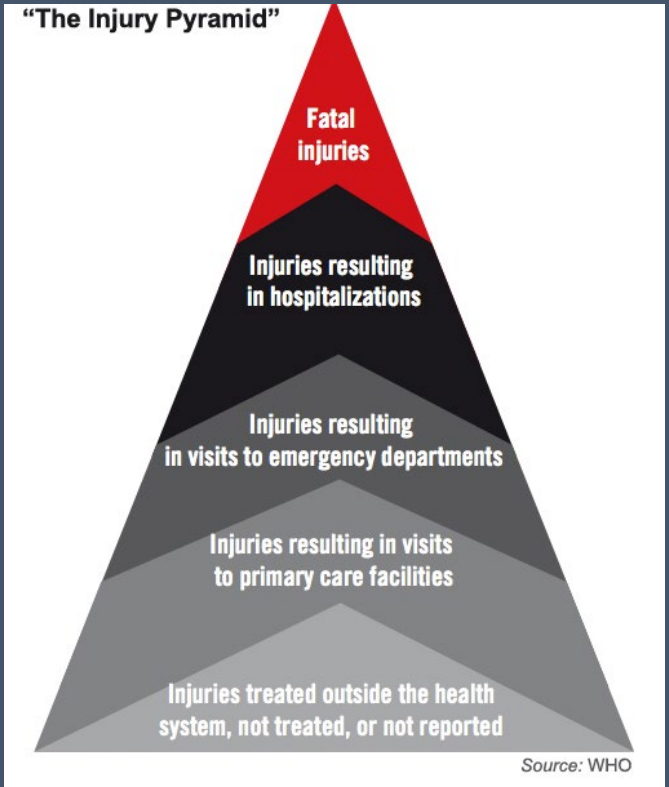


- Firearm Injuries costs the U.S. ~229 billion annually*
- Direct costs (i.e. medical costs) - ~$8.6 billion*
- Majority of costs are indirect costs due to lost work/productivity, lost quality of life, and criminal justice/jail time

Ted Miller PhD, Principal Research Scientist, Pacific Institute Research and Evaluation (PIRE); Atlantic 2015

*Not pediatric specific

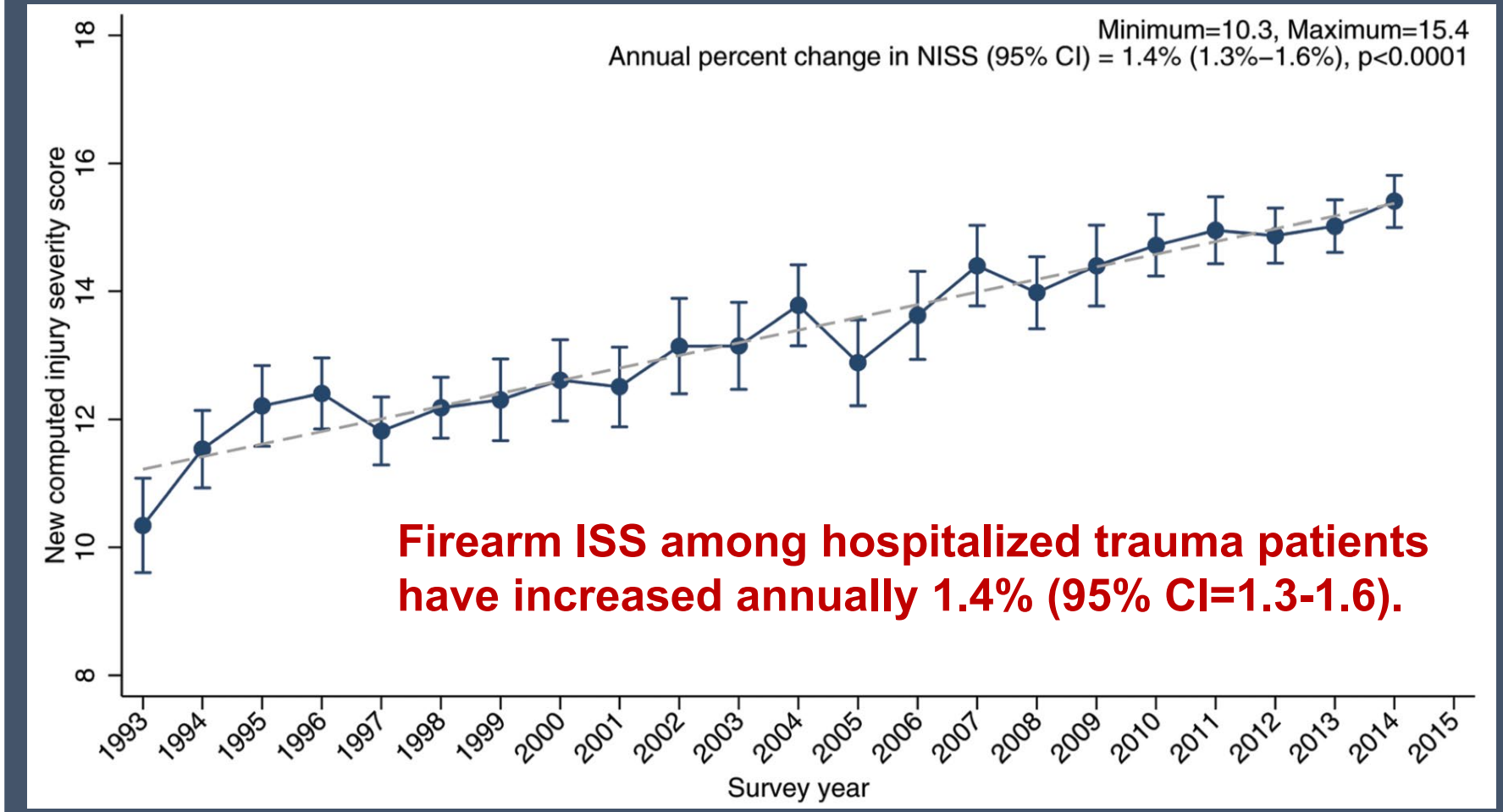
Non-fatal Firearm Injuries



- ~12,000 children/adolescents injured seriously enough to require ED treatment in 2016
- Majority of non-fatal firearm injuries occur among adolescents
- Mechanisms of Injury
  - < 10 years old = Unintentional; >10 years old = Assault-type Injuries
  - Suicide smallest number (case fatality rate = 90%)
- Types of Injuries Rate of Admission = 48.3%
  - 75% involve injuries to Upper/Lower Extremities
  - 20% head, neck or spinal injuries; 20% poly-traumatic injuries
- Long-term morbidity is substantial after pediatric firearm injuries
  - >50% require long-term disability care
  - ~3,200 children unable to independently perform age-specific ADLs annually

WISQARS 2016; Carter, Alpern, Cunningham et al 2016; Discala & Sege 2004; Arslan 2002; Leventhal 2014

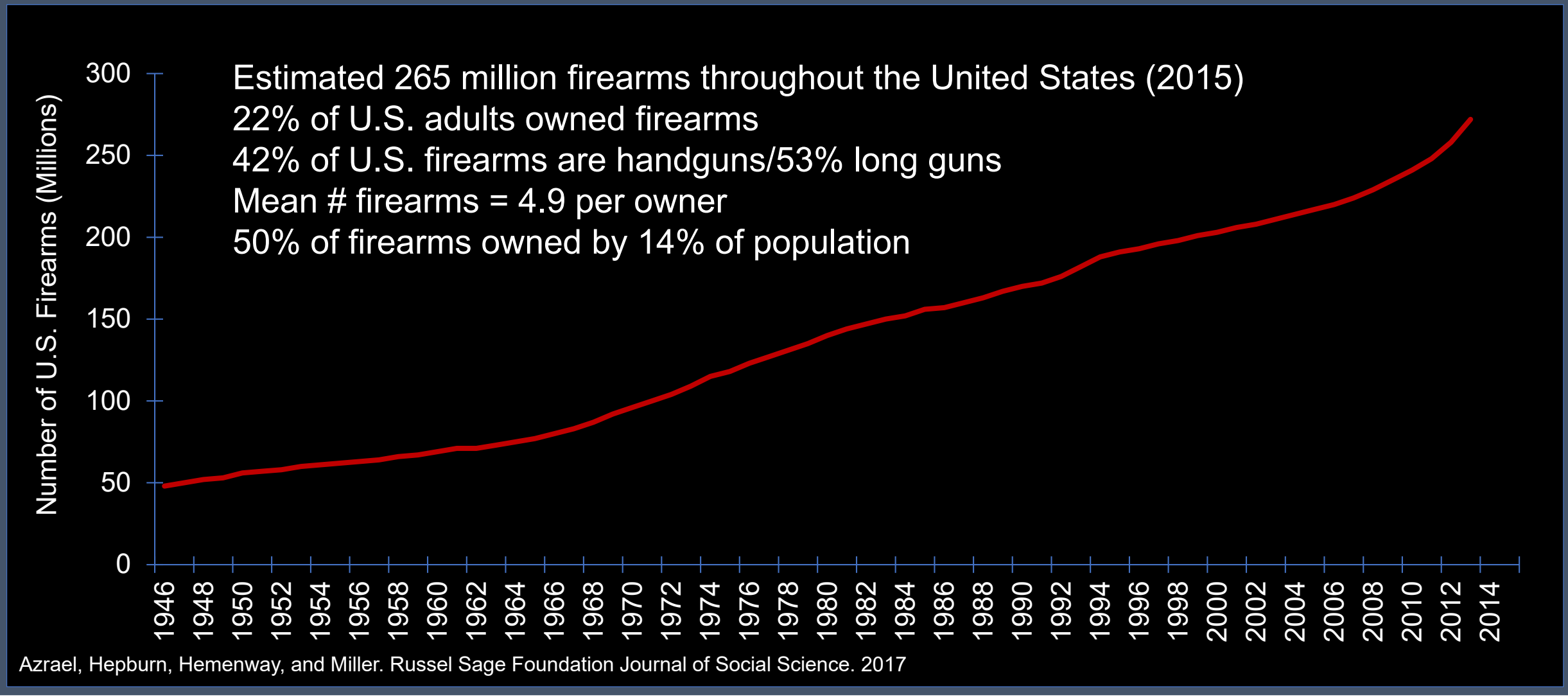
Trends in GSW Injury Severity Score (ISS) among Hospitalized Trauma Patients (1993-2014)



- Increases primarily from young (age 16-45) and older adults (age > 45).
- Among children (age < 16), increases occurred between 1992-1995 and 1998-2014, with plateau between 1995-1998.
- Increases similar by sex and intent.
- Overall findings reflect increasing injury severity for hospitalized firearm injuries & changing patterns of injury management.

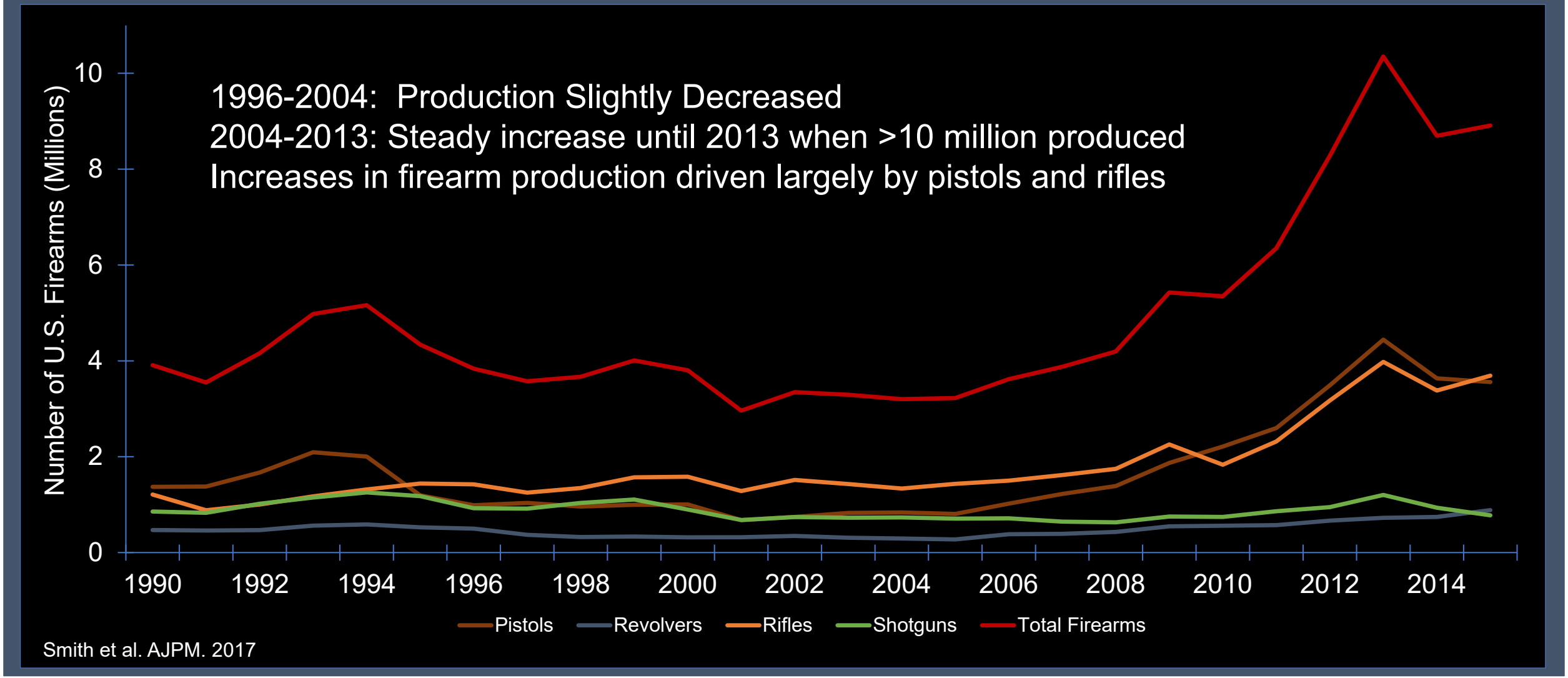
Kalesan et al., Trauma Surg & Acute Care Open, 2018

