

Means restriction: an effective suicide prevention strategy?



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Background



- GGB: Leading suicide location worldwide
- More than 1200 suicides since 1937
 - Approximately one suicide every 2-3 weeks
 - 4 foot railing, no other barrier
- Not always the uncontested leader among sites worldwide
 - the Eiffel Tower, St. Peter's Basilica, the Sydney Harbor and Arroyo Seco Bridges, Mt. Mihara

GGB Survivor

On the bridge, Baldwin counted to ten and stayed frozen. He counted to ten again, then vaulted over. *“I still see my hands coming off the railing,”* he said. As he crossed the chord in flight, Baldwin recalls:

“I instantly realized that everything in my life that I’d thought was unfixable was totally fixable—except for having just jumped.”

Barriers to Suicide and Suicide Prevention: Public Opinion and the Golden Gate Bridge

	Percent who think <u>ALL</u> Jumpers would find another way to kill themselves if a foolproof anti-suicide barrier were put up on the Golden Gate Bridge	Multivariate Odds Ratio (95% CI)
All respondents (n=2638)		
Male (n=1310)		
Female (n=1328)		
Current Smoker (n=548)		
Not a Current Smoker (n=2087)		
Personally own a firearm (n=735)		
Live in a household with guns but do not personally own any firearms (n=296)		
Live in a household without firearms (n=1560)		

2003 Deaths

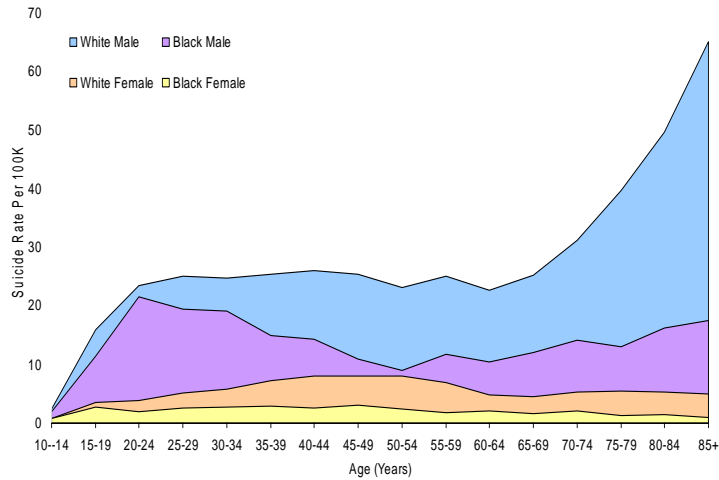
Suicides	31,484
Firearm Suicides	16,907(54%)
Homicides	17,732
Firearm Homicide	11,920 (67%)

Preliminary Findings from the HICRC 2004 Firearms Survey

	Households with Kids	Households without Kids
Firearm prevalence	39%	38%
In Households with Guns:		
% Unlocked	48%	56%
•% Loaded	22%	31%
•% Loaded & Unlocked	5%	12%

Hepburn L, Miller M, Azrael D, Hemenway D. Firearm ownership in the US: findings a national survey. Preliminary findings

U.S. Suicide Rates by Age, Race, and Gender



Source: National Center for Health Statistics

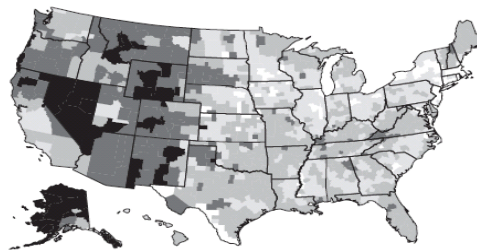
NYT
February
13, 2005

Suicide in Rural America

Suicide rates are highest in rural areas, especially those in the Rocky Mountain states, and most suicides are committed using guns. In cases where guns are used, the suicide rate in rural counties is higher than the homicide rate in urban areas.

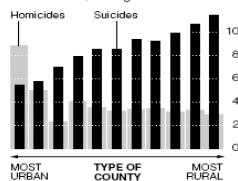
SUCIDES PER 100,000 PEOPLE

1990 to 2001, average annual rate for 805 health service areas in the U.S.



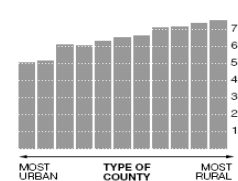
FIREARM DEATHS PER 100,000 PEOPLE

1989 to 1999, average annual rate



PERCENTAGE OF SUICIDES THAT ARE COMMITTED WITH FIREARMS

1989 to 1999

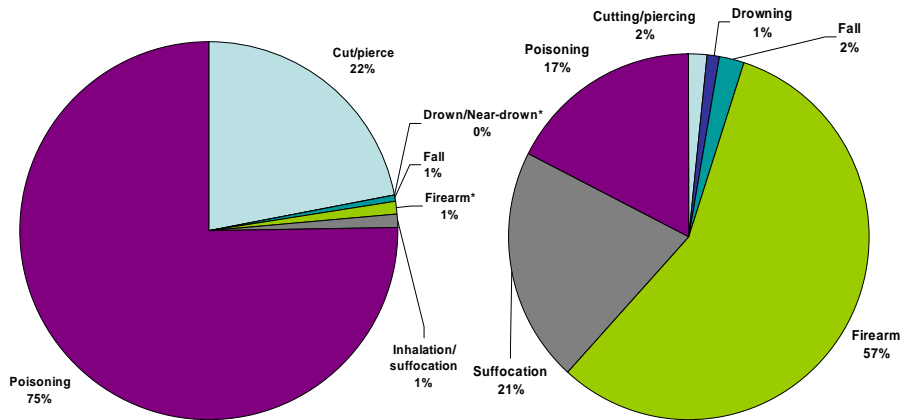


Sources: Centers for Disease Control and Prevention; Bruce Dambling, University of Virginia School of Medicine (map data); Charles Branas, University of Pennsylvania medical school (urban-rural data)

