In Search of a Safer World: How can we protect our youth from gun violence?

Method Availability, Suicide, and Homicide

David Brent, MD
Director, Services for Teens At Risk (STAR-Center)
University of Pittsburgh School of Medicine

Garrett Lee Smith Suicide Prevention
Substance Abuse and Mental Health Services Administration (SAMHSA) SM060387
Disclosures

• Guilford Press, royalties
• eResearch Technology, royalties
• UpToDate, Editorial Board
• Honoraria, Oxford Press
• Scientific Boards:
  – Klingenstein Third Generation Foundation & American Foundation for Suicide Prevention
Objectives

• Role of firearms availability, homicide, and mass shootings
• Review the relationship between method availability and suicide risk
• Impact of changes in availability on method use and suicide rate (population-based)
• Review impact of counseling and information (patient/individual based)
• Discuss implications for clinical care
Firearms Deaths in the US

- 31,000 Americans die annually from guns
  - 11,078 homicides
  - 73% under age of 24 by gun
  - 19,392 suicides
  - 44% under age of 24 by gun
  - 606 unintentional injuries

- Mass shootings account for 55 deaths per year
Firearms Mortality in the US: Relative to Other High-Income Countries

Odds Ratio (OR)

- Suicide
- Homicide
- Accident

15-24 yrs
5-14 yrs
Comparison of the United States and Other High Income Countries on Total Firearms Homicide Rates and Civilian Gun Ownership*

Mass Shootings, Homicide and Firearms Availability

- Firearms massacre in Australia in 1996 killing 35 people
- Passed legislation to:
  - Remove semi-automatic and pump action firearms
  - Sales through licensed firearms dealers
  - Police approval
  - Buy-back of 650,000 weapons
Impact of Firearms Regulations in Australia*

*Ozanne-Smith, et al., 2004
Firearms Deaths in Australia following Regulations*

*Chapman et al., 2006
Results of Legislation in Australia

• In the 18 years prior to legislation, 13 mass shootings
• In the 10.5 years since, NO mass shootings
• Rate of decline in homicide already in place but pace of decline doubled
Can we predict mass shootings with better mental health screening?

• 25% of individuals have a mental disorder
• 15 mass shootings since 1982
• 1 in 629 first-onset psychotic breaks associated with homicide
• While risk goes up in those with substance abuse, history of bullying, only 8% of the variance in homicidal behavior is accountable by mental disorder
• Engagement, outreach, and treatment may reduce risk over time, but statistically impossible to predict imminent violence
Assumptions of Method Restriction

• Decision to commit suicide can be impulsive, and with the absence of a particular method, suicide will NOT ensue

• If method substitution takes place, may involve a method that is less likely to be fatal
Method Used Based on Differential Access*

**Manhattan:** prescription drugs, jumping from buildings

**Bronx:** Jumping from buildings, commuter trains

**Queens:** Jumping from commuter trains, carbon monoxide inhalation from cars

**Staten Island:** Carbon monoxide inhalation from cars

* Marzuk, et al., 1992
Common Methods of Suicide

- Firearms
- Overdose
- Pesticides
- Asphyxiation
- Jumping
Firearms and Suicide

• Most common method of suicide in both genders in US
• Very high fatality rate for attempts (84-92%)
• More likely to be used if victim is intoxicated (Brent, 1987, 1993)
### Risk of Death from Firearms Relative to Other Methods, Illinois, 1990-1997*

<table>
<thead>
<tr>
<th>Method</th>
<th>OR†</th>
<th>(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firearms (exposure*)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Suffocation</td>
<td>2.6</td>
<td>(2.1 to 3.1)</td>
</tr>
<tr>
<td>Crash/jump</td>
<td>8.0</td>
<td>(6.4 to 10.2)</td>
</tr>
<tr>
<td>Exposure</td>
<td>18.0</td>
<td>(12.8 to 25.3)</td>
</tr>
<tr>
<td>Cuts</td>
<td>325.5</td>
<td>(256.8 to 412.7)</td>
</tr>
<tr>
<td>Poisons</td>
<td>270.4</td>
<td>(230.6 to 317.2)</td>
</tr>
</tbody>
</table>

*Firearm episodes are the exposure category. For example, firearm episodes are 2.6 times more lethal than suffocation episodes
†Model includes gender and age (continuous variable)
‡Shenassa, et al., 2003
The Relationship of Gun Availability and Suicide