Estimated of Number of U.S. Firearms



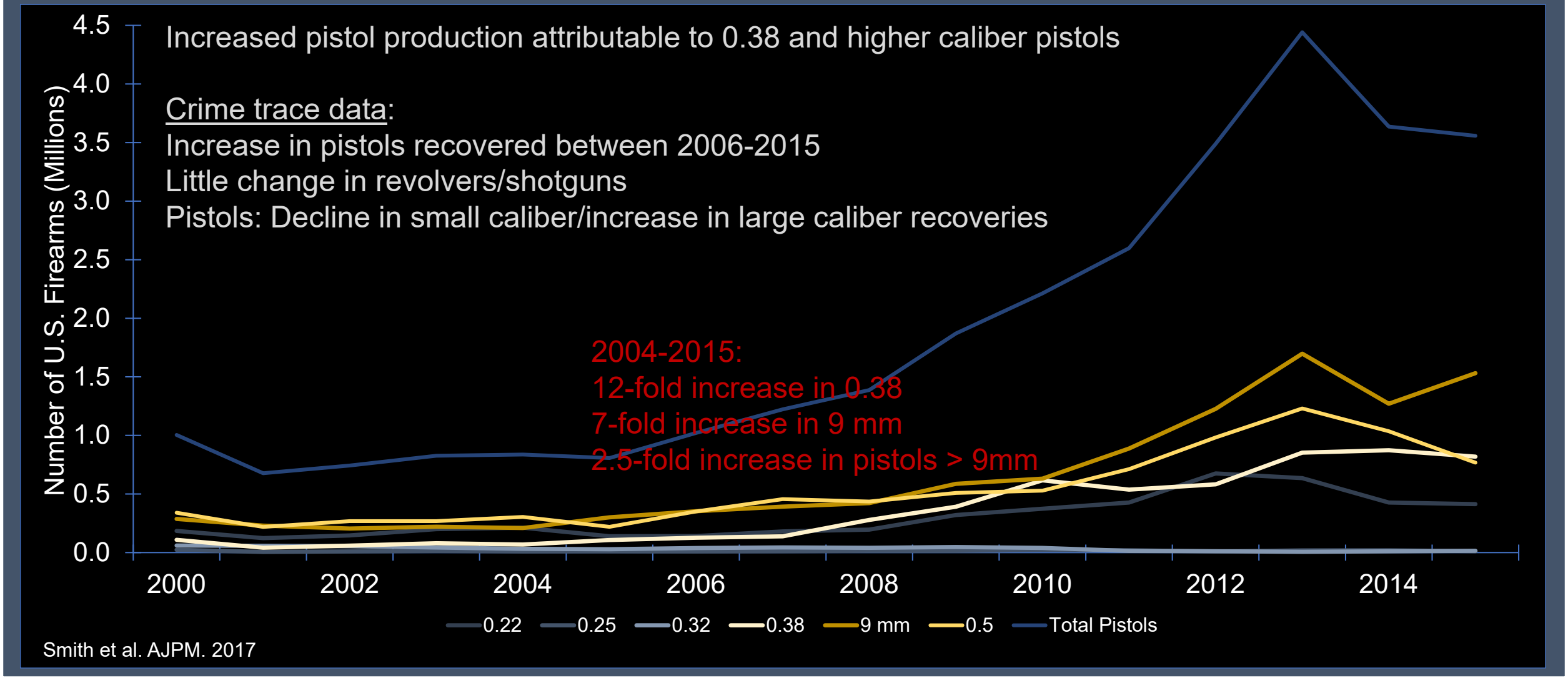
Azrael, Hepburn, Hemenway, and Miller. Russel Sage Foundation Journal of Social Science. 2017

Domestic U.S. Firearm Production



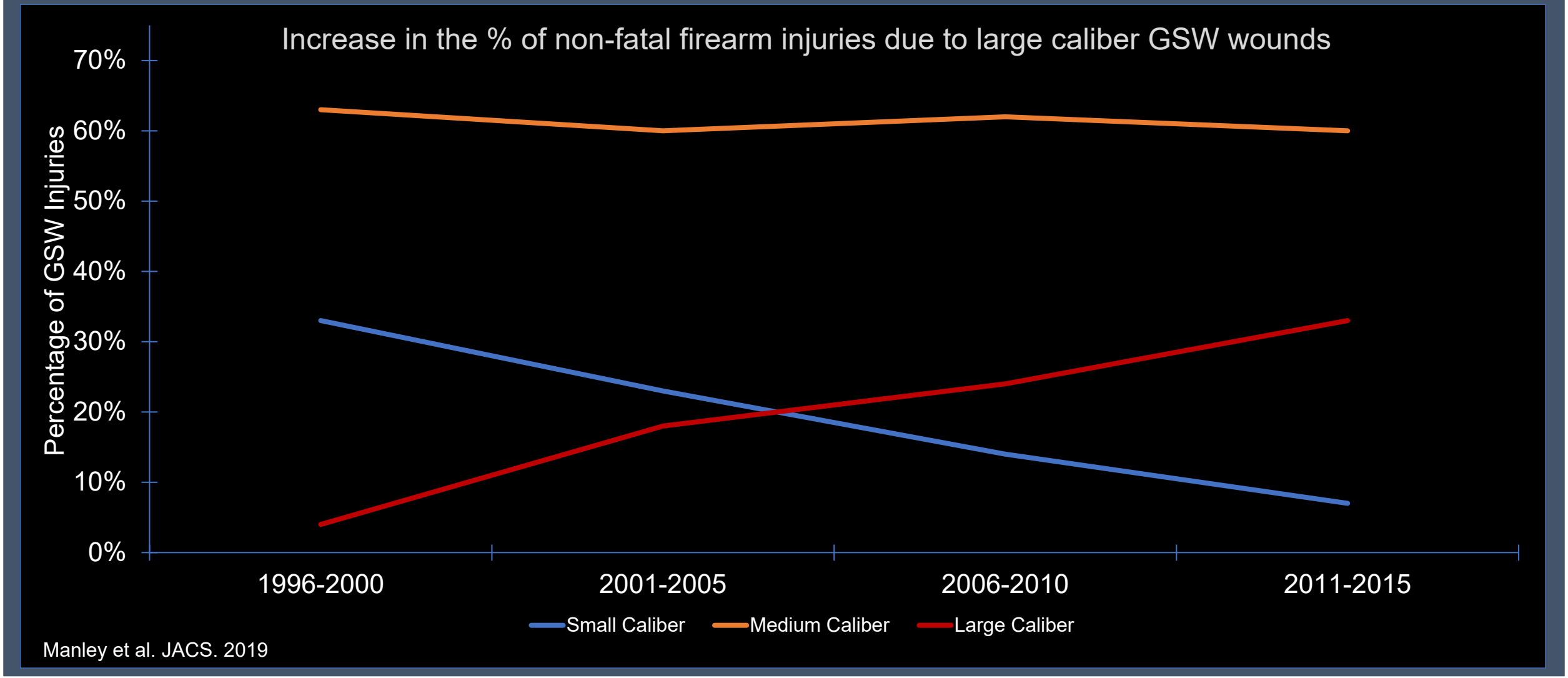
Smith et al. AJPM. 2017

U.S. Firearm Pistol Production by Caliber



Smith et al. AJPM. 2017

GSW Injuries by Firearm Caliber, Level-1 Trauma Center, Memphis, Tennessee



Manley et al. JACS. 2019

Case Fatality by Firearm Assault Injuries and Caliber of Weapon

•Small caliber: .22, .25, .32; Medium caliber: .38, 9 mm; Large caliber: .357, .40, .44, .45, 10mm

Medium Caliber vs. Small Caliber Weapon
Relative Risk of Death

RR = 2.25

(1.37-3.70)

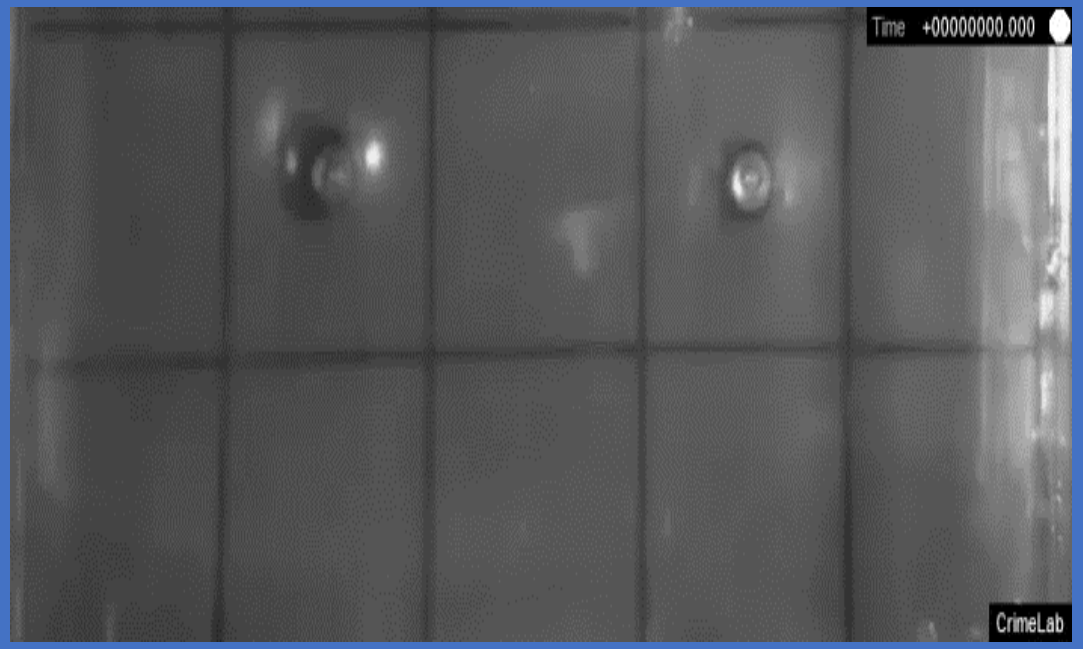
Large Caliber vs. Small Caliber Weapon
Relative Risk of Death

RR = 4.54

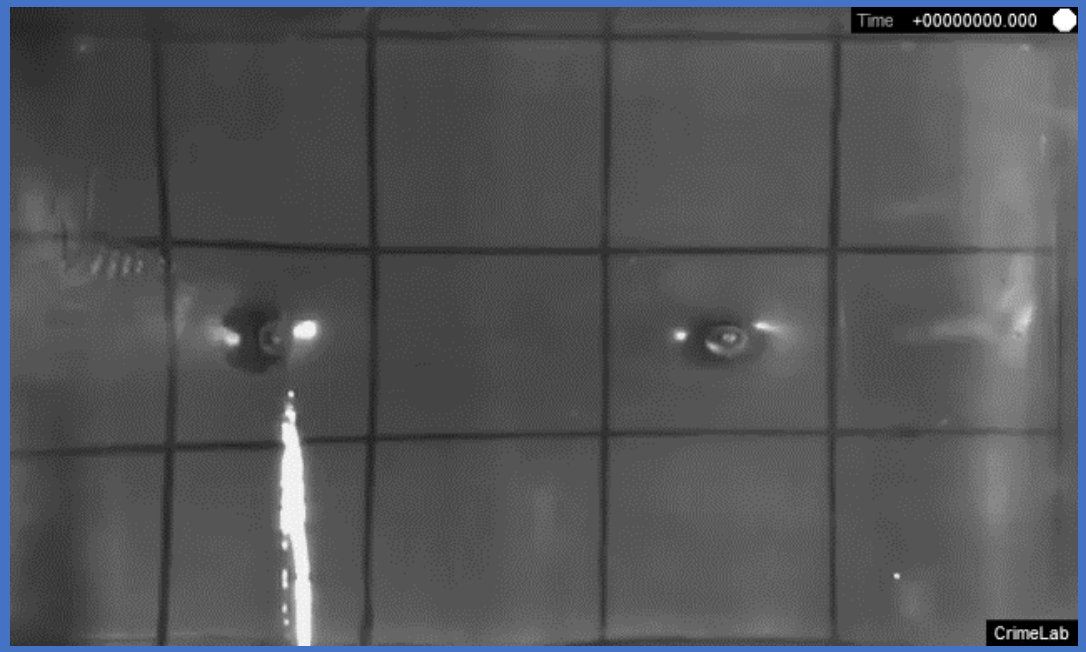
(2.37-8.70)

Braga and Cook, JAMA Network Open, 2018

Effects of Small vs. Large Caliber for Injury



.25 Caliber Pistol



.40 Caliber Pistol

Courtesy of Steve Hargarten; Medical College of Wisconsin; Department of Biomedical Engineering; Crime Lab

Effects of Small vs. Large Caliber for Injury

5.56 NATO

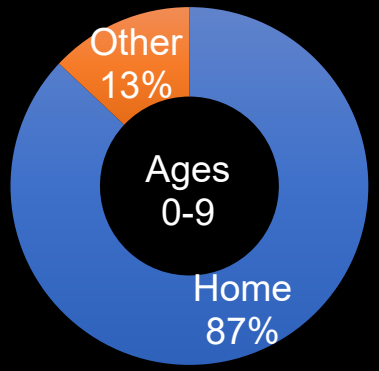
High Velocity
High Pressure
Rifle

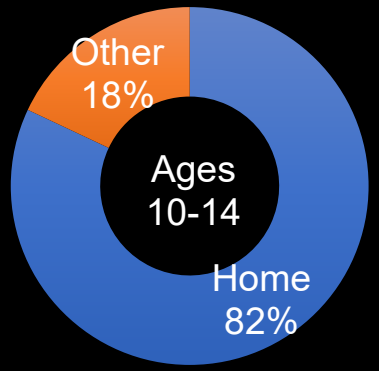
Courtesy of Steve Hargarten; Medical College of Wisconsin; Department of Biomedical Engineering; Crime Lab

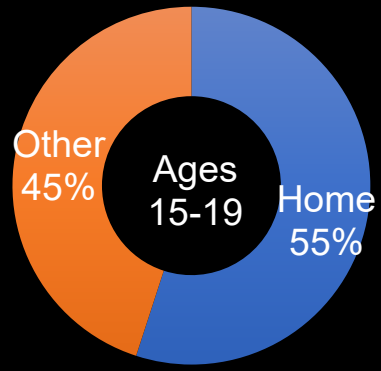
DEPARTMENT OF BIOMEDICAL ENGINEERING
MARQUETTE UNIVERSITY
MEDICAL COLLEGE OF WISCONSIN

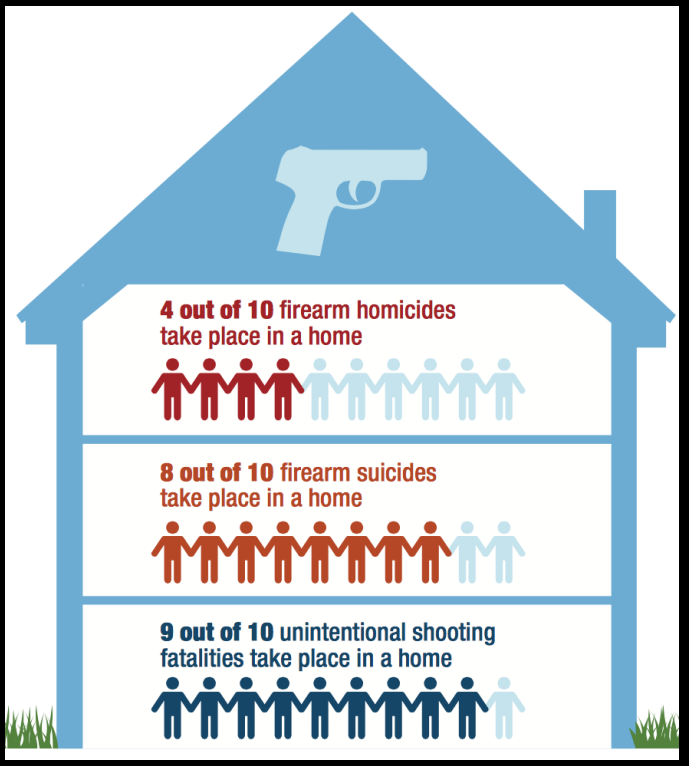
Where do firearm injuries occur among children and adolescents?