Non-fatal Self-Harm vs. Suicide, United States

Non-fatal Self-Harm (n=324,940)

Suicide (n=29,699)



WISQARS Non-Fatal Injury Reports (2002 Data) seen in ER regardless of disposition
 WISQARS Fatal Injury Reports (2001 Data)

The Epidemiology of Case Fatality Rates for Suicide in the Northeast

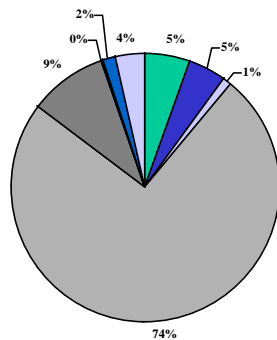
Miller M, Azrael D, Hemenway D. The epidemiology of case fatality rates for suicide in the northeast. *Ann Emerg Med.* 2004 Jun;43(6):723-30.

Methods

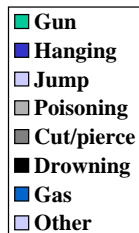
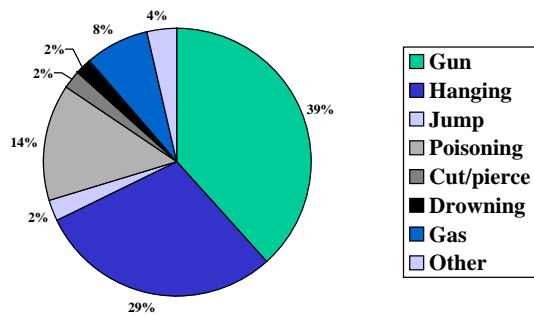
- Mortality Data (1996-2000)
 - 5,806 suicides
- Hospital Discharge Data (1996-2000)
 - 7 North East States: MA, RI, CT, NJ, ME, VT, NH
 - Suicide Acts Admitted to Medical Hospitals
 - 39,025 Non-fatal hospitalized suicide attempts

Self Harm vs. Suicide Deaths, By Method: Seven Northeast States

Self-harm, fatal and non-fatal

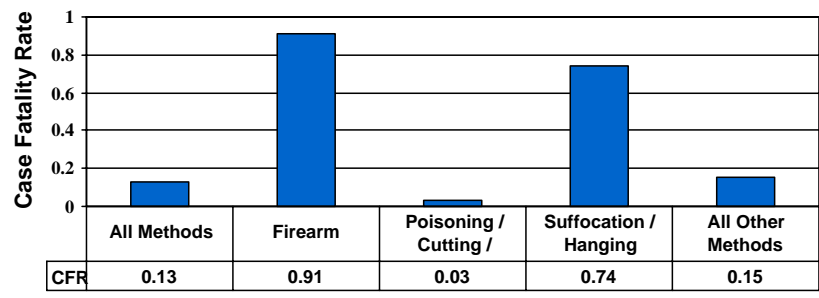


Suicide Deaths



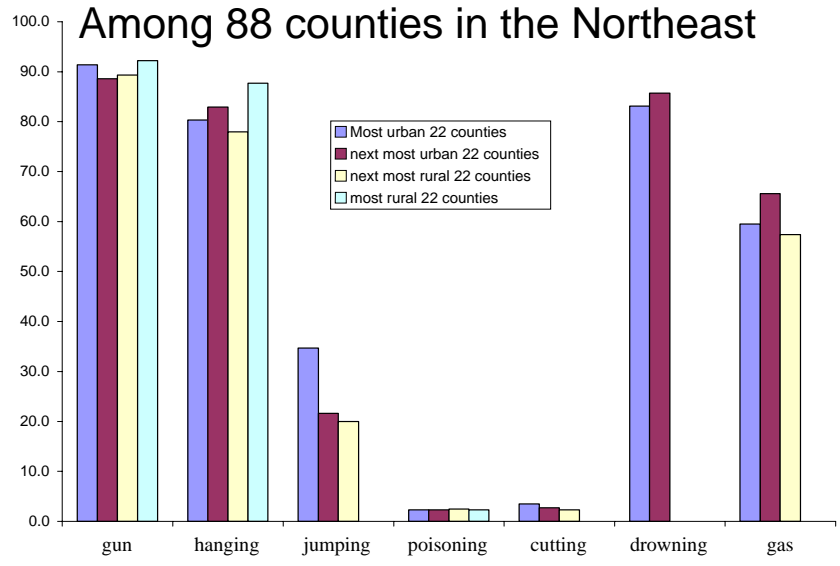
Suicide Attempts and Case Fatality Rate by Method Seven Northeast States, 1996-2000