• Population studies
  – Correlation between gun availability and firearms suicide rate
  – Gun ownership is not correlated with depression, anxiety, substance abuse suicidal ideation, planning or attempt (Brent, 1991; Hemenway & Miller 2002; Miller et al., 2009)
  – As gun ownership drops, so does the firearms suicide rate
## States with Highest and Lowest Rates of Gun Ownership*

### Data on Suicides in States with the Highest and Lowest Rates of Gun Ownership, 2001–2005.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>States with the Highest Rates of Gun Ownership</th>
<th>States with the Lowest Rates of Gun Ownership</th>
<th>Ratio of Mortality Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person-years</td>
<td>195 million</td>
<td>200 million</td>
<td></td>
</tr>
<tr>
<td>Percent of households with guns</td>
<td>47</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of firearm suicides</td>
<td>14,365</td>
<td>3,971</td>
<td>3.7</td>
</tr>
<tr>
<td>No. of nonfirearm suicides</td>
<td>6,573</td>
<td>6,781</td>
<td>1.0</td>
</tr>
<tr>
<td>Total no.</td>
<td>20,938</td>
<td>10,752</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of firearm suicides</td>
<td>2,212</td>
<td>286</td>
<td>7.9</td>
</tr>
<tr>
<td>No. of nonfirearm suicides</td>
<td>2,599</td>
<td>2,478</td>
<td>1.1</td>
</tr>
<tr>
<td>Total no.</td>
<td>4,811</td>
<td>2,764</td>
<td>1.8</td>
</tr>
</tbody>
</table>

* The states with the highest rates of gun ownership included here are Wyoming, South Dakota, Alaska, West Virginia, Montana, Arkansas, Mississippi, Idaho, North Dakota, Alabama, Kentucky, Wisconsin, Louisiana, Tennessee, and Utah. The states with the lowest rates of gun ownership included here are Hawaii, Massachusetts, Rhode Island, New Jersey, Connecticut, and New York. Data on gun ownership are from the 2001 Behavioral Risk Factor Surveillance System. Data on suicides are from the Centers for Disease Control and Prevention Web-Based Injury Statistics Query and Reporting System (WISQARS; www.cdc.gov/ncipc/wisqars).

**Miller, et al., 2008**

*Ajdacic-Gross, et al., 2010*
Case-control Studies

• Guns are **more likely** to be in the home of suicide victims

• Conversely, if a gun is in the home, it is highly likely to be the **method of choice**

• The gun used for suicides is **most likely found in the home**, or less commonly the home of a relative

• Guns in the home may be a **bigger risk factor** for suicide in **younger** individuals but still associated with mid-life and elder suicides
### Case-control Studies:
#### Guns in the Home and the Method of Suicide*

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of gun for suicide if kept in home</td>
<td>67- 88%</td>
</tr>
<tr>
<td>Use of gun if <strong>not</strong> kept in home</td>
<td>6-23%</td>
</tr>
<tr>
<td>Firearms &amp; alcohol use (OR [95% CI])</td>
<td>7.3</td>
</tr>
<tr>
<td>Bought gun within 2 weeks of suicide</td>
<td>3%</td>
</tr>
</tbody>
</table>

*Brent, 1993; Kellerman, 1992; Shah, 2000
Gunshot Deaths involving Guns Kept at Home (Kellermann & Reay, 1986)
Guns in the Home and Suicide by Age (OR) (Kellermann, 1992)
Population Attributable Risk: Guns and Psychopathology by Age*

*Brent, et al., 1999
Types of Guns, Methods of Storage and Suicide

- **Handguns** pose a greater risk than long guns.
- **Loaded guns** pose a greater risk than unloaded guns.
- **Unlocked guns** pose a greater risk than locked guns.
- **Loaded guns** particularly increase risk for suicide in those without clear psychiatric disorder and intent (Brent, 1993).
Guns in Home in Suicide: Types of Gun and Storage (ORs) (Brent, 1993; Kellermann, 1992)
Rates of Suicide by Firearm in the First Year After Purchase Among Persons Who Purchased Handguns in California in 1991*

The horizontal line indicates the age- and sex-adjusted average annual rate of suicide by firearm in California in 1991 and 1992 (11.3 per 100,000 persons per year).