- Children are more likely to be killed by a gun in a home than anywhere else.
- Most common locations for fatal firearm injuries among all children (0-19 years old):
  - Home or surrounding area (60%)
  - Street/Highway (19%)
  - Motor Vehicle/Parking Lot/Public Garage (7%)









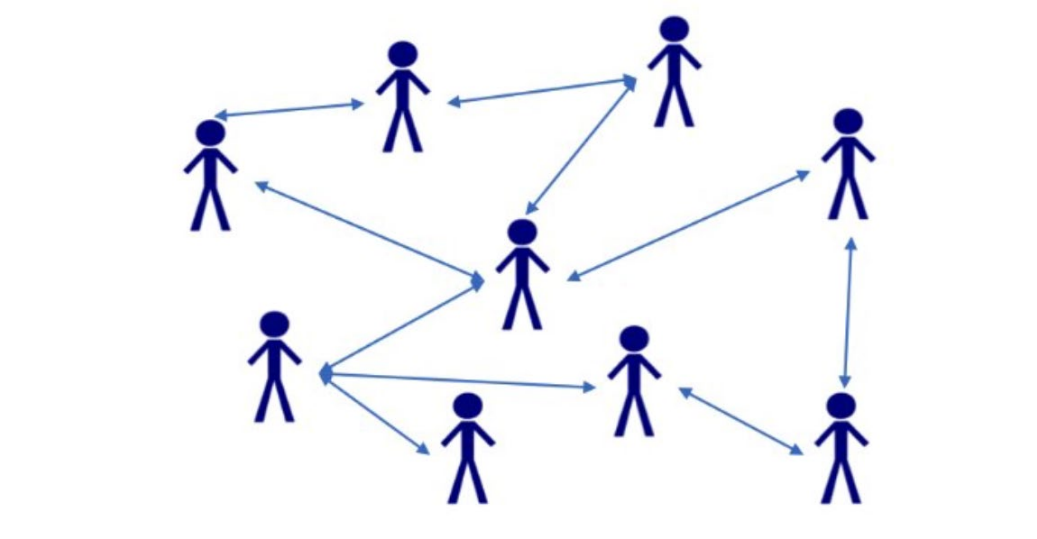
Source: “The Truth About Kids and Guns”, Brady Center to Prevent Gun Violence, 2011

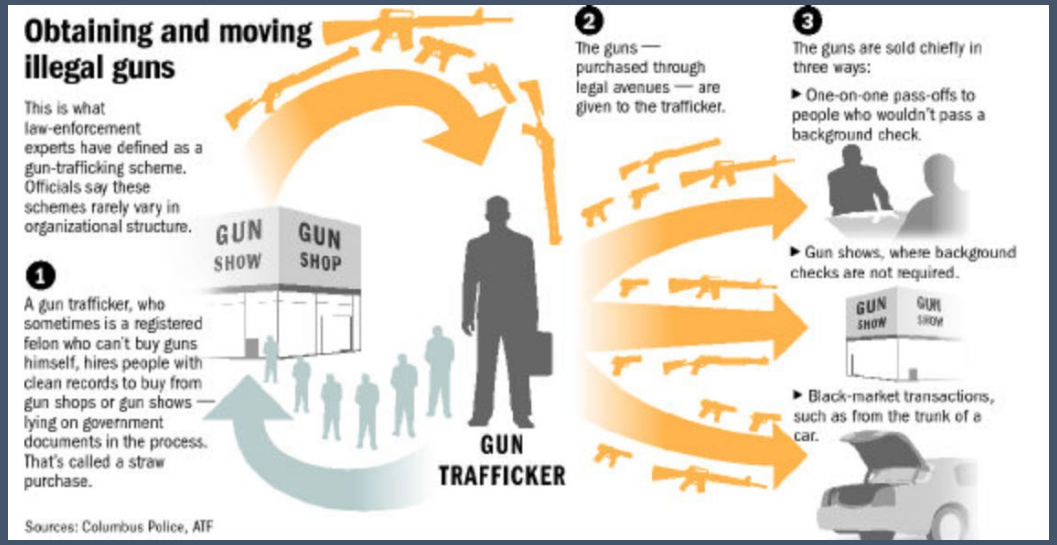
Firearm Access among Children and Adolescents

- ***The single most modifiable risk factor for pediatric firearm injuries is firearm access***
  - Loaded, unlocked firearms in the home
  - Illegal diversion of firearms from legal owners
- <u>Firearm Access at home</u>
  - 1/3 of homes with children have firearms
    - 40% have a firearm that not stored safely
  - 75% of suicides firearm came from home of the victim or a close relative
- <u>Diversion of firearms from legal channels</u>
  - ED-based study of firearm possession among assault-injured youth
    - 80% obtained the firearm from illegal channels
    - ~40% reported obtaining a firearm for protection

Schuster 2000; Okoro CA 2005; Carter 2013

How do Adolescents Acquire Firearms?





Social Networks

Family member/Home

Friends or Peers

Diversionary Sources

Street dealer

Drug Dealer/Addict

Only 20% of firearms acquired by youth are through traditional legal channels (i.e., purchased from department, sporting goods store or pawnshop)

(Webster 2002; Carter 2013)

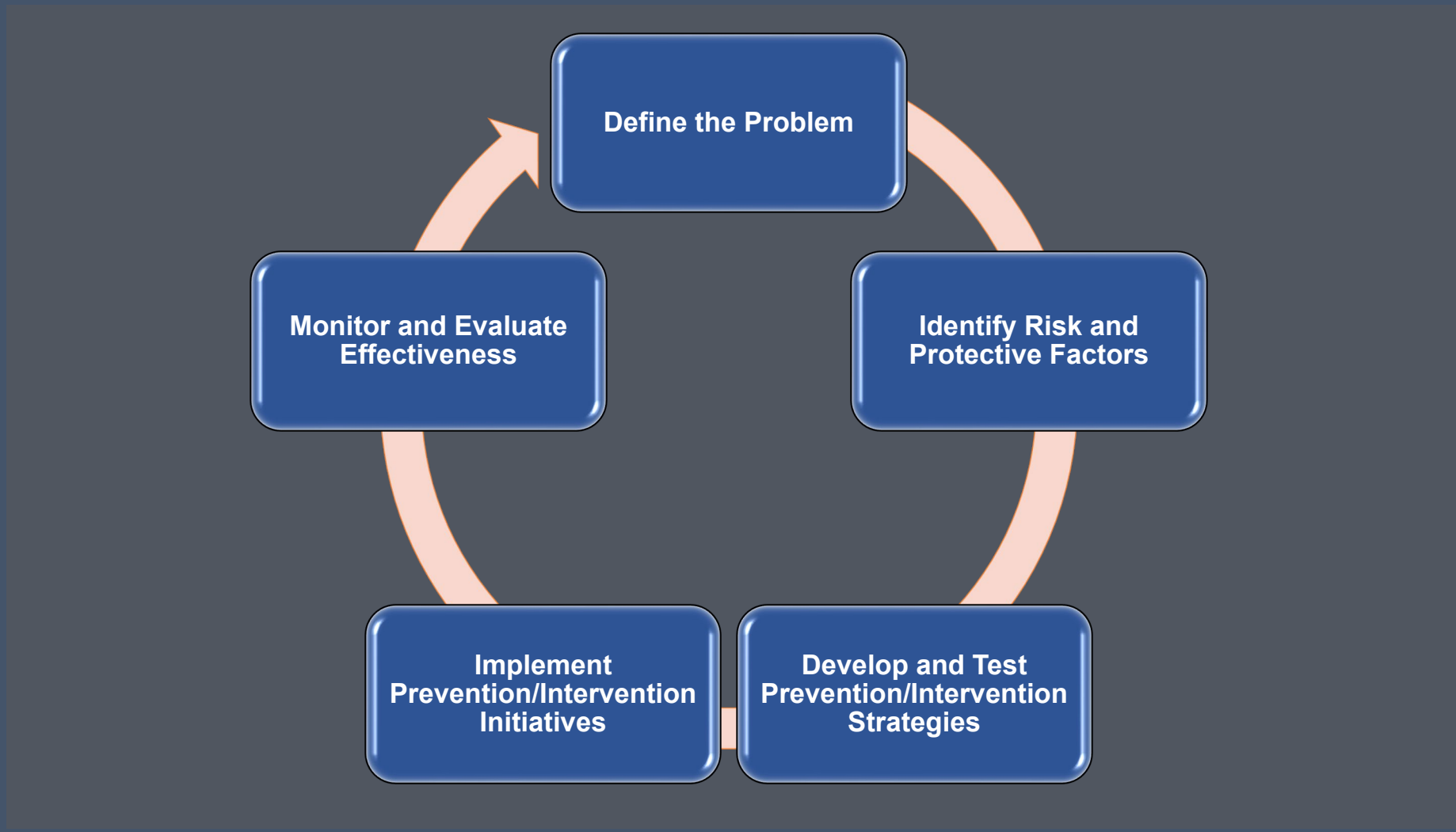
Take Home Points

- Firearm injuries are 2nd leading cause of death for U.S. children and adolescents and have been increasing since 2013
  - High-school students are now more likely to die from a firearm injury than any other cause of death
- While intent patterns and underlying risk factors differ among different populations, firearm injuries affect all children/adolescents
- Injury severity is increasing, partly resulting from shifts towards more firearm injuries and higher caliber firearm availability
- Patterns of injury for children/adolescents differs from adults and require their own field of study on prevention and reducing injury
- The single most modifiable risk factor for pediatric firearm injuries is firearm access/availability
- Physicians have a role in preventing firearm injuries precisely because so many children/adolescents are dying

Addressing the Public Health Disease of Firearm Violence

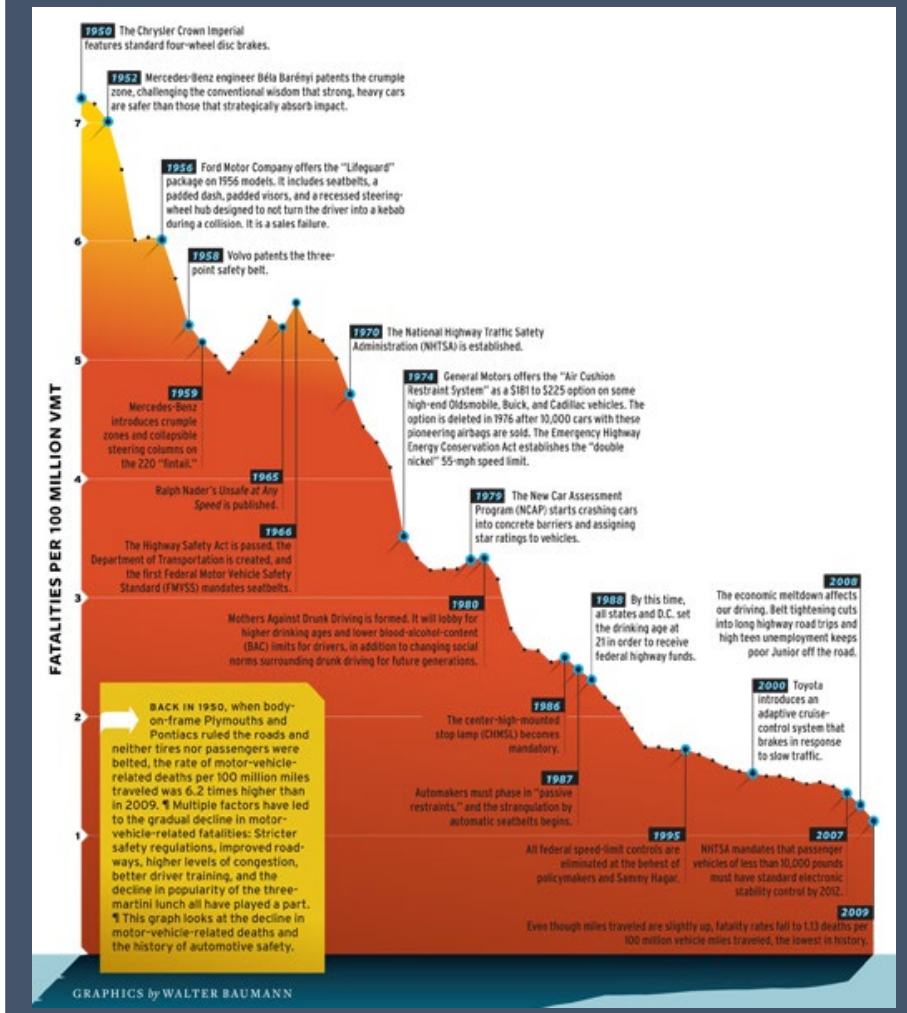
A Framework For Developing Solutions

Public Health Approach



An Injury Prevention Success…….

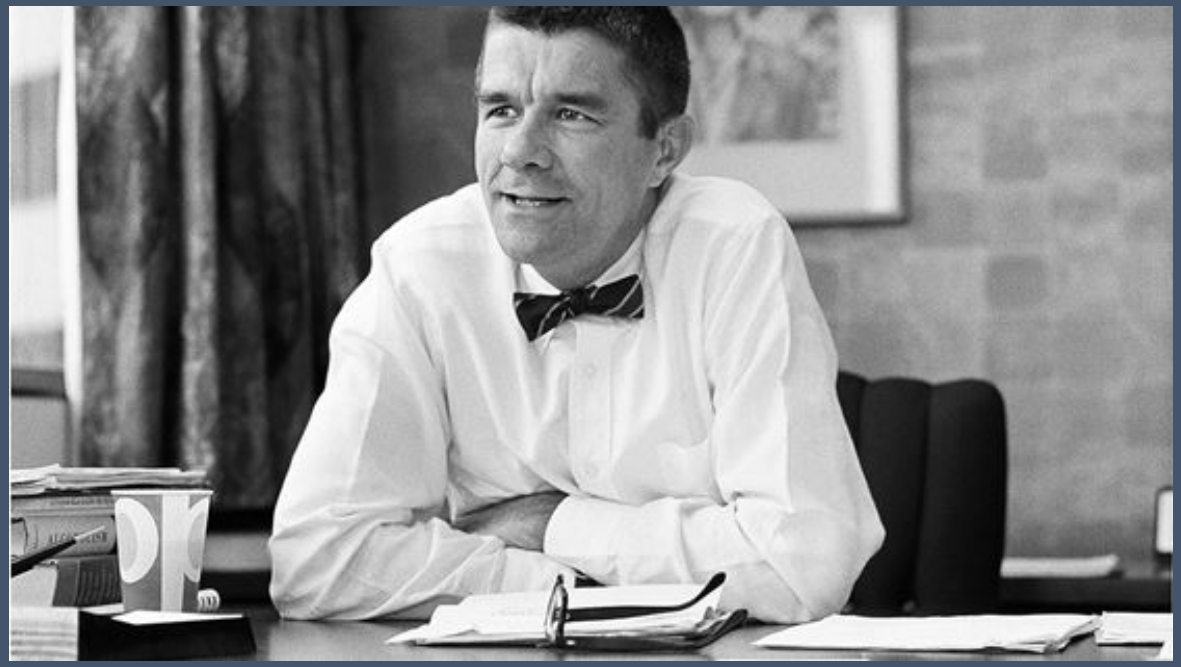
Not an accident.....a pathway forward



- **Crash Avoidance** = Adaptive Headlamps, Reflectors, Signals, Mirrors, Anti-lock brakes, Lane departure warning systems, Electronic Stability Control
- **Crashworthiness Improvements** = Seatbelts, Airbags, Tempered Glass, Crumple Zones, Collapsible Steering Columns, Instrument Panel padding
- **Behavioral Modifications** = Alcohol Impaired Driving
  - Per Se Laws (i.e. .08 BAC Limit), Alcohol Interlocks, Min Drinking Age Laws
  - Zero Tolerance Laws
- **Road Safety Interventions**
  - Divided Roadways, Signage, Streetlights, Reflective barriers, Curved rails
- **Trauma System Development**
- **Increased Measures for High-risk Populations**
  - Children = Car Seats, Graduated Drivers Licensing Laws
  - Elderly = Physician Review/Intervention for elderly drivers