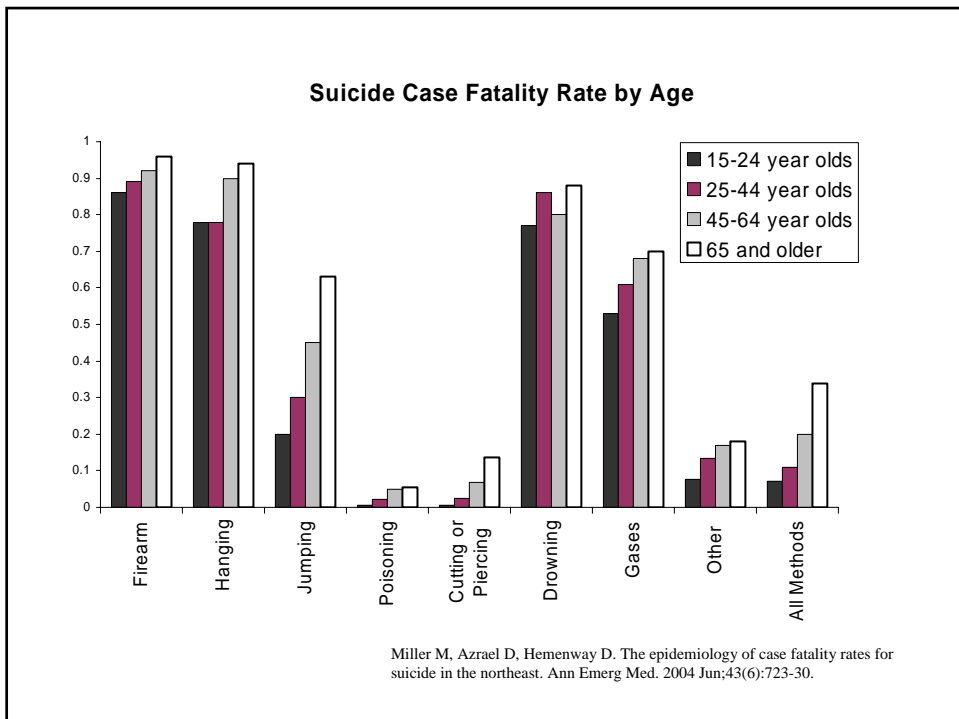
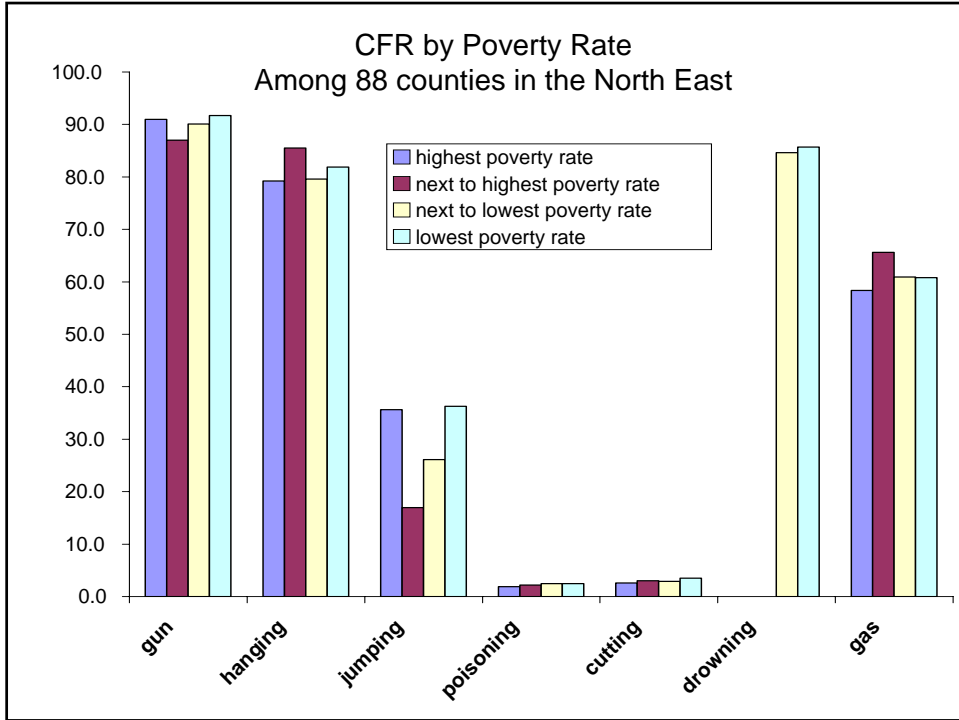
	All Methods	Firearm	Poisoning/ Cutting/ Piercing	Suffocation/ Hanging	All Other Methods
Percent of suicide acts by methods	100%	5%	85%	5%	5%

