

17 The effect of firearms on suicide

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Introduction

Gun deaths today are mostly suicides, not homicides. In 2015, 61.6% of all firearms deaths were suicides, and just 36.3% were homicides (Centers for Disease Control and Prevention, 2016b). Lethal gun violence, then, is mostly about self-destruction rather than criminal violence. In this light, it is vital to address the question: Do more guns cause more suicides?

This question bears an obvious relationship to gun control policy, since any policies that were effective in keeping guns from people at higher risk of suicide could lower the firearms death toll by reducing the most common type of gun-related death. Those skeptical of the suicide-reducing potential of gun control argue that suicidally inclined persons who otherwise would have shot themselves but were denied access to guns would simply turn to alternative methods of killing themselves, such as hanging, jumping from high places, self-poisoning, and the like. If so, reducing gun availability, while it probably would reduce the number of suicides *by shooting*, would not reduce the number of people who kill themselves. In response, those who believe that greater gun availability does raise the total suicide rate assert that alternative methods of suicide are less lethal than shooting, so fewer people would die from suicide even if suicide attempters did substitute other methods.

To explore these issues, I review two bodies of evidence: (1) case-control research on the association between exposure to guns and suicide, and (2) evidence bearing on the assertion that suicide attempts by shooting are more likely to result in death than attempts using other methods likely to be substituted if firearms were not available.

Case-control research on the effect of exposure to firearms on suicide

A case-control study is an individual-level nonexperimental study in which individuals possessing an attribute of interest (e.g., they committed suicide), called 'cases,' are compared with individuals lacking the attribute (e.g., persons who died of nonsuicidal causes or who are still alive), called 'controls.' The

attribute of interest in commonly a rare one, and cases and controls are often matched on other variables.

There are many case-control studies that have examined the association between firearms access and suicide, but they offer little convincing evidence on the existence of a causal effect of gun access on suicide, as distinct from a spurious association, because they entail no serious effort to control for likely confounding variables – other factors that affect suicide but that are also correlated with gun access.

The list of likely confounders in this area is a long one. We start with a list of variables known to be associated with both gun ownership and suicide, followed by a list of variables known to be associated with gun ownership, and for which there also are strong theoretical reasons to expect that they affect suicide, but no empirical evidence testing the proposition.

The following are known to have associations with both gun ownership/possession and suicide that have been documented in empirical research.

- (1) Strength of suicidal intent (in studies that compare completed suicides vs. attempts). No one disputes that persons more determined to kill themselves are more likely to do so – the proposition is virtually a tautology. It is also true, however, that people more intent on committing suicide are more likely to choose more lethal suicide methods such as shooting or hanging to attempt suicide, and some will acquire guns specifically for the purpose of using them to commit suicide. Evidence confirming this commonsensical proposition is reviewed later in the paper.
- (2) Age Middle-aged persons are more likely to own guns (Kleck, 1997, p. 101) and more likely to commit suicide (Wiebe, 2003, p. 777).
- (3) Sex Males are more likely than females to own guns (Kleck, 1997, p. 101) and more likely to commit suicide (Wiebe, 2003, p. 777).
- (4) Race African-Americans are less likely to own guns than whites (Kleck, 1997, p. 101), and less likely to commit suicide (Centers for Disease Control and Prevention, 2016a [for 1999–2014, the suicide rate was 5.2 per 100,000 for African-Americans, vs. 13.2 for whites]).
- (5) Region People living in the northeast part of the United States are less likely to own guns than people in other regions (Kleck, 1997, p.101), and less likely to commit suicide (Wiebe, 2003, p. 779).
- (6) Marital status Married people are more likely to own guns than unmarried people (Kleck, 1997, p. 101), and are less likely to commit suicide (Wiebe, 2003, p. 779).
- (7) Income Poor people are less likely to own guns than middle- or upper-income people (Kleck, 1997, p. 101), but more likely to commit suicide (Wiebe, 2003, p. 777).
- (8) Living alone People who live alone are less likely to own guns than persons who live with others (Kleck, 1997), and (surprisingly) are also less likely to commit suicide (Wiebe, 2003, p. 779).

- (9) Education College graduates are less likely to own guns (Kleck, 1997, p.102), and less likely to commit suicide (Wiebe, 2003, p. 777).
- (10) Population size of place of residence People who live in places with larger populations are less likely to own guns (Kleck, 1997, p. 102), and less likely to commit suicide than people who live in places with smaller populations (Wiebe, 2003, p. 779).
- (11) Alcoholism or heavy drinking Alcohol abuse and heavy drinking are positively associated with gun ownership (Brent, 2001; Hemenway/Miller) and positively associated with suicide (Brent, Perper and Allman, 1987; Rivara et al., 1997; Brent, 2001).
- (12) Illicit drug use Illicit drug use is positively associated with firearm ownership (Rivara et al., 1997; Carter et al., 2013), and positively associated with suicide (Brent, 2001).
- (13) Gang membership Gang members are more likely to own guns than other youth (Callahan and Rivara, 1992, p. 3042) and are more likely to commit suicide (Knox and Tromanhauser, 1999).
- (14) Experience as a victim of violent crime, especially sexual assault Experience as a victim of violent crime is positive associated with gun ownership (Kleck, 1997) and positively associated with suicide (Bryan et al., 2013; Simon et al., 2002).
- (15) Sociability Diener and Kerber (1979) found that gun owners are less sociable than nonowners. Those who are more socially isolated and who have less social support are more likely to commit suicide (Trout, 1980).