Haddon Matrix

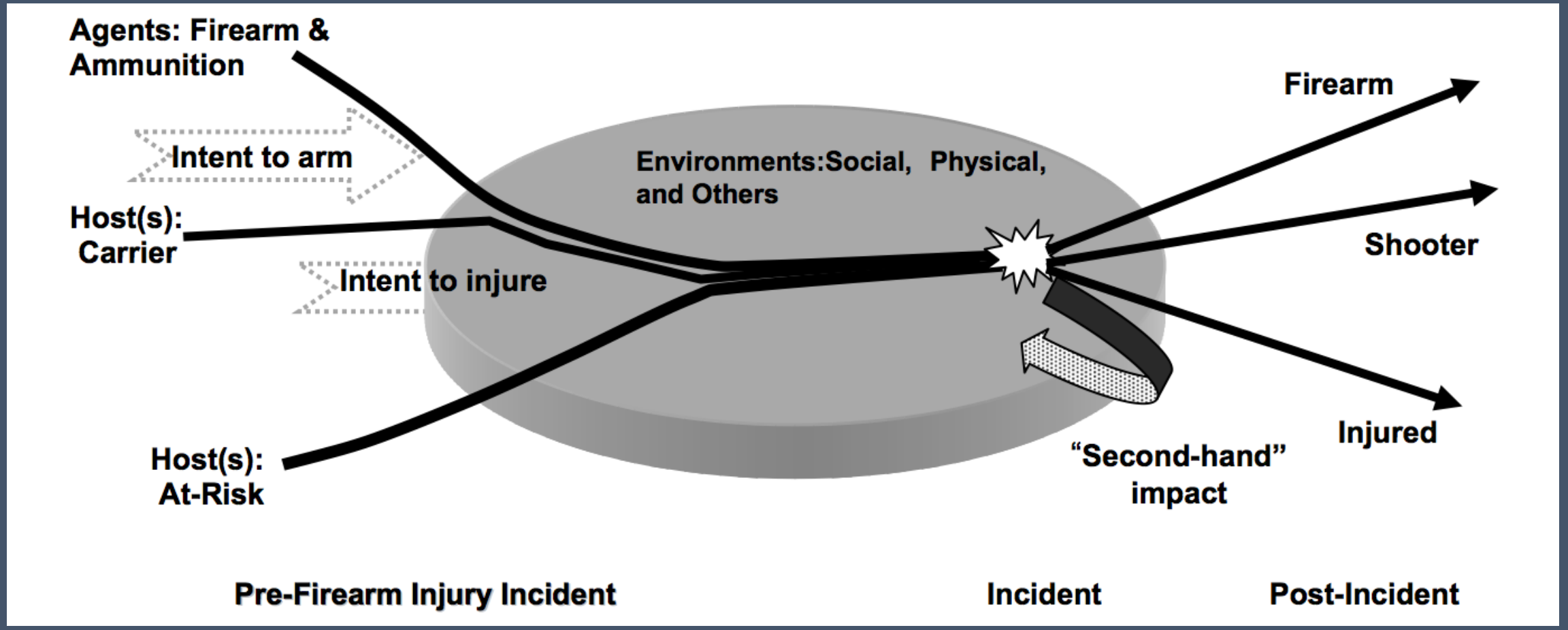
- Created by William Haddon, Jr., M.D.
- Father of Modern Injury Epidemiology
- First Head of NHTSA & IIHS
- Developed Haddon Matrix in 1950s
- Broadened view of prevention to more than driver behavior



Haddon Matrix – Motor Vehicle Crashes

	FACTORS			
PHASES	**Host/ Driver or Passenger**	**Vehicle/Vector** *(objects that transmit kinetic energy)*	**Physical Environment**	**Social Environment** (Traffic Safety Culture)
Pre-Event (Before the crash occurs)	➢ Driver vision ➢ Alcohol Impairment ➢ Driver experience/ ability ➢ Driver knowledge ➢ Restraint/ helmet choice ➢ Driver rested and attentive	➢ Maintenance of brakes and tires ➢ Speed of travel ➢ Load characteristics ➢ Anti-lock braking system (ABS) ➢ Electronic stability control (ESC)	➢ Adequate roadway markings ➢ Divided highways ➢ Roadway lighting ➢ Intersection configuration ➢ Road curvature ➢ Adequate shoulders and rumble strips	➢ Public / community attitudes on drinking and driving ➢ Impaired driving laws ➢ Graduated licensing laws ➢ Speed limits ➢ Enforcement and adjudication of traffic laws ➢ Support for injury prevention programs
Event (During the crash)	➢ Spread out energy in time and space with seat belt/ airbag use ➢ Child restraint use	➢ Vehicle size ➢ Crashworthiness of vehicle- crash space, crush resistance, safety rating	➢ Guard rails, median barriers ➢ Presence of fixed objects near roadway ➢ Roadside embankments	➢ Adequate seat belt and child seat laws ➢ Motorcycle helmet laws
Post-Event (After the crash)	➢ Crash victim's overall health ➢ Age of victim	➢ Gas tanks designed to minimize fires ➢ On-Star or other automated crash notification and GPS locator	➢ Availability of effective EMS systems and staffing ➢ Effective incident site management ➢ Distance to quality trauma care ➢ Rehabilitation programs available	➢ Policies and funding supporting emergency and medical response systems ➢ Public support for trauma care and rehabilitation ➢ EMS training ➢ Resources and programs for psychological recovery from trauma

Haddon Matrix – Firearm Violence



Firearm and Injury Center at Penn. 2011. "Firearm Injury in the United States."

Within Your Scope of Practice and Definitely in your Lane

- Understand the epidemiology and risk factors for firearm injury
- Become knowledgeable about the basics of firearms
- Develop skills for screening and counseling of patients & families
  - Universal Screening
  - High risk populations
    - Teens and Depression
    - Adolescents at risk for Non-partner and Partner violence
  - Know what to do with answers
  - Safe Storage Counseling
  - Lethal Means Counseling
- Support evidence-based public health research and practices

Respect firearm ownership…
counsel on safety
meet people where they are at
and focus on harm reduction

FACTS
FIREARM SAFETY AMONG CHILDREN AND TEENS

State of the Science

J Behav Med (2019) 42:811–829
https://doi.org/10.1007/s10865-019-00043-2

Check for updates

State of the science: a scoping review of primary prevention of firearm injuries among children and adolescents

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Abstract Intentional and unintentional firearm injury is the second leading cause of death for youth, underscoring the need for effective primary prevention approaches that focus on increasing safe storage by caregivers and decreasing handling/carriage among youth. This article describes the state of the science for prevention of firearm injuries among children and adolescents. We applied PRISMA guidelines to present results from a scoping review using PubMed, Scopus, CINAHL, and CJ Abstracts for original research articles published between January 1, 1985 and March 1, 2018 in the U.S. focusing on primary screening or interventions for primary prevention of pedi- or assessed behavioral (e.g., carriage) or injury-related firearm outcomes. Evidenced-based prevention programs are needed to mitigate firearm morbidity and mortality among youth.

Keywords Universal prevention · Primary prevention · Firearm injury · Safe storage · Firearm carriage · Children · Adolescents

Background

Healthcare-based Safe Storage Interventions

- Healthcare-based Safe Storage Intervention studies
  - Decreasing risk for unintentional injury
  - Restricting lethal means access
  - Healthcare provider training
- Screening and Education/Counseling around firearm safety and lethal means access, particularly when paired with providing free gun locks, increases safe firearm storage in homes with children
- Educational interventions for healthcare providers can improve self-efficacy and attitudes regarding screening and counseling, but unknown whether this translates to improved behavioral outcomes (i.e., counseling of at-risk families/patients)

Kruesi et al 1999; Oatis et al 1999; Grossman et al 2000; Stevens et al 2002; Albright and Burge 2003; Carbone 2005; Barkin et al 2008; Runyan et al 2016; Dingeldein et al 2012

Get Educated….Training in Skills

Firearm Injury Prevention Curriculum for Pediatric Residents

- Five web-based video modules
- Self-paced over one month
- Developed through literature review and content-expert guidance
- Filmed using free university-based recording studios and Camtasia software
- Accessed by learners through Canvas online learning platform

Module 1: Introduction

Format Lecture by study author with supplemental Powerpoint slides
Content
- Background on firearm injuries in youth
- Impact of pediatricians on counseling
- Outline of curriculum modules and goals

Length 4 minutes

Module 2: Epidemiology

Format Lecture by firearm injury expert with supplemental Powerpoint slides
Objectives
- Review trends in national firearm injuries
- Understand types of pediatric firearm injuries
- Discuss importance of firearm access/safe storage in the home

Length 8 minutes

Module 3: Counseling

Format Three scripted clinical scenarios authored by firearm injury experts and performed by actors, highlighting motivational interviewing-based behavioral counseling techniques:
- Case 1: Teenager with depression
- Case 2: Six-year-old without firearms in the home
- Case 3: Three-year-old with firearms in the home

Objectives
- Utilize direct questioning for firearm screening
- Identify high risk households
- Develop counseling techniques
- Recognize counseling barriers and developing approach to challenging scenarios
- Connect families to resources

Length 15 minutes

Module 4: Safe Storage

Format Hands-on video demonstration by pediatrician and firearm owner
Objectives
- Review firearm/ammunition types
- Review of safe storage guidelines and options for firearms and ammunition

Length 9 minutes

Module 5: Documentation

Format Powerpoint slides with instructional voiceover
Objectives
- Demonstration of proper documentation of screening and counseling in EHR
- Demonstration of access to educational handout through the EHR

Length 5 minutes

Approach to Firearm Safety Counseling

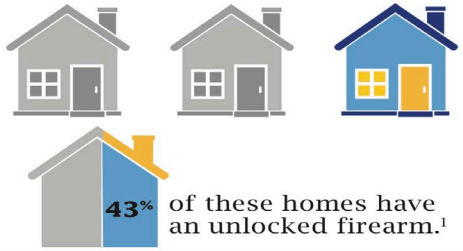
www.childfirearmsafety.org

Get Educated….Resources

Parents' Guide to Home Firearm Safety

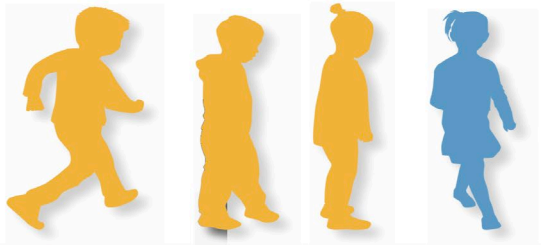
Children have **easy** access to firearms.

1 in 3 U.S. homes with children under 18 has a firearm.[1]



43% of these homes have an unlocked firearm.[1]

3 in 4 children age 5 to 14 know where firearms are kept in their home.[2]



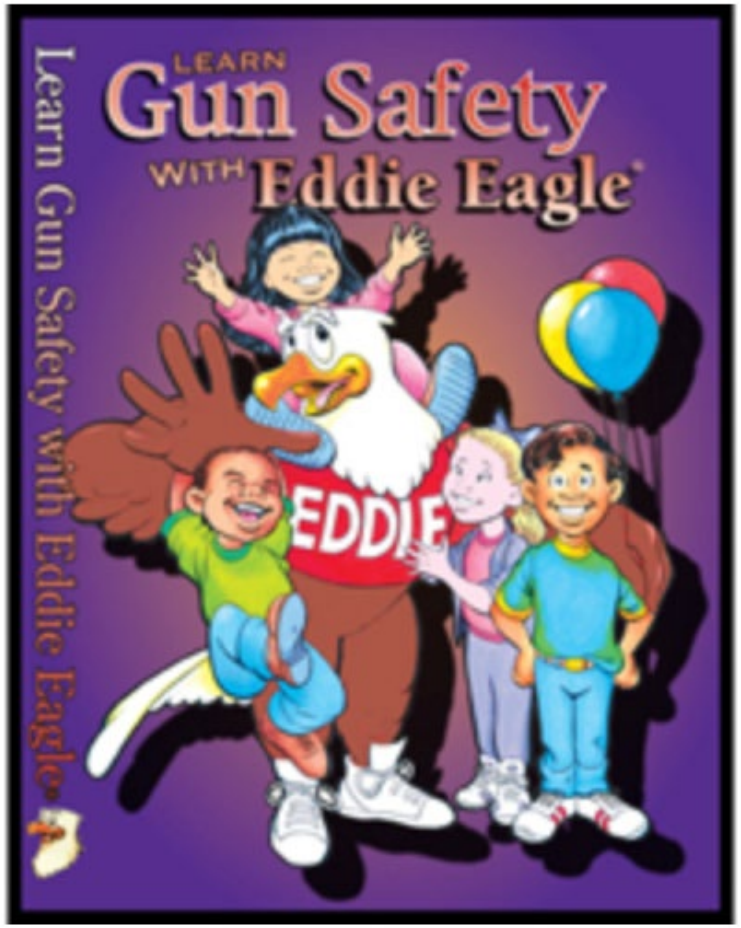
What are the **safe** storage options?