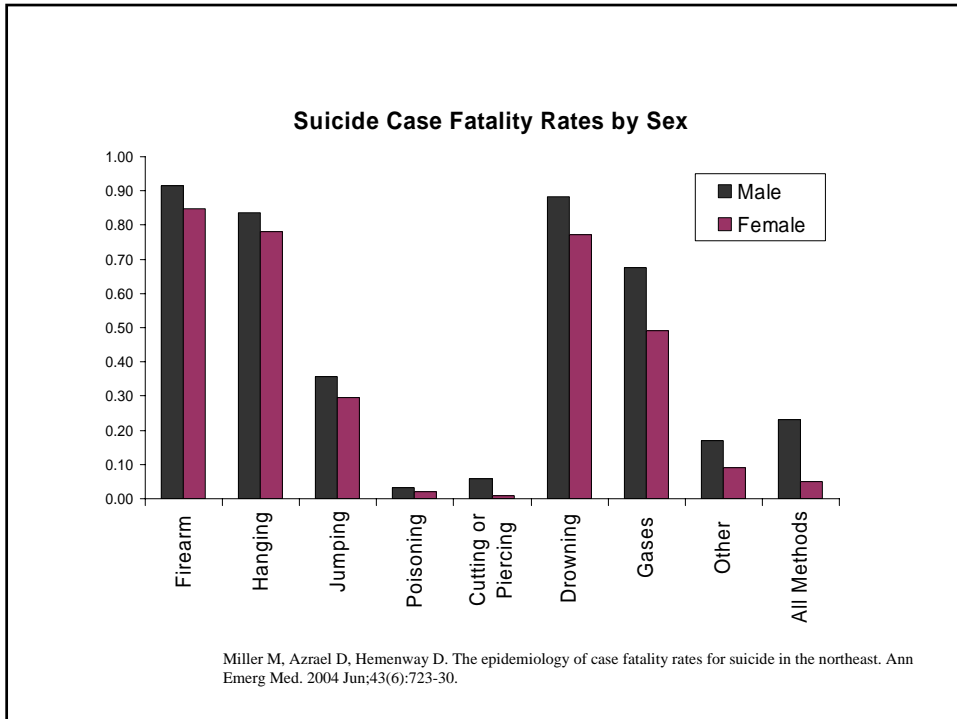


Source: Miller et al., Annals of Emer Med, 2004.

CFR by Rate of Urbanization Among 88 counties in the Northeast







Means Restriction as a Suicide Prevention Strategy

- Suicide acts are often impulsive
- Crises are often temporary
- 90% of survivors of near-lethal suicide attempts do not commit suicide thereafter

Impulsivity

SURVIVORS OF SELF-INFLICTED SHOOTING

(De Moore et al, 1994)

- 33 survivors of self-inflicted firearm injuries
- Most common reason for shooting was interpersonal conflict with partner or family members (21 patients)
- Act almost always described as impulsive
- All used firearms available in household and availability was often reason given for choice of this method

Impulsivity

Factors associated with the medical severity of suicide attempts in youths and young adults

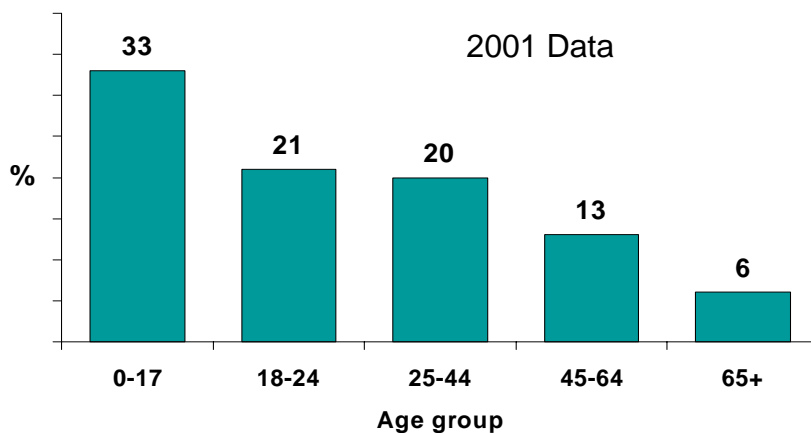
(Swahn MH, Potter LB, 2001)

- 25% of 153 survivors of near lethal suicide attempts acted within 5 minutes of the impulse to do so
- 71% acted within one hour

CRISIS | same-day

- Did suicide occur within 24 hours of a very recent crisis or precipitating event?
 - e.g. arrest, job loss, argument, relationship break-up, legal trouble, police pursuit, bad report card
- Purpose is to identify suicides that may have an impulsive element

CRISIS | % same day by age



N=1,671 CT, ME, UT, WI, Allegheny County, San Francisco County

Is prevention of suicide during risk periods effective in long term?

(If jumpers can't jump what do they do?)

FOLLOW-UP STUDY OF GOLDEN GATE BRIDGE SUICIDE ATTEMPTERS (Seiden, 1978)

- **515 Golden Gate Bridge attempters restrained from jumping, May 1937-1971 (70% male)**
- **Median follow-up period 26.7 years**
- **Deaths during follow-up periods:**
 - 25/515 (4.9%)**
 - (7 from GGB, 1 from Bay Bridge)**
 - 2/3 of deaths within 6 months**

FOLLOW-UP STUDY OF ATTEMPTED SUBWAY SUICIDES (O'Donnell et al, 1994)

94 individuals (49 M, 45 F) Survived suicide attempts on London Underground, 1977 - 1979

- **10 – 13 year follow-up**
- **7 suicides and 2 probable suicides
i.e. 9/94 (9.6%)**

All the suicides and probable suicides occurred in first 43 months of follow-up period