*Wintemute et al., 1999
Rates of Suicide by Firearm During the Six Years After Purchase Among Persons Who Purchased Handguns in California in 1991

The horizontal line indicates the age- and sex-adjusted average annual rate of suicide by firearm in California in 1991 through 1996 (10.7 per 100,000 persons per year).

*Wintemute et al., 1999
Protective Gun Storage Practices and Youth Suicide/Unintended Deaths by Guns (ORs) (Grossman, 2005)
Availability, Type, Storage of Guns, and Suicides: with and without Psych Disorder (OR)

Adolescents (Brent, 1993)

- Any guns
- Long guns
- Hand guns
- Loaded

Psych disorder
- No psych

Adults (Kellermann, 1992)

- Any guns

Psych Disorder
- No Psych Disorder
Natural Experiments with Gun Availability and Storage

• Changes in gun availability associated with reduction in suicide rates overall and by firearms
  – Population studies
  – Studies involving the Swiss and Israeli armies

• Changes in storage practices also associated with changes in firearms suicide rates
Household Gun Ownership and Firearms Suicide Rate

*Miller, et al., 2006
Firearms Restrictions for Weekend Passes for Youth in the IDF (Lubin, 2009)

- In 2006, youth in the IDF no longer brought their guns with them when on weekend passes
- Suicide in the IDF—90% firearms
- Rate in 2003-05 on average 28
- Rate in 2007-08 on average 16.5
- Decline in weekend suicides from 10 to 3
Primary Care-based Firearms Counseling: Why Do It?

- 25% of households store firearms unsafely = 2 million households with children
- Already shown a relationship between storage and suicide/unintended death in youth
- Firearms counseling acceptable to the vast majority of parents
  - ¾ will listen to physician advice about safe storage
  - Only 17% would consider removing a gun, though
- Evidence that brief interventions can improve safe storage of guns/ammunition
Physicians’ Firearms Attitudes and Practices about Counseling (%)
Why the Gap Between Theory and Practice in Firearms Counseling?

- Perceived lack of time
- Belief that counseling is ineffective
- Belief that patients and families won’t heed advice or will be offended
- Belief that firearm injuries and fatalities are not a problem in the practice
Why do Families have Guns in the Home?

• Reasons for having guns:
  – Recreational = long-guns
  – Protection = handguns

• Factors associated with unsafe storage
  – Living in rural settings, in the South
  – Work-related gun ownership
  – Handgun owner
  – Owning a gun for protection
  – Firearm safety training
  – Alcohol consumption and abuse
Compliance with Request to Remove Guns in Outpatient Adolescent Psychiatric Setting (Brent, 2000)

- Clinical trial: 106 depressed adolescents
- Families all asked to remove guns (no other options provided)
- Only 27% of those who had guns actually removed them, and 17% of those without guns initially obtained them.
- Gun removal was more likely if:
  - Patients had a history of suicide attempt
  - The parent was not married (and talked to the gun owner)
- Gun removal was less likely if:
  - Patients were of urban origin
  - Parents had greater marital dissatisfaction
  - Father substance abuse
Impact of Firearm Safety Counseling: Primary Care (Grossman, 2000)

- Grossman et al. (2000): Randomized controlled trial
- Steps to Prevent Firearms Injury Program (STOP)
- No changes in gun ownership, acquisition, or methods of storing after intervention.
- Purchase of trigger locks (8% vs. 2.5%, ES = 0.12, P = .06)
• Intervention in FP
• Screen for storage practices
• “Having a loaded or unlocked gun is a risk for injury or death to your family members, whether by accident or on purpose. I urge you to store your gun unloaded in a locked drawer away from the reach of children.”
• On follow-up, 58-64% of the intervention vs. 33% of the control group made changes to make storage more safe.
Coyne-Beasley et al., 2001*

-Used Steps to Prevent Injury from Firearms (STOP) in shopping center parking lot + free gun locks

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Baseline</th>
<th>6-month Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storing guns in a locked compartment</td>
<td>48%</td>
<td>77%</td>
</tr>
<tr>
<td>Use of gun locks</td>
<td>0%</td>
<td>72%</td>
</tr>
<tr>
<td>Inquiry about firearm ownership and storage practices</td>
<td>28%</td>
<td>88%</td>
</tr>
</tbody>
</table>