What's it called?		What does it look like?	Where can I buy it?
Cable Lock	**Do not** install around the trigger.		amazon.com ($7-$20) May be available free from local police.
Trigger Lock	**Do not** use on a loaded gun.		amazon.com ($6-$35)
Lock Box	Store ammunition separately. Only adults should have access to keys.		Dick's Sporting Goods ($30-$100+)
Gun Safe	Store ammunition separately.		Cabela's ($150+) Home Depot ($70+)
Take Apart Firearm			

www.childfirearmsafety.org

Know what doesn't work

- Programs designed to teach firearm safety and avoidance to children
  - Eddie Eagle Program (NRA)
  - Straight talk about Risks (STAR)
- Pre-kindergarten – 12th grade
- Only effective teaching kids to remember gun safety messages and skills for supervised role play
- **NONE effective outside the context of the training session**
  - **i.e. real life scenarios**

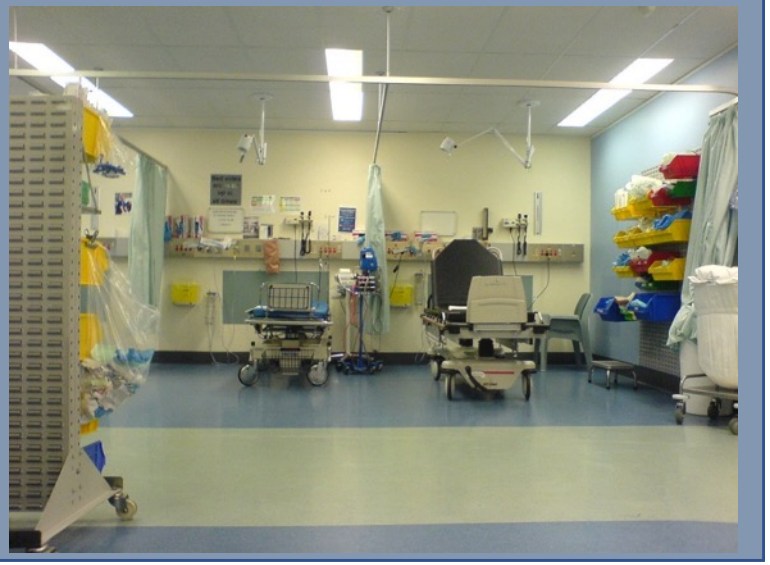


Interpersonal Violence Prevention in Emergency Department Settings

FACTS
FIREARM SAFETY AMONG CHILDREN AND TEENS

EDs Provide Access to At-Risk Youth

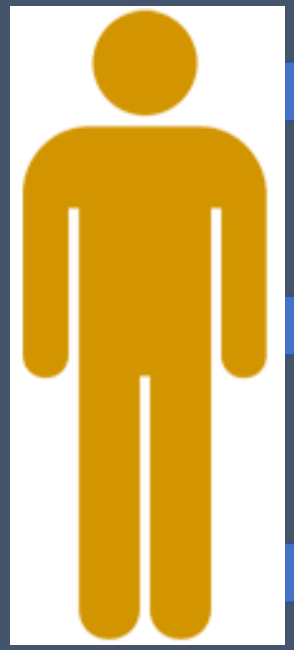
- ED visit provides a “teachable moment”
- School-based prevention programs miss an at-risk population as attendance may be sporadic
- Inpatient hospital-based programs miss a large portion of youth who are treated and released
  - 90.0% of all youth are discharged from ED
  - 84.0% of assault-injured youth
  - 51.7% of firearm injuries
- Most inner city youth lack a primary care physician
  - Emerging adults not yet connected to adult care



Violence as a Recurrent Disease

<u>Assault-injury types</u>
20% Firearm (ISS=7.2)
15% Cut/Pierced (ISS=2.2)
64% Struck by/Against (ISS=2.0)

- 57% drug use disorder
- 22.3% alcohol use disorder
- 20% used alcohol/drugs before fight
- 25% indicated intention to retaliate
- 23% report having firearms
    - 80% illegally acquired
- Elevated rates of ED visits for assault and mental health



- 36.7% repeat violent injury
- 65% higher risk than non-AI

- 59.0% firearm violence
- 40% higher risk than non-AI

- 47.2% arrest/CJ involvement
- 30% higher risk than non-AI

- Drug and/or Alcohol Use Disorders
- PTSD
- Retaliatory Attitudes
- Firearm Possession

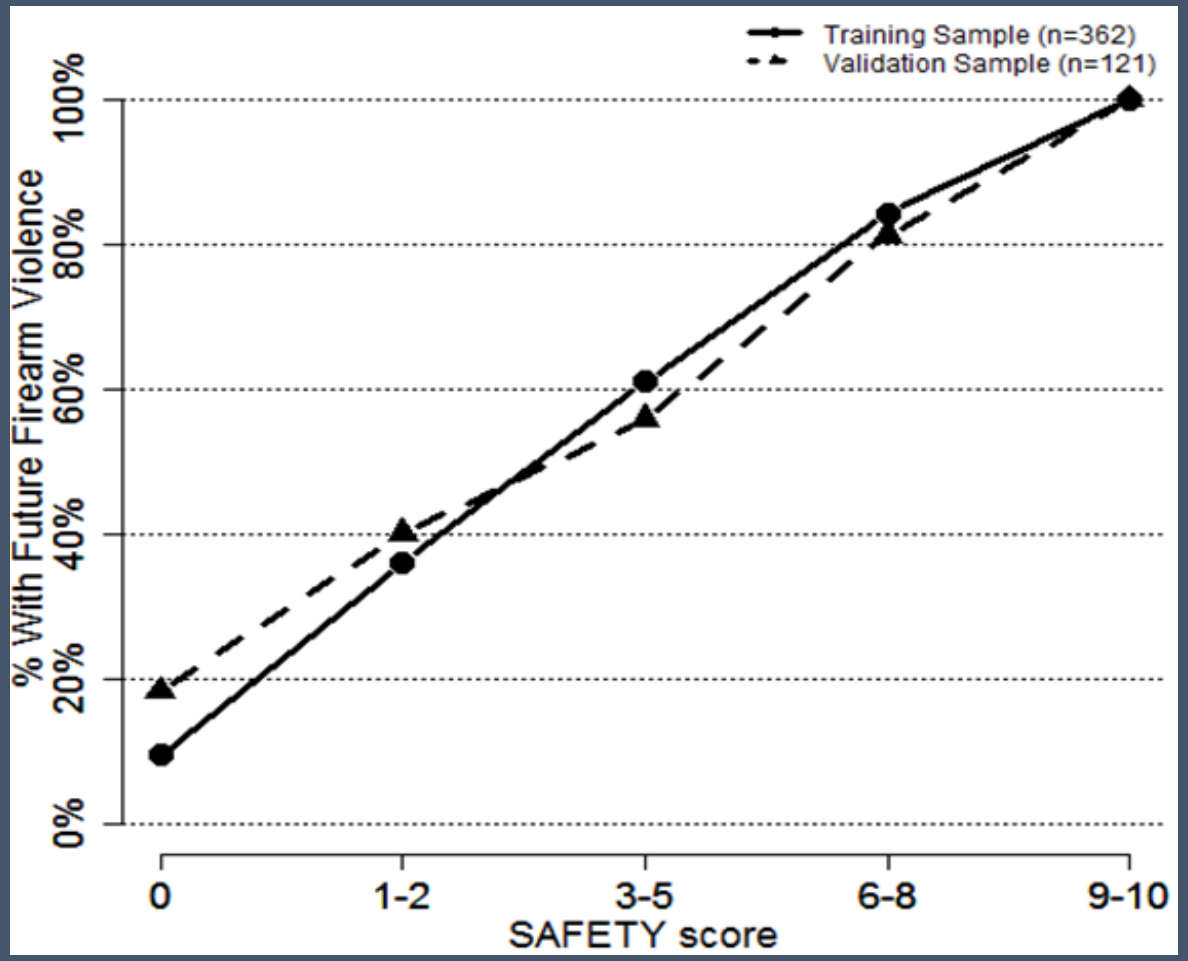
Carter 2013; Cunningham 2014; Carter 2015; Carter 2018

SaFETy Score - Risk of Future Firearm Violence

S (Serious Fighting)	**In the past 6 months, including today, how often did you get into a serious physical fight?**
F (Friend Weapon Carrying)	**How many of your friends have carried a knife, razor, or gun?**
E (Community Environment)	**In the past 6 months, how often have you heard guns being shot in your neighborhood?**
T (Firearm Threats)	**How often, in the past 6 months, including today, has someone pulled a gun on you?**

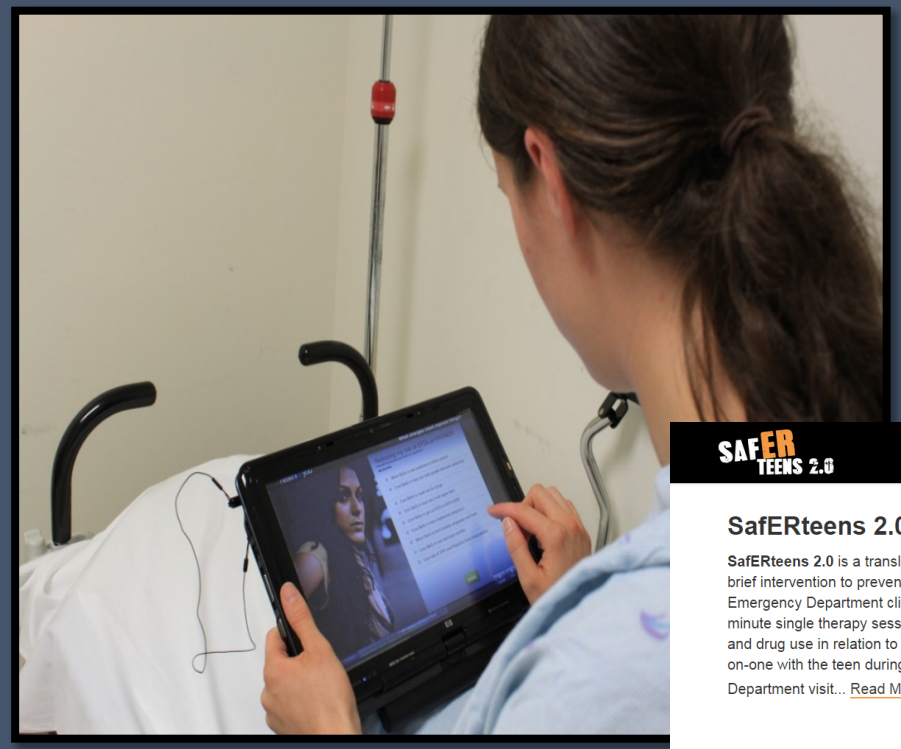
Goldstick, Carter, Walton, Dahlberg, Sumner, Zimmerman, Cunningham
Annals of Internal Medicine 2017
R01 # 024646 NIDA/NIH (Cunningham)

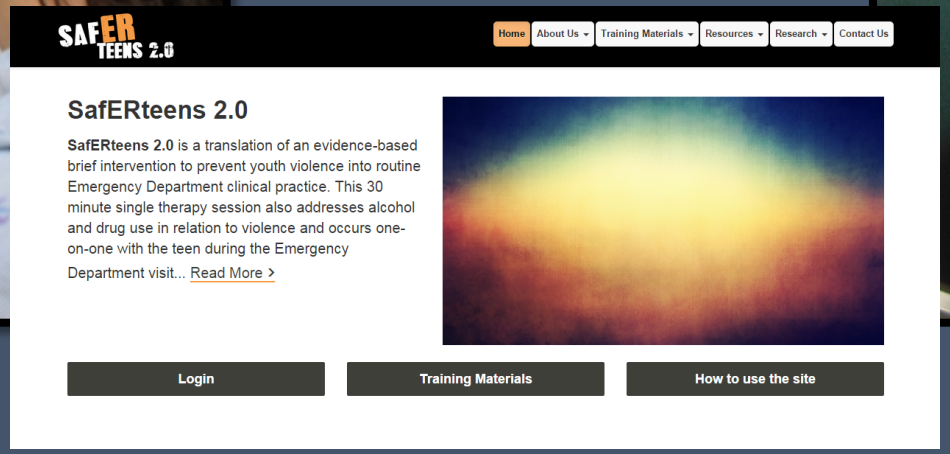
SaFETy Risk Gradient



Goldstick, Carter, Walton, Dahlberg, Sumner, Zimmerman, Cunningham Annals of Internal Medicine 2017
R01 # 024646 NIDA/NIH (Cunningham)