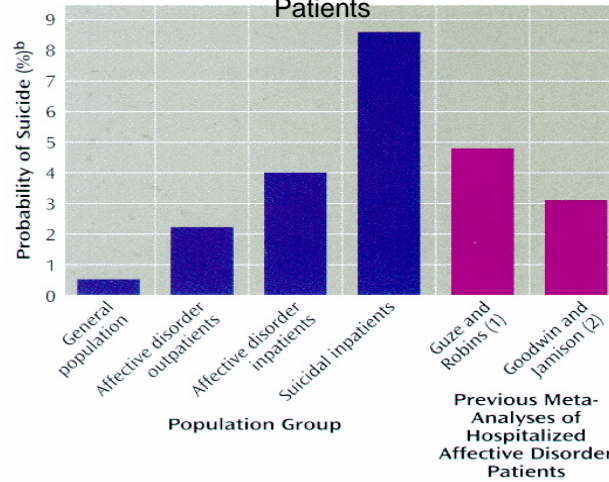
No evidence of longer-term risk

Self inflicted gun shot wounds: lethality of method versus intent

- 30 patients who survived suicide attempts with firearms
- All intended to die
- None had completed suicide by end of 2 year study
- No support for traditional notion that SA with lethal methods are planned
 - in fact, other evidence points to impulsivity being over-represented in firearm suicides, especially among youth (Azreal et al, 2003)

Peterson LG et al (1985) Self inflicted gun shot wounds: lethality of method versus intent. AJP 142:228-231.

Lifetime Risk of Suicide Among Five Populations of Psychiatric Patients



^a See Table 1 for studies that comprised the patient populations.

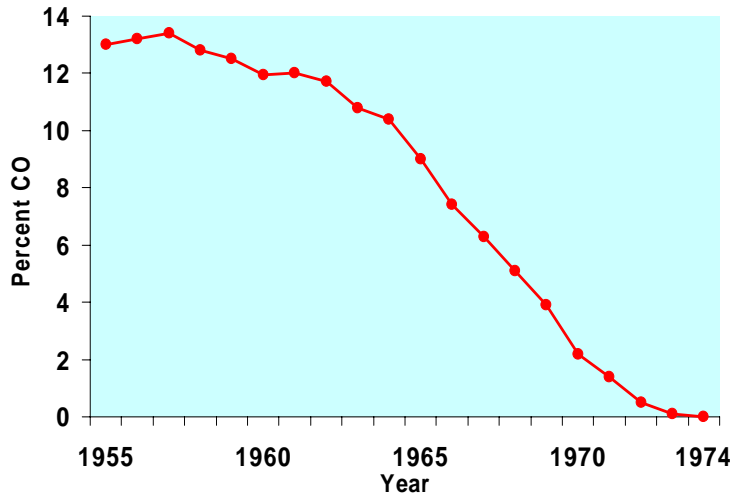
^b Determined by application of Bayes's Rule (39), which states that the probability of suicide is equal to the probability of suicide given death (proportionate mortality prevalence) times the probability of death (general mortality prevalence).

From: Bostwick: Am J Psychiatry, Volume 157(12).December 2000.1925-1932

Does availability of method affect suicide rates?

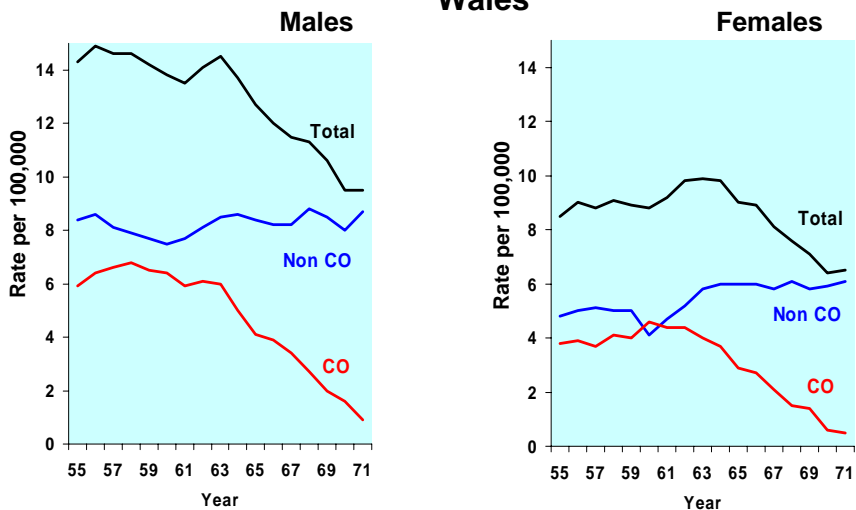
THE COAL GAS STORY (Kreitman, 1976)

Percentage of CO in domestic gas, United Kingdom 1955-74

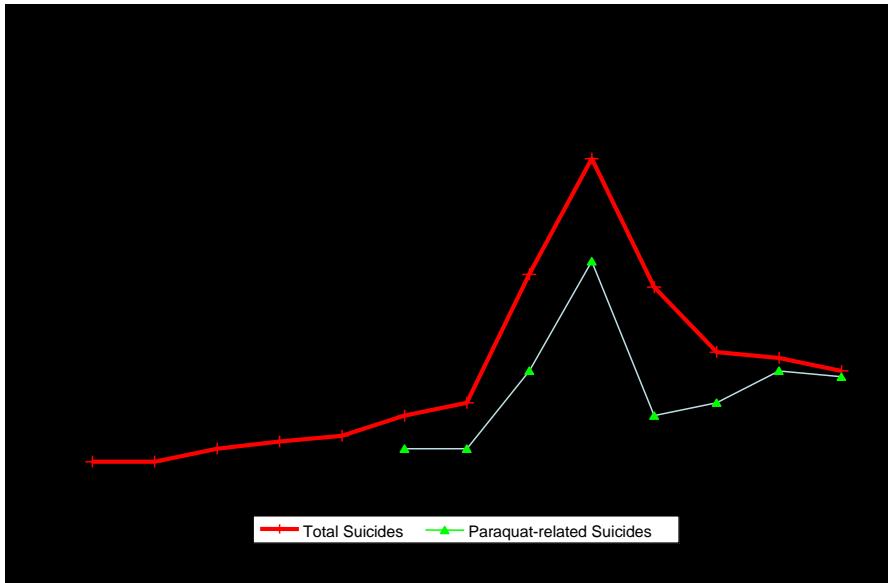


THE COAL GAS STORY (Kreitman, 1976)