* All comparisons significant at P < .05
Carbone, 2005 study

• 206/2649 pediatric patients in primary care, mostly Hispanic
• 30 minute practitioner training
• Screen about firearms storage
• Brief intervention: “a gun in the home can be a risk to the family. It is safest not to have one, but if you keep a gun in the house, unload it and lock it up.”
• Offered free gun lock
Firearms Counseling in Primary Care (Carbone, 2005)
Barkin et al., 2008

• 134 practices, with 470 households with at least one gun
• Screener
  – Are guns stored or hidden in a place other than a gun safe or locked gun cabinet?
  – Are all guns stored with gun locks?
  – Are bullets stored separate from guns?
• Offer MI and free gun cable lock (time=1 min)
• 76% vs. 51% in expt vs. control gave firearms advice.
Change in % Using Gun Locks
(Barkin, 2008)
Conclusions about Firearms Interventions

- Need to speak directly to the gun owner
- Asking people to remove guns is not successful, but parents willing to speak about safe storage
- Asking people to store guns more safely can be effective in a brief intervention
Overdose/Self-Poisoning

• Switch from TCAs to SSRIs associated with a lower suicide rate
• Restriction in availability of over the counter analgesics may have had a beneficial effect
• Pesticides most common method of suicide in Asia—restriction in sales/safe storage associated with a reduction in the suicide rate
Tricyclic Antidepressants, SSRIs and Suicide*

*Gibbons, et al., 2005
TCAs and SSRIs*

Figure 4. Suicide rates and time trends in men (the higher rates) and women (the lower rates) 15 years of age and older in Sweden during the period 1977–1997

*Carlsten et al., 2001
Availability of Analgesics and Suicide Attempts*

*Corcoran, et al., 2010

Figure 3: National rate of intentional drug overdose presentations to hospital in Ireland involving distalgesic, other prescription compound analgesics and solpadeine, 2003-2008. Note: Error bars represent the 95% confidence intervals for the rates.
Pesticide Restriction in Taiwan*

*Chang, et al., 2012
Pesticide Restriction in Taiwan
Continued*

*Chang, et al., 2012
Lockboxes for Pesticides*

*Konradsen et al., 2007
Asphyxiation with Carbon Monoxide

- Detoxification of domestic gas associated with decline in suicide rate
- Advent of catalytic converters resulted in a decline in deaths due to carbon monoxide poisoning
- Some evidence of method substitution
Changes in Suicide by Automotive Exhaust*

*McClure, et al., 2000
Suicide by Car Exhaust

Percentage of suicides by hanging (□) and by car exhaust asphyxiation (♦).

*Amos, et al., 2001
**Bridge Barriers in Bristol**

- **1998**—placed barriers to prevent jumping from Clifton Suspension Bridge in Bristol, UK
- Number of suicides halved from this bridge
- No overall increase in suicide

*Bennewith et al., 2007*
Suicides in Toronto by jumping from Bloor Street Viaduct and other bridges before (1993-2001) and after (July 2003-June 2007) construction of a suicide prevention barrier at Bloor Street Viaduct: corrected per capita to suicides in 1993 population (not standardized for age)

*Sinyor, et al., 2010*
Conclusions

• Evidence that method restriction can affect suicide rates

• While there is sometimes evidence of method substitution, it can take years to take effect and may result in substitution of a lower lethality method

• Brief counseling in primary care can improve safety storage of firearms
Firearms, Mass Shootings, and Homicide

• US has the highest rates of gun homicide, homicide overall, and gun ownership
• Screening for imminent violence is not likely to accurately detect who is at risk
• Treatment engagement may prevent violence over the long run
• Best investment is to prevent abuse, substance abuse, and antisocial disorders with early interventions
Thank you very much for your attention!

• Part of this presentation was presented on a webcast funded under award SM060387 by the Substance Abuse and Mental Health Services Administration (SAMHSA).

• We acknowledge with gratitude the Pennsylvania Legislature for its support of the STAR-Center and our outreach efforts.

• This presentation may not be reproduced without written permission from: STAR-Center Outreach, Western Psychiatric Institute and Clinic, 3811 O’Hara Street, Pittsburgh, PA 15213 (412)864-3346

• All rights reserved, 2013