Screen and Intervention Violence Prevention
Youth 14-18 seeking ED care

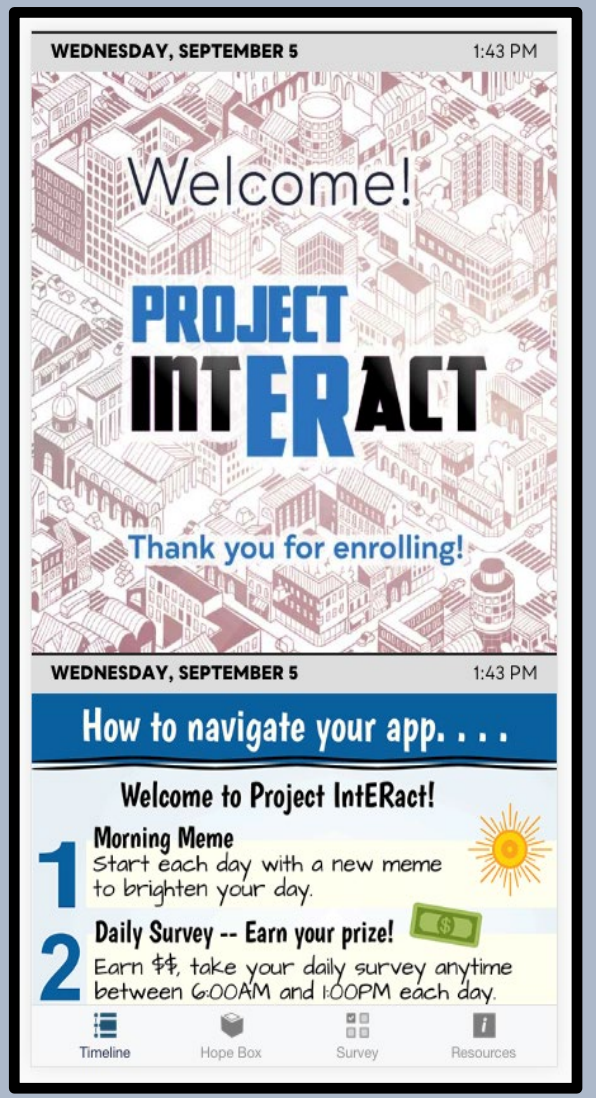


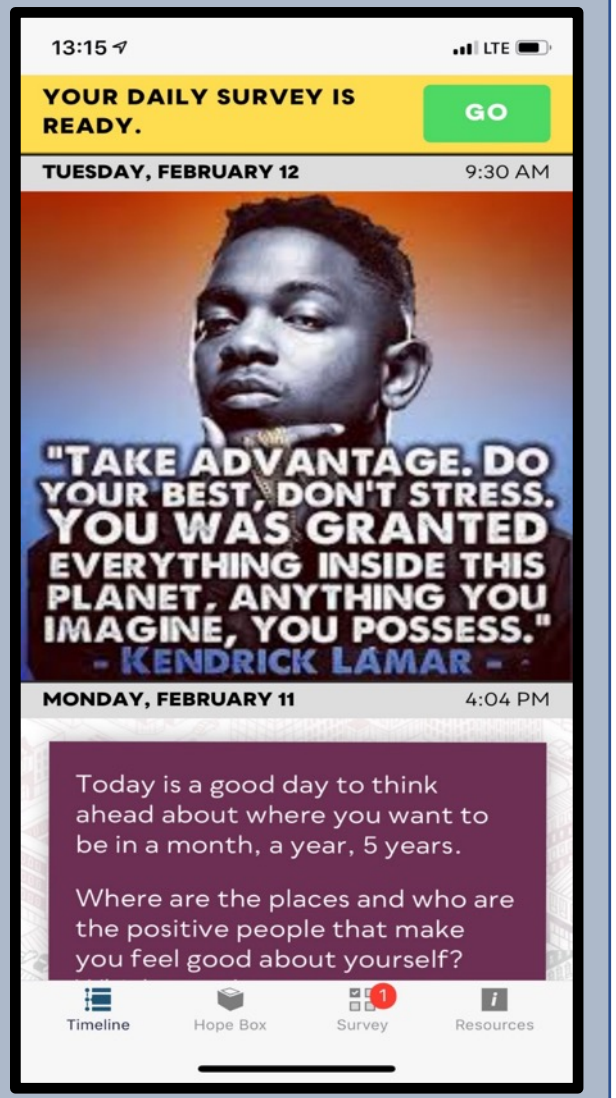


www.saferteens.org

Project IntERact

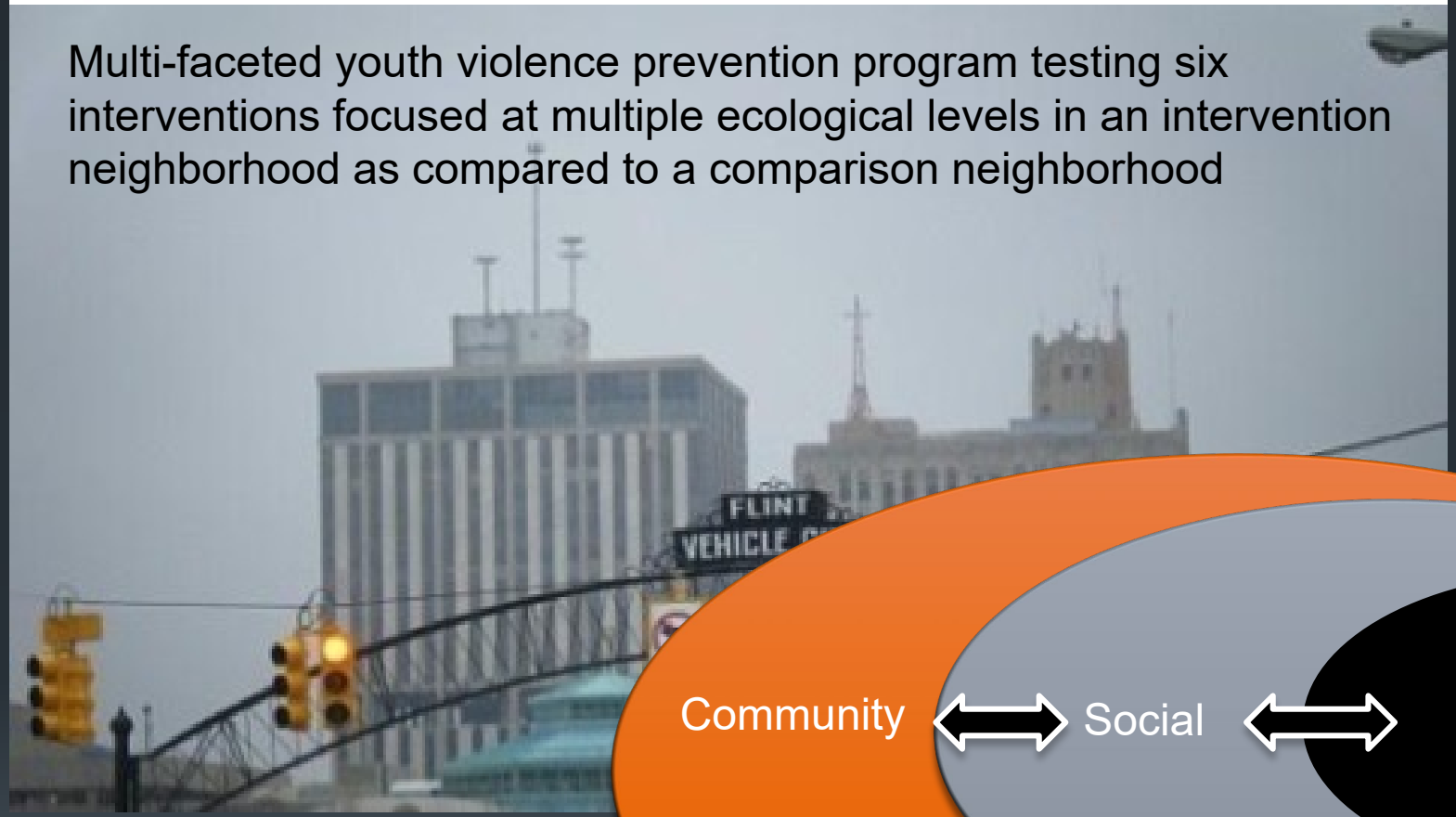
- Pairs Multi-session Remote Behavioral Therapy with a Smartphone-based APP
- 1 ED session + 5 post-ED sessions
- MI+CBT+CM
- Smartphone APP
  - Daily surveys
  - Positive Tailored MI+CBT Messaging
  - GPS tracking-high-risk location alerts
  - One-touch Social Support
  - Personalized Feedback
  - Strengths-based CM Resources

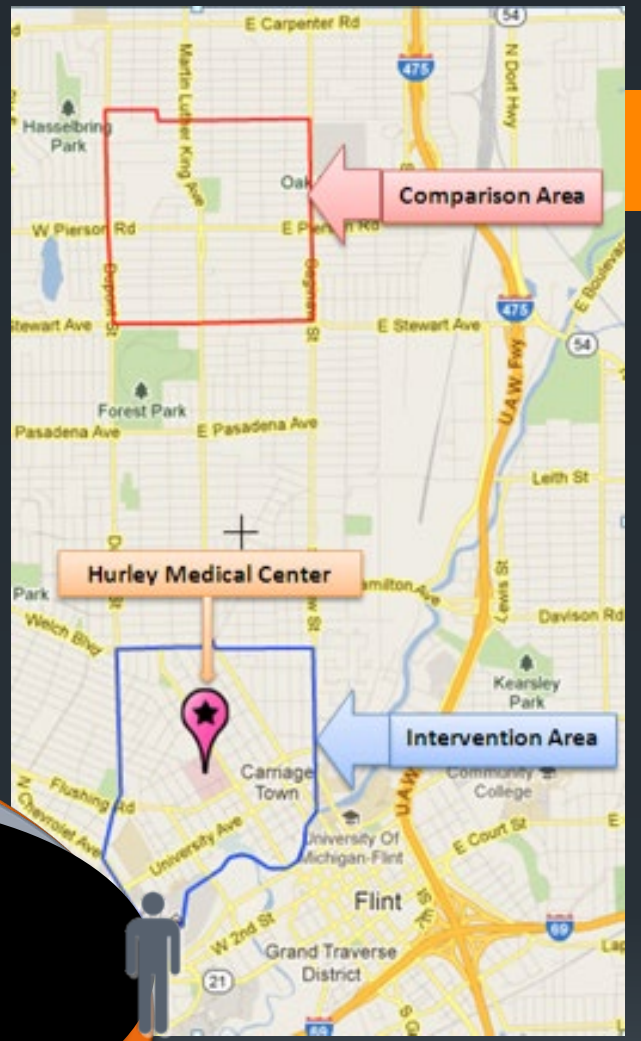




Michigan Youth Violence Prevention Center

Multi-faceted youth violence prevention program testing six interventions focused at multiple ecological levels in an intervention neighborhood as compared to a comparison neighborhood





Community ⟺ Social ⟺ Individual

- Community Policing
- Clean & Green Initiatives

- Father & Sons
- Targeted Outreach Mentoring

- Sync (ED-based BI)
- Youth Empowerment Solutions (YES)

Outside Your Practice….but within your lane

- Advocate for additional research funding commensurate with the burden of disease
- Support the work your professional societies are doing on firearm safety
- Help frame the issue as one of health and safety, not political debate
- Support on-going community organizations working on firearm injury prevention

FACTS Consortium

FACTS

FIREARM SAFETY AMONG CHILDREN AND TEENS

FACTS Consortium

- Funded 9/2017 by NICHD-most substantial NIH investment in firearm research in over 20 years
  - 25 content experts across disciplines
  - Mixture of junior and senior to grow field

  - **Aim #1:** define a *pediatric-specific* firearm injury research agenda
  - **Aim #2:** core studies to provide preliminary data that informs large-scale studies and fills early data needs
  - **Aim #3**: Establishing web-based searchable data archive for childhood firearm injury
  - **Aim #4:** Build a cadre of national research scholars that will serve as an emerging pipeline for future research.

MICHIGAN STATE UNIVERSITY

Northwestern University

MEDICAL SCHOOL
UNIVERSITY OF MICHIGAN

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF MICHIGAN

BROWN

ASU Arizona State University

University of Colorado
Boulder | Colorado Springs | Denver | Anschutz Medical Campus

Ann & Robert H. Lurie
Children's Hospital of Chicago®

MEDICAL COLLEGE OF WISCONSIN

Penn
University of Pennsylvania

Children's National

UNIVERSITY of WASHINGTON

HARVARD
UNIVERSITY

Stakeholder Panel

	Gun Owners	Religious	Military	Schools/ Education	Law Enforcement	Public Health/ Medical
Homicide						
Suicide						
Unintentional						
Mass Shootings						

James R. Anderson, BG Veteran MI National Guard

James Berlin, Police Chief, City of Roseville, MI, Firearm Safety Trainer

Tom O'Connor, Gun Owners for Responsible Ownership, OR

Geraldine Hills, Arizonans for Gun Safety

Chris Harris, Pastor, Bright Star Community Outreach, IL

Joneigh Khaldun, Public Health Commissioner Detroit

Adelyn Allchin & Vicka Chaplin, Educational Fund to Stop Gun Violence

Joe Erardi Executive Board, AASA (School Superintendent Assoc.), Former Superintendent, Newtown, CT

Ben Hoffman, AAP Violence Prevention Group

Rochelle Dicker, Trauma Surgeon, LA County Dept of Health

LokMan Sung, Medical examiner, Detroit

Dorman, Greg Supervising Attorney, Gang & Gun Prosecution Section LA

AIM#1: Research Agenda

JAMA Pediatrics | Special Communication

Prevention of Firearm Injuries Among Children and Adolescents

Consensus-Driven Research Agenda from the Firearm Safety Among Children and Teens (FACTS) Consortium

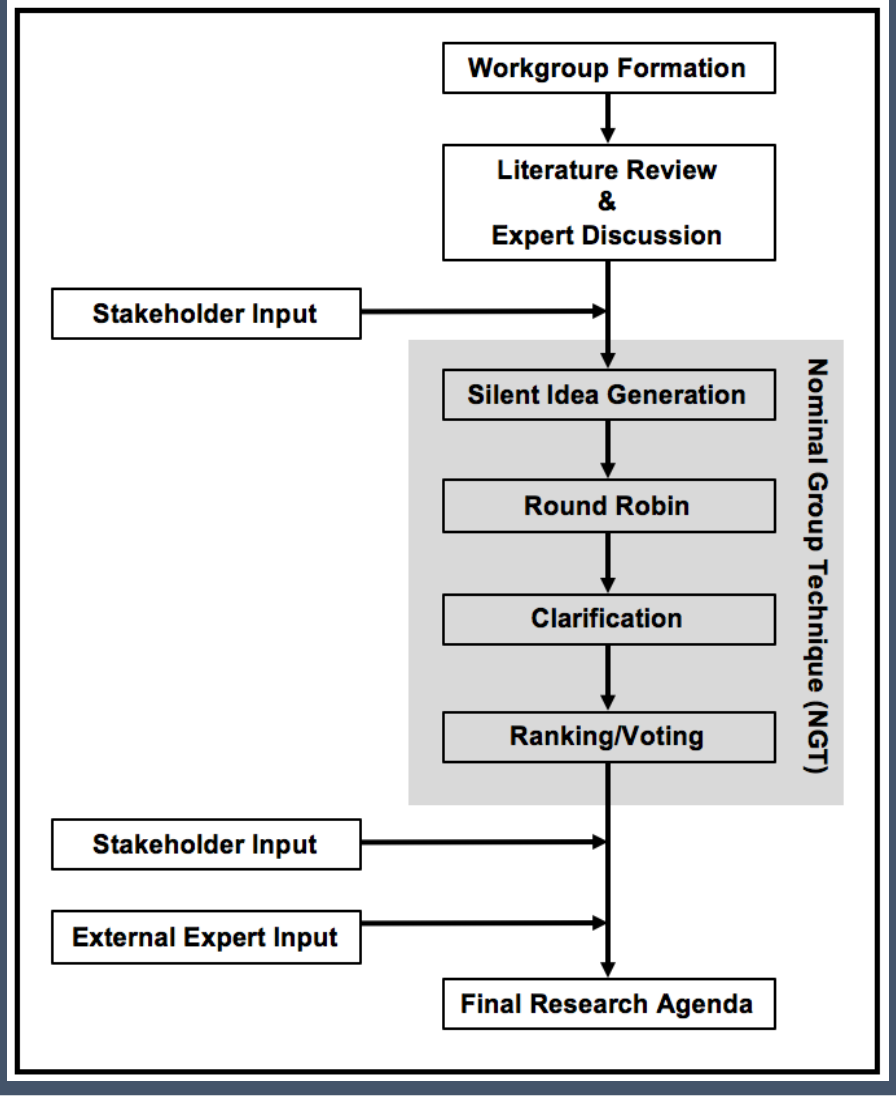
Rebecca M. Cunningham, MD; Patrick M. Carter, MD; Megan L. Ranney, MD, MPH; Maureen Walton, MPH, PhD; April M. Zeoli, PhD; Elizabeth R. Alpern, MD, MSCE; Charles Branas, PhD; Rinad S. Beidas, PhD; Peter F. Ehrlich, MD, MSc; Monika K. Goyal, MD, MSCE; Jason E. Goldstick, PhD; David Hemenway, PhD; Stephen W. Hargarten, MD, MPH; Cheryl A. King, PhD; Lynn Massey, MSW; Quyen Ngo, PhD, LP; Jesenia Pizarro, PhD; Lisa Prosser, PhD; Ali Rowhani-Rahbar, MD, MPH, PhD; Fredrick Rivara, PhD; Laney A. Rupp, MPH; Eric Sigel, MD; Jukka Savolainen, PhD; Marc A. Zimmerman, PhD

Supplemental content

IMPORTANCE Firearm injuries are the second leading cause of death among US children and adolescents. Because of the lack of resources allocated to firearm injury prevention during the past 25 years, research has lagged behind other areas of injury prevention. Identifying timely and important research questions regarding firearm injury prevention is a critical step for reducing pediatric mortality.

OBJECTIVE The Firearm Safety Among Children and Teens (FACTS) Consortium, a National Institute for Child Health and Human Development–funded group of scientists and stakeholders, was formed in 2017 to develop research resources for the field, including a pediatric-specific research agenda for firearm injury prevention to assist future researchers and funders, as well as to inform cross-disciplinary evidence-based research on this critical injury prevention topic.