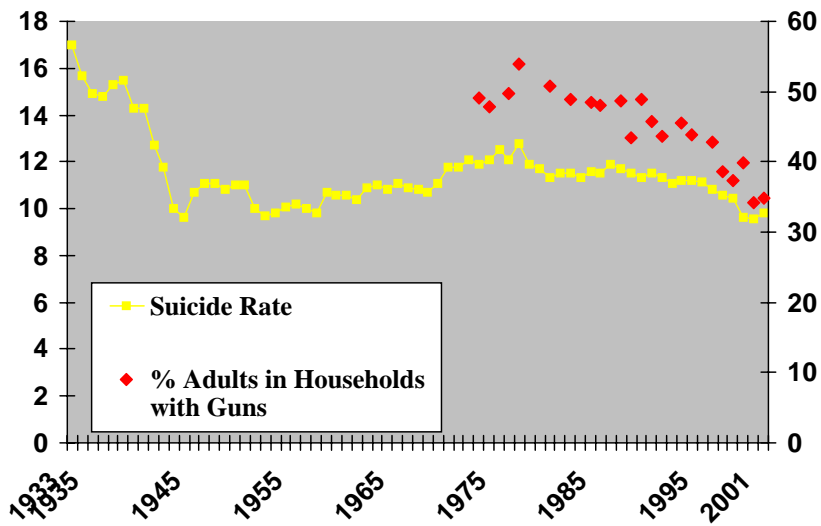
Sex-specific suicide rates by mode of death: England & Wales



Exercise



Suicide Rates United States, 1933-2001



Source: Natl. Center for Health Statistics
Age-adjusted to 1940 U.S. population

The Association between Changes in Household Firearm Ownership and Rates of Suicide in the United States, 1981-2002

Dependent Variable

- Firearm and non-firearm suicide mortality rates from WISQARS, 4 Census regions, 1981-2002

Independent Variables

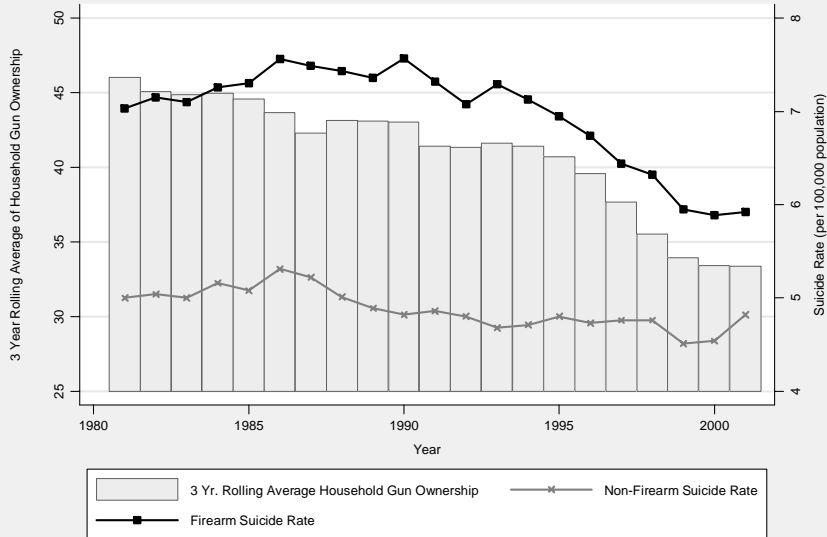
- Percentage of individuals living in households with firearms (gun prevalence) – General Social Survey (GSS)
- Age
- Region
- Per capita alcohol consumption - National Institute on Alcohol Abuse and Alcoholism
- Unemployment – Bureau of Labor Statistics
- Poverty and urbanization – Census Current Population Survey

Analysis

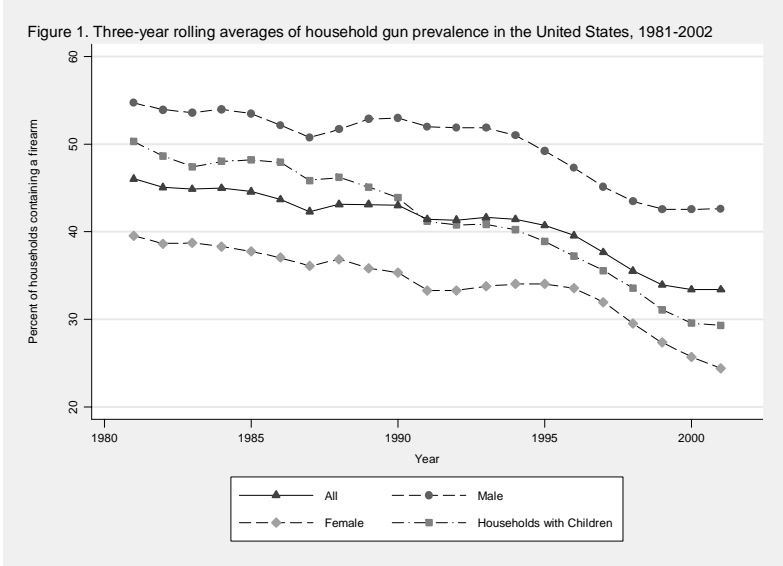
- GEE modeling to account for serial auto-correlation

Miller M, Azrael D, Hepburn L, Hemenway D, Lippmann S. Injury Prevention. 2006. In Press.

Figure 2. Household gun ownership levels and rates of firearm and non-firearm suicide mortality: United States, 1981-2002



Miller M, Azrael D, Hepburn L, Hemenway D, Lippmann S. Injury Prevention. 2006. In Press.



Miller M, Azrael D, Hepburn L, Hemenway D, Lippmann S. Injury Prevention. 2006. In Press.

Table 1. Longitudinal Association between Household Gun Ownership and Suicide Mortality: Percent Decrease in Mortality Rate for each 10% Decrease in Household Firearm Ownership Level (1981-2001), adjusted for age, unemployment, poverty, per capita alcohol consumption and region of the country

	% Decrease in Firearm Suicide Rate (95% Confidence Interval)	% Decrease in Non-Firearm Suicide Rate (95% Confidence Interval)	% Decrease in Overall Suicide Rate (95% Confidence Interval)
Total Population	4.2% (2.3% -6.1%) ***	0.3% (-1.4% - 2.3%)	2.5% (1.4% -3.6%) ***
Males	3.4% (2.8% -4.1%) ***	1.1% (-0.7% -2.9%)	2.3% (1.7% - 2.9%)***
Females	3.4% (1.9% - 4.9%) ***	-0.5%(-1.9% - 1.9%)	1.0% (0.4% - 1.6)**
Children (0-19 years of age)	8.3% (6.1% -10.5%) ***	-0.4% (-2.9% -2.1%)	4.1% (2.3% -5.9%) ***

Miller M, Azrael D, Hepburn L, Hemenway D, Lippmann S. Injury Prevention. 2006. In Press.

12-month prevalence of suicide related behaviors (National Co-morbidity Survey)

	1990-1992 NCS	2001-2003 NCS	P Value
Ideation	2.8%	3.3%	0.44
Gesture	0.3%	0.2%	0.24
Attempt	0.4%	0.6%	0.44

Kessler et al. JAMA. 2005;293:2487-2495

Firearms and Suicide across the 50 US States, 1999-2002

Dependent Variable

- Firearm and non-firearm suicide mortality rates

Independent Variables

- Household Firearm Prevalence (BRFSS 2002)
- Alcohol and illicit substance abuse and dependence-
- Serious mental illness
- Unemployment
- Poverty and urbanization

Miller M, Lippmann S, Azrael D, Hemenway D. Journal of Trauma. 2006. In Press.

Suicides by Age Group: The 15 U.S. States with the Highest vs. the 6 U.S. States with the Lowest Average Household Gun Ownership* (2000-2002)

	High-Gun States (Total Pop., 2000-2002: 115 Million)	Low-Gun States (Total Pop., 2000-2002: 118 Million)	Mortality Rate Ratio (High Gun : Low Gun)
	47% of Households have firearms	15% of Households have firearms	
5-19 Year Olds			
Firearm Suicide	654	121	5.5
Non-Firearm Suicide	417	339	1.3
Total Suicide	1071	460	2.4
35-64 year olds			
Firearm Suicide	4674	1316	3.6
Non-Firearm Suicide	2775	2992	1.0
Total Suicide	7449	4308	1.8

Miller et al. Journal of Trauma. 2006. In Press

Seriously Considered Suicide in Past 5 Years

HICRC National RDD Survey, 2004

Personally Own Firearms (n=762)	Households with Firearms (n=1075)	No Firearms (n=1639)
2.8%	2.9%	4.9%

Miller et al. 2006.

Correlation Coefficients: rates of suicide, firearm suicide, non-firearm suicide, lifetime major depression, lifetime suicidal thoughts and firearm ownership, US Census regions

	Suicide Rate	Firearm suicide rate	Non-firearm suicide rate	Major depression	Suicidal thoughts
Household Handgun prevalence	0.59	0.83	-0.57	-0.10	-0.01

Psychiatric disorder prevalence estimates by census region, 1991-92 (National Co-morbidity Study, n=48,000). Lifetime major depression (n=8098) and ever seriously considered suicide (n=5877) were reported by 17% and 13% of respondents nationally.
 Mean household firearm and handgun ownership rates come from the General Social Surveys.
 Controlled for per capita alcohol consumption, unemployment, college education from NCS

Hemenway D, Miller M. Association of rates of household handgun ownership, lifetime major depression, and serious suicidal thoughts with rates of suicide across US census regions. *Injury Prevention* 2002; 8:313-316

Rates of Household Firearm Ownership and Rates of Suicide, Firearm Suicide and Non-Firearm Suicide across 7 North East States, 1996-2000

	Percent of Households with Firearms	Suicides per 100000	Firearm Suicides per 100000	Non-Firearm Suicides per 100000
Vermont	42%	12.3	8.0	4.3
Maine	41%	13.3	7.8	5.5
New Hampshire	30%	11.7	6.2	5.5
Connecticut	17%	8.5	3.3	5.2
Rhode Island	13%	8.3	3.0	5.3
Massachusetts	12%	7.5	2.1	5.4
New Jersey	12%	7.1	2.3	4.8
All 7 States	17%	8.2	3.1	5.1