EVIDENCE REVIEW A nominal group technique process was used, including 4 key steps (idea generation, round-robin, clarification, and voting and consensus). During idea generation,



Pilot Projects

National Adolescent/Parent Dyad Survey (Gallup Organization)

Agent-based Modeling Simulation Study for Violence (Flint, MI)

Primary Prevention Counseling for Safe Storage (Focus Groups, UP, MI)

Implementation study using Firearm Safety Check Intervention in Primary Care

PECARN Data Collection Improvement on Non-Fatal Injuries

Observational Study of Social Media Responses after Mass Shootings

Evaluation of Extreme Risk Protection Orders (in Oregon)

State laws (Restrictiveness/Permissiveness) and their association with K-12 school shootings

Dose-Response Analysis and Firearm-specific Outcomes for the Busy Streets Intervention

www.childfirearmsafety.org

Data Repository

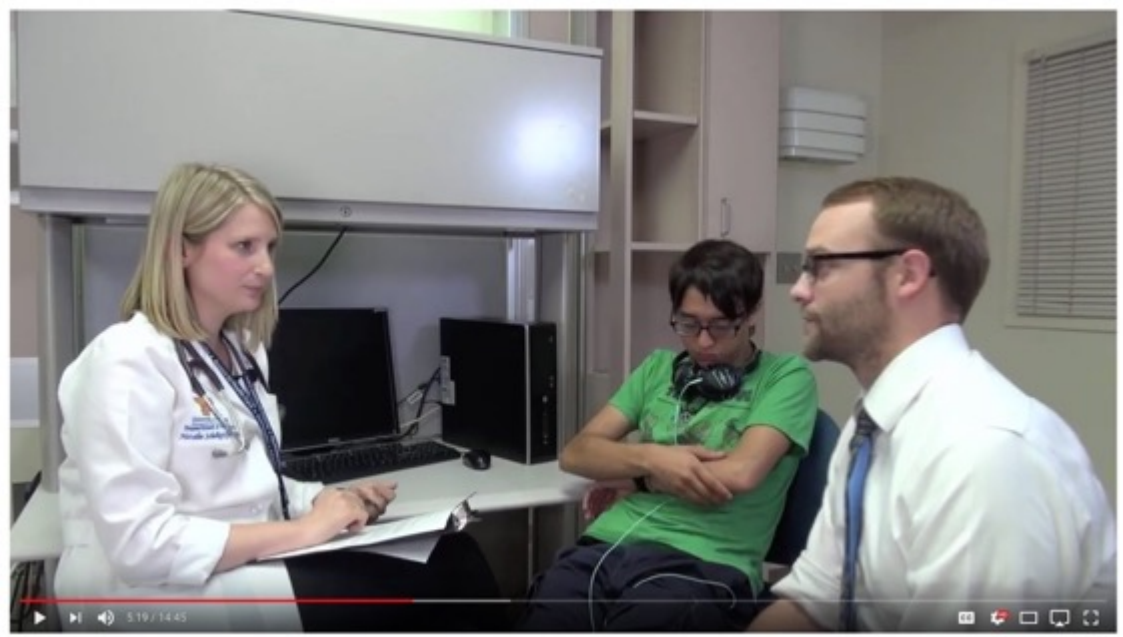
DATA

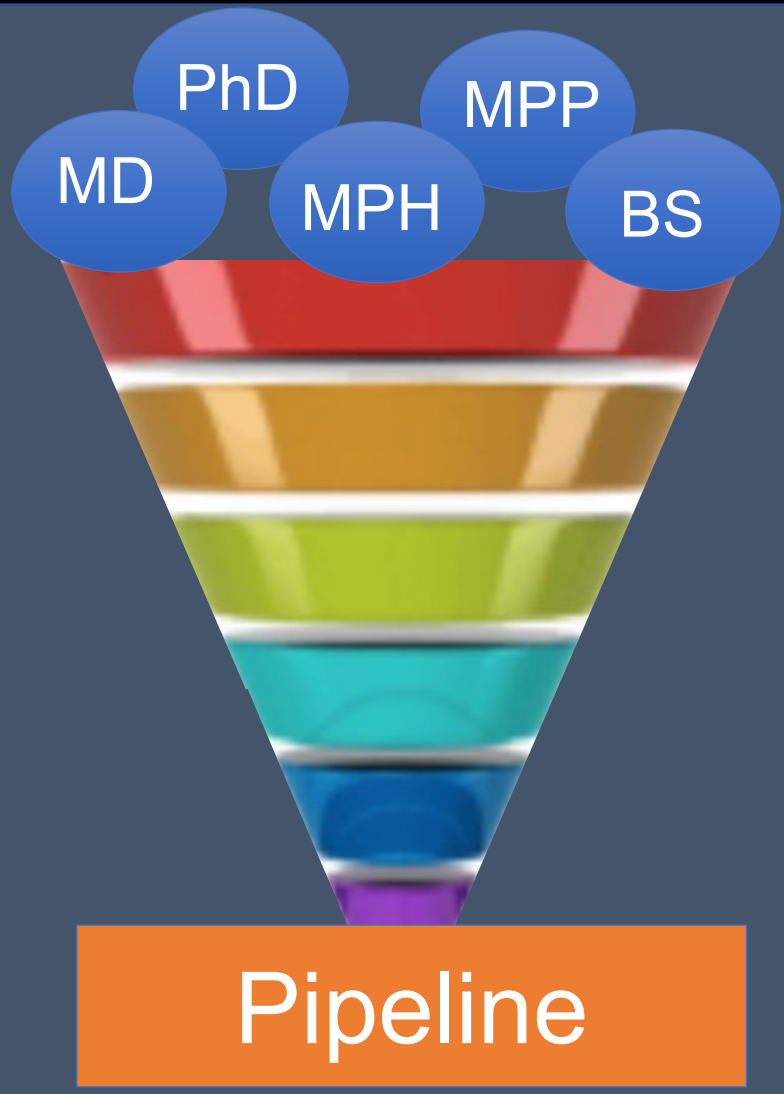
ICPSR Website with searchable data

One stop FACTS info and resources

Leverage Relationships with PECARN and other large consortiums to enhance data collection/analysis/trials

Creating Research Resources





Questions?

- Patrick M. Carter, MD
  - UM Injury Prevention Center
  - Department of Emergency Medicine
  - University of Michigan
  - cartpatr@med.umich.edu

Critical to Reframe as Injury Prevention and Safety Issue not Gun “Control”

FIREARMS AND CHILDREN

REPORT OF A FORUM

SPONSORED BY THE AMERICAN ACADEMY OF PEDIATRICS

AND

THE HENRY J. KAISER FAMILY FOUNDATION

AUGUST 30 TO SEPTEMBER 1, 1989

ELK GROVE VILLAGE, ILLINOIS

2. Long-term goal:

o Have fewer guns. Get guns out of the environments of children. Because of the way firearms are used, this will require bans on handguns, assault rifles, and deadly airguns.

A Quick Historical Detour to the 1990s

SPECIAL ARTICLE

GUN OWNERSHIP AS A RISK FACTOR FOR HOMICIDE IN THE HOME

ARTHUR L. KELLERMANN, M.D., M.P.H., FREDERICK P. RIVARA, M.D., M.P.H., NORMAN B. RUSHFORTH, PH.D., JOYCE G. BANTON, M.S., DONALD T. REAY, M.D., JERRY T. FRANCISCO, M.D., ANA B. LOCCI, PH.D., JANICE PRODZINSKI, B.A., BELA B. HACKMAN, M.D., AND GRANT SOMES, PH.D.

Abstract *Background.* It is unknown whether keeping a firearm in the home confers protection against crime or, instead, increases the risk of violent crime in the home. To study risk factors for homicide in the home, we identified homicides occurring in the homes of victims in three metropolitan counties.

Methods. After each homicide, we obtained data from the police or medical examiner and interviewed a proxy for the victim. The proxies' answers were compared with those of control subjects who were matched to the victims according to neighborhood, sex, race, and age range. Crude and adjusted odds ratios were calculated with matched-pairs methods.

Results. During the study period, 1860 homicides oc-

percent of these, yielding 388 m
pared with the controls, the vic
alone or rented their residence.
more commonly contained an illi
with prior arrests, or someone wh
in a fight in the home. After contr
teristics, we found that keeping
was strongly and independently
creased risk of homicide (adjusted
cent confidence interval, 1.6 to 4.4
involved homicide by a family m
quaintance.

Conclusions. The use of illicit
physical fights in the home are in

SPECIAL ARTICLE

SUICIDE IN THE HOME IN RELATION TO GUN OWNERSHIP

ARTHUR L. KELLERMANN, M.D., M.P.H., FREDERICK P. RIVARA, M.D., M.P.H., GRANT SOMES, PH.D., DONALD T. REAY, M.D., JERRY FRANCISCO, M.D., JOYCE GILLENTINE BANTON, M.S., JANICE PRODZINSKI, B.A., CORINNE FLIGNER, M.D., AND BELA B. HACKMAN, M.D.

Abstract *Background.* It has been suggested that limiting access to firearms could prevent many suicides, but this belief is controversial. To assess the strength of the association between the availability of firearms and suicide, we studied all suicides that took place in the homes of victims in Shelby County, Tennessee, and King County, Washington, over a 32-month period.

Methods. For each suicide victim (case subject), we obtained data from police or the medical examiner and interviewed a proxy. Their answers were compared with those of control subjects from the same neighborhood, matched with the victim according to sex, race, and age range. Crude and adjusted odds ratios were calculated with matched-pairs methods.

cluding 11 case subjects for various reasons, we were able to interview 80 percent (442) of the proxies for the case subjects. Matching controls were identified for 99 percent of these subjects, producing 438 matched pairs. Univariate analyses revealed that the case subjects were more likely than the controls to have lived alone, taken prescribed psychotropic medication, been arrested, abused drugs or alcohol, or not graduated from high school. After we controlled for these characteristics through conditional logistic regression, the presence of one or more guns in the home was found to be associated with an increased risk of suicide (adjusted odds ratio, 4.8; 95 percent confidence interval, 2.7 to 8.5).

Conclusions. Ready availability of firearms is associ-

A Quick Historical Detour to the 1990s

Excerpts from a 1995 letter to Senator Arlen Specter, Chair of HHS Appropriations Committee

We, in Congress, have the responsibility of ensuring that government-sponsored research is providing the public with accurate data and analysis. Funding redundant research initiatives, particularly those which are driven by a social policy agenda, simply does not make sense. This CDC program can be cut with no diminution of service in administering the public interest, and at a savings to the taxpayer.

As you and your staff are aware, a controversy has arisen regarding the Centers for Disease Control's (CDC) National Center for Injury Prevention and Control (NCIPC). Senator Smith has indicated that he wishes to offer an amendment to the appropriate appropriations vehicle that will eliminate funding for the NCIPC altogether. We wanted you to know that we ~~are sympathetic to his~~ objectives, and it is our hope that by outlining our concerns you will consider addressing them, which hopefully will avoid the need for a fully contested debate on the matter.

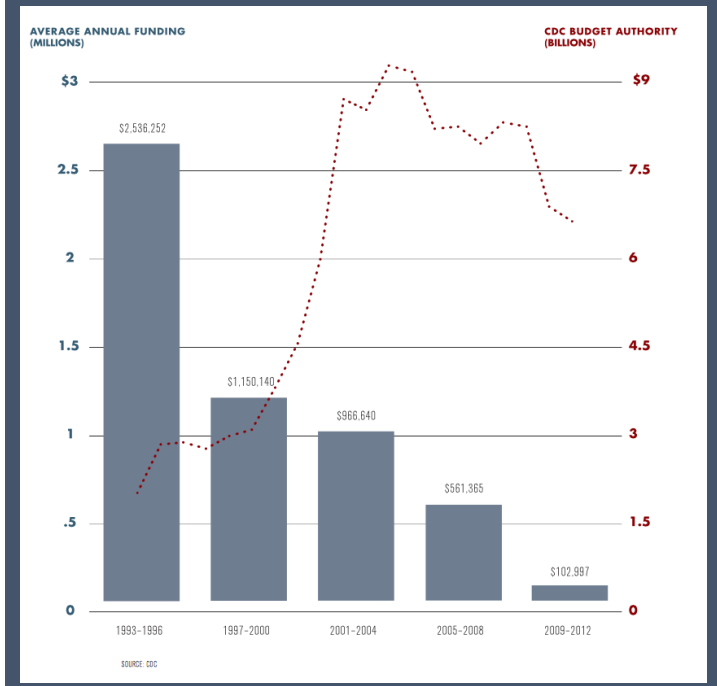
The Dickey Amendment

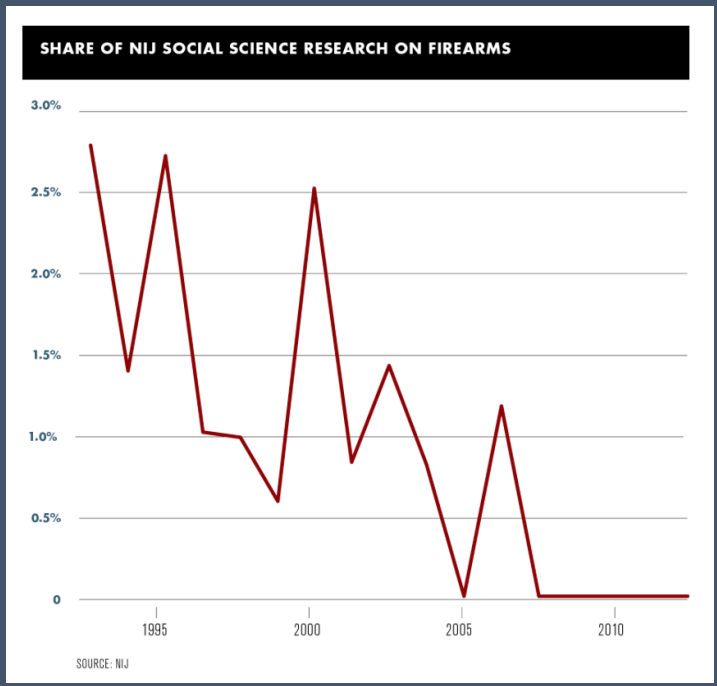
CENTERS FOR DISEASE CONTROL AND PREVENTION

DISEASE CONTROL, RESEARCH, AND TRAINING

To carry out titles II, III, VII, XI, XV, XVII, and XIX of the Public Health Service Act, sections 101, 102, 103, 201, 202, 203, 301, and 501 of the Federal Mine Safety and Health Act of 1977, and sections 20, 21 and 22 of the Occupational Safety and Health Act of 1970, title IV of the Immigration and Nationality Act and section 501 of the Refugee Education Assistance Act of 1980; including insurance of official motor vehicles in foreign countries; and hire, maintenance, and operation of aircraft, $2,262,698,000, of which $30,553,000 shall remain available until expended for equipment and construction and renovation of facilities, and of which $32,000,000 shall remain available until September 30, 1998 for mine safety and health activities, and in addition, such sums as may be derived from authorized user fees, which shall be credited to this account: *Provided*, That in addition to amounts provided herein, up to $48,400,000 shall be available from amounts available under section 241 of the Public Health Service Act, to carry out the National Center for Health Statistics surveys: *Provided further*, That none of the funds made available for injury prevention and control at the Centers for Disease Control and Prevention may be used to advocate or promote gun control: *Provided further*, That the Director may redirect the total amount made available under authority of Public Law 101–502, section 3, dated November 3, 1990, to activities the Director may so designate: *Provided further*, That the Congress is to be notified promptly of any such transfer: *Provided further*, That the functions described in clause (1) of the first proviso under the subheading "mines and minerals" under the heading "Bureau of Mines" in the text of title I of the Department of the Interior and Related Agencies Appropriations Act, 1996, as enacted by section 101 (c) of the Omnibus Consolidated Rescissions and Appropriations Act of 1996 (Public Law 104–134), are hereby transferred to, and vested in, the Secretary of Health

That none of the funds made available for injury prevention and control at the Centers for Disease Control and Prevention may be used to advocate or promote gun control: *Provided further*, That





Branas 2005; WHO 2015; Ladapo 2013; MAIG 2013

What has this meant for Pediatric Firearm Injury Prevention?