Miller M, Azrael D, Hemenway D. Firearms and Suicide in the Northeast. *Journal of Trauma*. 2004; 57:626-632

Rates of Self-harm (per 100,000), 7 Northeast States, 1996-2000, by State and Method

	Suicide Attempt Rate All Methods	Suicide Attempt Rate Firearm	Suicide Attempt Rate Poisoning/Cutting/Piercing	Suicide Attempt Rate Suffocation/Hanging	Suicide Attempt Rate All Other Methods
Vermont	77	9	63	2	3
Maine	80	9	66	3	3
New Hampshire	78	7	65	3	3
Connecticut	67	4	57	3	2
Rhode Island	76	3	65	4	3
Massachusetts	64	2	55	4	3
New Jersey	55	3	48	3	2
Percent of suicide attempts by method	100%	5%	85%	5%	5%

Miller M, Azrael D, Hemenway D. Firearms and Suicide in the Northeast. Journal of Trauma. 2004; 57:626-632

Case Control Studies: Guns In Home and the Method of Suicide

	Brent 1993	Kellerman 1992
Use of gun if kept in home	88%	88%
Use of gun if not kept in home	19%	6%
Guns in home and firearms as method (Odds Ratio [OR])	31.1	69.5
Firearms and alcohol use (OR [95%CI])	7.3	--
Bought gun within two weeks of suicide	--	3%

Source: Institute of Medicine, Reducing Suicide: Programs from Suicide Prevention

Suicide After the Purchase of a Handgun, Six Years

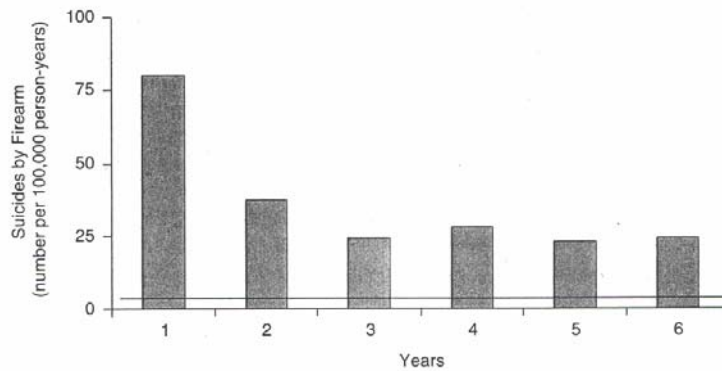


FIGURE 8-1b Rates of suicide by firearm during the six years after purchase among persons who purchased handguns in California in 1991. The horizontal line indicates the age- and sex-adjusted average annual rate of suicide by firearm in California in 1991 through 1996 (10.7 per 100,000 persons per year). SOURCE: Wintemute et al. 1999. Copyright © 1999 Massachusetts Medical Society. All rights reserved.

Risk of Suicide in the Home in Relation to Various Patterns of Gun Ownership

Variable	Adjusted Odds Ratio	95% Confidence Interval
<i>Type of guns in the home</i>		
One or more handguns	5.8	3.1 – 4.7
Long guns only	3.0	1.4 – 6.5
No guns in the home	1.0	--
<i>Loaded guns</i>		
Any gun kept loaded	9.2	4.1 – 20.1
All guns kept unloaded	3.3	1.7 – 6.1
No guns in the home	1.0	--
<i>Locked guns</i>		
Any guns kept unlocked	5.6	3.1 – 10.4
All guns kept locked up	2.4	1.0 – 5.7
No guns in the home	1.0	--

Source: Kellerman et al. 1992. NEJM

Storage Practices and Suicide Risk, 5-19 year olds

Firearm Storage Practice	No. (%)		Adjusted Odds Ratio (95% CI)
	Cases (N=106)	Controls (N=480)	
Gun unloaded	66%	91%	0.30 (0.16-0.56)
Gun locked	32%	58%	0.27 (0.17-0.45)
Ammunition locked	24%	48%	0.39 (0.23-0.66)

Grossman et al, JAMA, February 9, 2005.

Barriers to suicide and suicide prevention: Public Opinion re the potential effectiveness of a suicide barrier on the Golden Gate Bridge



On the bridge, Baldwin counted to ten and stayed frozen. He counted to ten again, then vaulted over. "I still see my hands coming off the railing," he said. As he crossed the chord in flight, Baldwin recalls, "I instantly realized that everything in my life that I'd thought was unfixable was totally fixable—except for having just jumped."

Barriers to Suicide and Suicide Prevention: Public Opinion and the Golden Gate Bridge

	Percent who think <u>ALL</u> Jumpers would find another way to kill themselves if a foolproof anti-suicide barrier were put up on the Golden Gate Bridge	Multivariate Odds Ratio (95% CI)
All respondents (n=2638)	34%	NA
Male (n=1310)	37%***	1.05 (0.86, 1.28)
Female (n=1328)	31%	Reference
Current Smoker (n=548)	43%***	1.55 (1.25, 1.93)***
Not a Current Smoker (n=2087)	32%	Reference
Personally own a firearm (n=735)	48%***	2.10 (1.70,2.59)***
Live in a household with guns but do not personally own any firearms (n=296)	36%***	1.36 (1.02,1.81)*
Live in a household without firearms (n=1560)	26%	Reference

An additional 40% thought that most jumpers would have found another way to complete suicide

Questions