Federal research dollars focused on leading U.S. causes of death among children and adolescents ranged from $597 per death for firearm injury to $25 million per death for HIV.

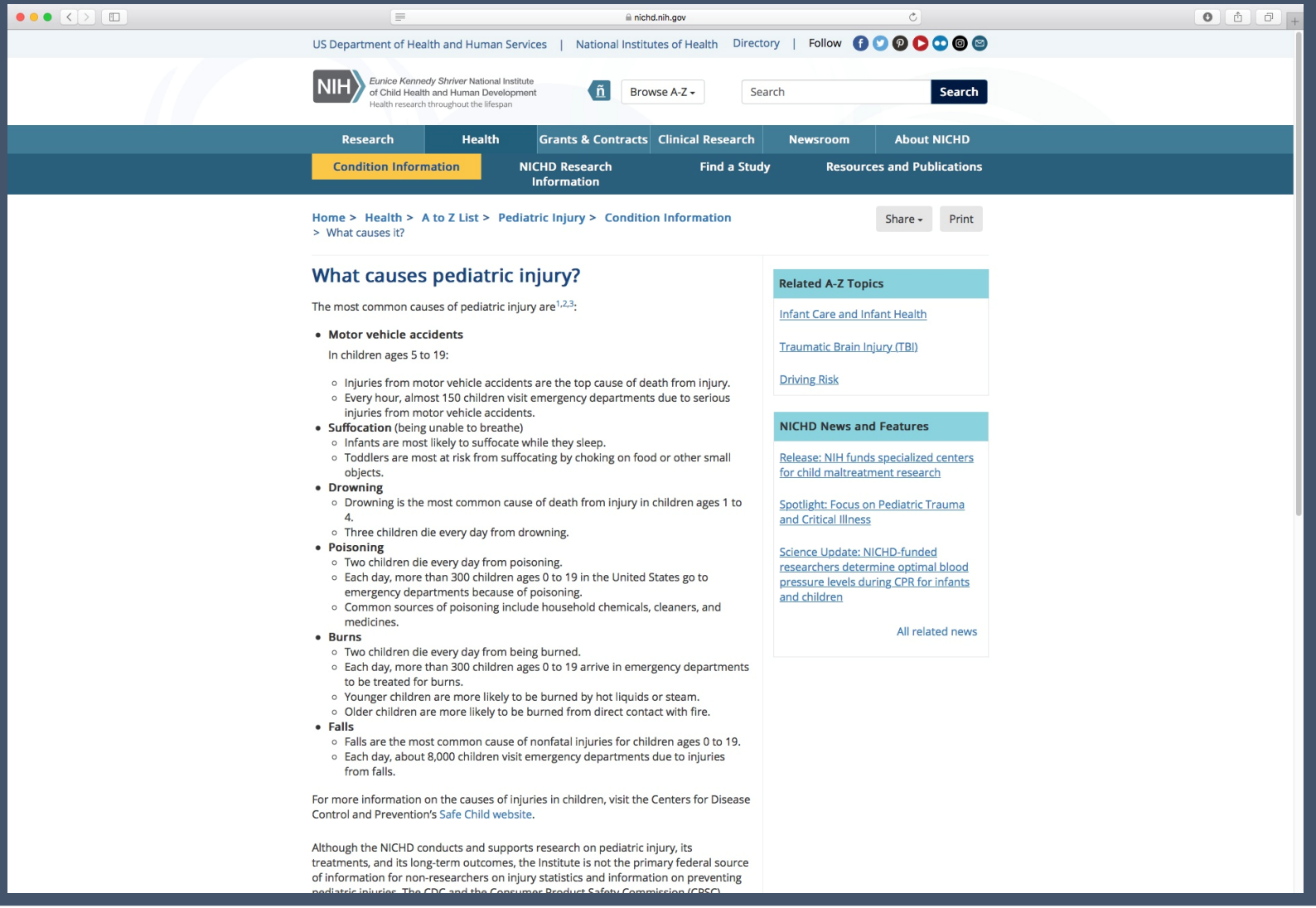
EXHIBIT 1

Federal research awards and corresponding peer-reviewed publications in PubMed focusing on selected causes of mortality among children and adolescents ages 1–18, 2008–17

Cause of mortality	Deaths	Research awards[a]	Funding for research ($)	Mean funding per year ($ millions)	Research dollars per death ($)	Publications
Motor vehicle crash[b]	33,577	186[a]	877,589,272	88	26,136	2,223
Firearm injury[c]	20,719	32	12,368,889	1	597	540
Cancer	17,111	5,168	3,345,352,670	335	195,508	50,235
Opioid overdose	3,385	234	114,354,067	11	33,782	2,193
Congenital abnormalities	9,627	759	357,597,201	36	37,145	7,716
Sepsis	1,602	213	94,179,634	9	58,788	4,514
Diabetes	697	396	201,424,461	20	288,987	5,781
Meningitis	400	64	33,094,457	3	82,736	3,316
HIV	91	1,996	2,310,475,179	231	25,389,837	16,087
Tetanus	0	15	4,029,047	0.4	4,029,047[d]	1,480

Cunningham, Ranney, Goldstick, Kamat; Roche, & Carter, Health Affairs, 2019

What has this meant for Pediatric Firearm Injury Prevention?



nichd.nih.gov

US Department of Health and Human Services | National Institutes of Health Directory | Follow

NIH *Eunice Kennedy Shriver* National Institute of Child Health and Human Development
Health research throughout the lifespan

Browse A-Z | Search | Search

Research | Health | Grants & Contracts | Clinical Research | Newsroom | About NICHD

Condition Information | NICHD Research Information | Find a Study | Resources and Publications

Home > Health > A to Z List > Pediatric Injury > Condition Information > What causes it?

Share | Print

What causes pediatric injury?

The most common causes of pediatric injury are[1,2,3]:

- **Motor vehicle accidents**

  In children ages 5 to 19:

  - Injuries from motor vehicle accidents are the top cause of death from injury.
  - Every hour, almost 150 children visit emergency departments due to serious injuries from motor vehicle accidents.
- **Suffocation** (being unable to breathe)
  - Infants are most likely to suffocate while they sleep.
  - Toddlers are most at risk from suffocating by choking on food or other small objects.
- **Drowning**
  - Drowning is the most common cause of death from injury in children ages 1 to 4.
  - Three children die every day from drowning.
- **Poisoning**
  - Two children die every day from poisoning.
  - Each day, more than 300 children ages 0 to 19 in the United States go to emergency departments because of poisoning.
  - Common sources of poisoning include household chemicals, cleaners, and medicines.
- **Burns**
  - Two children die every day from being burned.
  - Each day, more than 300 children ages 0 to 19 arrive in emergency departments to be treated for burns.
  - Younger children are more likely to be burned by hot liquids or steam.
  - Older children are more likely to be burned from direct contact with fire.
- **Falls**
  - Falls are the most common cause of nonfatal injuries for children ages 0 to 19.
  - Each day, about 8,000 children visit emergency departments due to injuries from falls.

For more information on the causes of injuries in children, visit the Centers for Disease Control and Prevention's Safe Child website.

Although the NICHD conducts and supports research on pediatric injury, its treatments, and its long-term outcomes, the Institute is not the primary federal source of information for non-researchers on injury statistics and information on preventing pediatric injuries. The CDC and the Consumer Product Safety Commission (CPSC)

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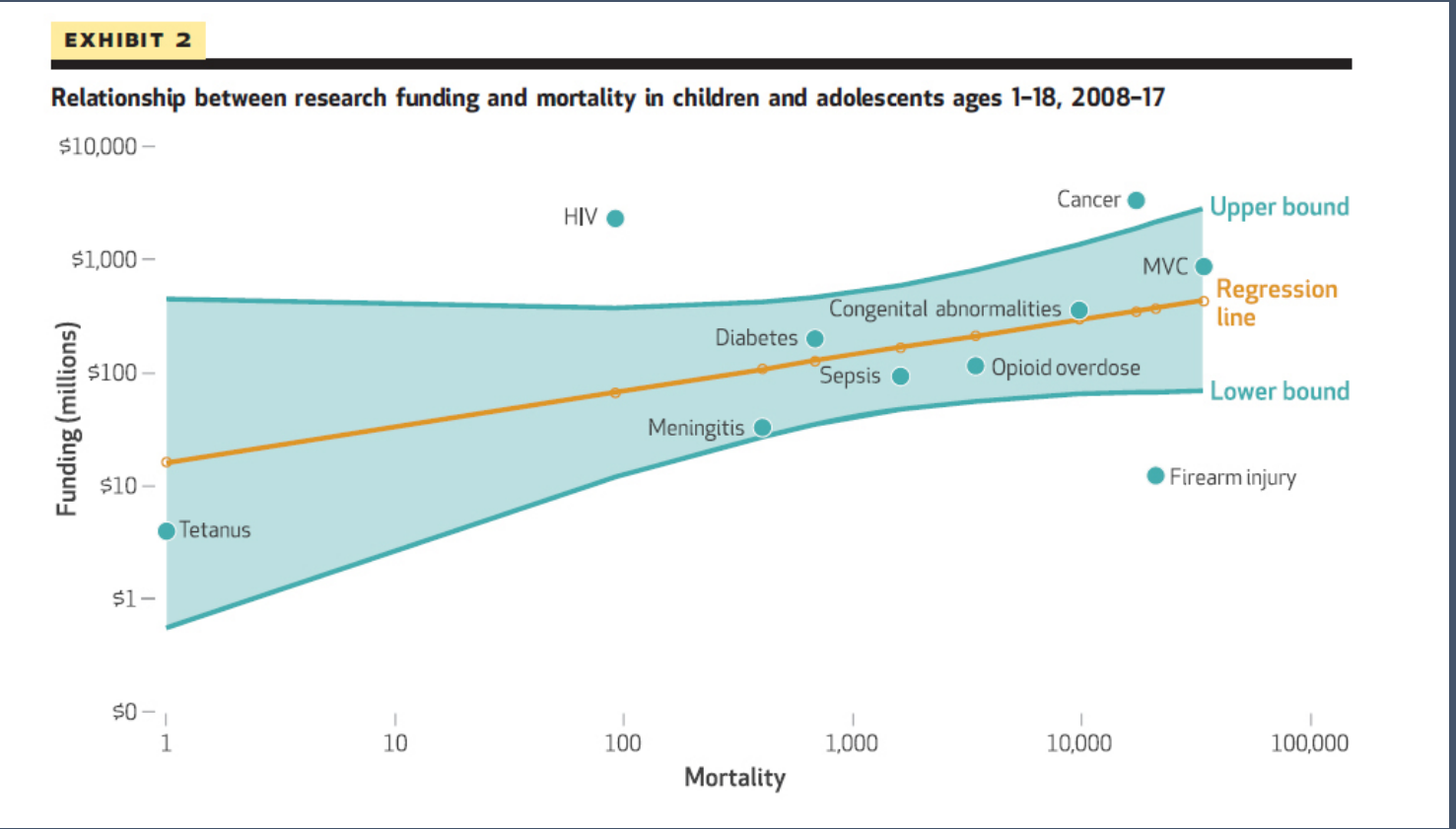
What has this meant for Pediatric Firearm Injury Prevention?

The model suggests that research on firearm injury prevention is 96.7% underfunded, or funded at roughly 1/13 of the predicted amount — given the typical U.S. research funding response to disease and injury epidemics.



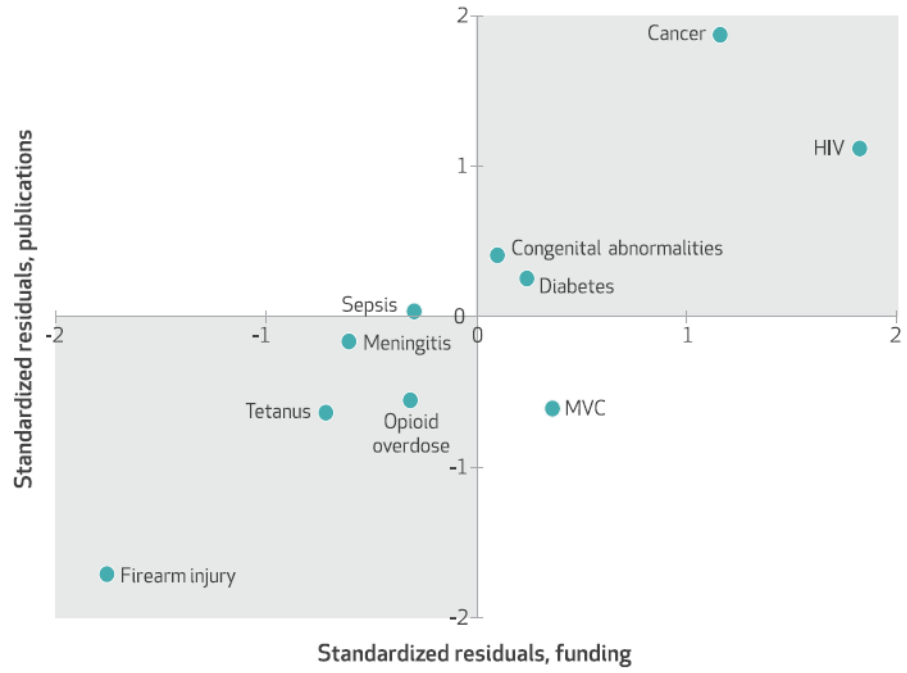
Cunningham, Ranney, Goldstick, Kamat; Roche, & Carter, Health Affairs, 2019

What has this meant for Pediatric Firearm Injury Prevention?

Firearm injuries were more than 1.5 standard deviations below the predicted level for both funding and publication, based on mortality levels.

EXHIBIT 4

Standardized differences between observed and predicted funding and publication totals based on mortality in children and adolescents ages 1–18, 2008–17



To decrease death rates among U.S. children and adolescents, a substantial increase in research funding for firearm injury prevention is required.

About $37 million per year over the next decade is needed to realize a reduction in pediatric firearm mortality that is comparable to that observed for other pediatric causes of death.

Cunningham, Ranney, Goldstick, Kamat; Roche, & Carter, Health Affairs, 2019