The following are variables known to be related to gun ownership, and for which there is sound theoretical reasons to believe that they would affect suicide, but as yet no empirical evidence testing such effects.

- (16) Self-reliance/self-blame Gun owners perceive themselves to be more self-reliant than nonowners (Feagin, 1970), and there are sound reasons to believe this also makes people more prone to suicide. A person possessing a personality that emphasizes self-reliance and the belief that they are in charge of their own fate is also more likely to believe that they are to blame for their own problems when things go wrong, and consequently are more likely to commit suicide.
- (17) Residence in a high crime neighborhood Living in high-crime places makes people more likely to acquire guns for self-protection, especially handguns (Kleck, 2015, p. 44), and the many life stresses common to such places are likely to make suicide more probable.
- (18) Perception of the world as a hostile place People who believe they are surrounded by threats of victimization are more likely to own guns for self-protection (Kleck, 1997), but also more likely to believe there are few people around them who would be willing to help them with their problems. This lack of felt social support is likely to raise the risk of suicide.
- (19) Drug dealing Drug dealing is positively associated with possession of firearms (Sheley and Wright, 1995), and is likely to be positively correlated with suicide due to both the misery produced by the drug

addiction that commonly accompanies drug dealing and the intense emotional stress produced by the ongoing risk of arrest, imprisonment, or death at the hands of one's customers and competitors.

This list is by no means comprehensive. Readers could no doubt add still more variables to the list. Controlling for these 19 variables should instead be seen as the start of a serious effort to identify the causal effect of gun ownership on suicide. One distinct pattern evident among these confounders should be stressed: almost all are factors that are positively correlated with both gun ownership and suicide. The effect of failing to control for such a variable is to bias the estimate guns/suicide association upward, i.e., to make it larger and more positive than it should be. Analysts failing to control for a variable like this will wrongly attribute to gun ownership the suicide-elevating effects of the confounder. The more confounders of this type the researcher fails to control, the worse the distortion.

Although it is an obvious point, it may bear emphasizing that no single one of these confounders is likely to account for the guns/suicide association found in some studies all by itself. Rather, each one may make a modest individual contribution to the association, but all of them collectively could account for all of the association.

With these considerations in mind, let us examine the full body of case-control research on the effect of gun ownership on suicide. In Table 17.1, the strength of association between gun ownership and suicide is measured with an odds ratio (OR), which expresses how much higher or lower the odds of committing suicide are for persons exposed to a gun. The crude OR is the simple bivariate odds ratio, without any controls for confounding variables, and thus is not meaningful as a measure of the causal effect of gun ownership on suicide. The adjusted OR ('adj OR') is the odds ratio when controlling for other possible confounding variables. If the variables controlled truly are confounders, the adjusted OR generally gives a better picture of the causal effect of gun ownership on suicide. On the other hand, if the analysts merely controlled for variables that either did not affect suicide or were not correlated with gun ownership, the adjusted OR would provide no better an estimate of the causal effect than the crude OR. Finally, the numbers under **p** in Table 17.1 are levels of statistical significance. When the authors only reported that the association was nonsignificant, this is denoted in Table 17.1 with 'n.s.'

Many of the adjusted odds ratios found in these studies are extraordinarily large, often exceeding 6, and some even as high as 10.4. How could gun ownership increase the odds of suicide by a factor of 10, or even 6? Most case-control researchers do not even propose an explanation of what mechanism might be involved in such enormous effects, but those who do usually cite just one factor: the supposedly higher fatality rate of suicide attempts committed with firearms compared with those of other methods that would be substituted if firearms were not available. This topic is addressed later in the paper.

Table 17.1 Case-Control Studies of Access to Firearms and Suicide

Study	Sample/Dataset	Number of		Control Vars		Number of Likely		Findings		
		n	Suicides ^d	Total	Signif ^b	Confounders ^c	Crude OR	p	Adj p	OR
Miller, 1978	Elderly white males	60	30	0	0	0	0	1.0	n.s.	—
Brent et al., 1988 ^d	W. PA adolescents (A)	65	27	3	3	2	(age, suicidal intent)	2.7	<.025	n.s.
	W. PA adolescents (B)	83	27	2	2	1	(age)	—	—	3.4
Brent et al., 1991 ^d	W. PA adolescents (A)	94	47	2	2	1	(suicidal intent)	4.5	.001	2.1
	W. PA adolescents (B)	94	47	1	1	0		4.2	.001	2.2
Kellermann et al, 1992	In-home suicides, 3 urban counties	720	360	10	6	4	(sex, age, race, lives alone)	3.2	<.025	4.8
Brent et al., 1993a	W. PA adolescents	45	7	0	0	0		—	.04	—
Brent et al., 1993b	W. PA adolescents	134	67	3	3	0		3.3	.004	4.4
Bukstein et al., 1993	W. PA adolescents, substance abusers	35	23	0	0	0		Any guns: Handguns: Long guns:	—	n.s. — —

(Continued)

Table 17.1 (Cont.)

Study	Sample/Dataset	Number of			Control Vars		Number of Likely		Findings		
		n	Suicides ^a	Total	Signif ^b	Confounders ^c	Crude OR	p	Adj p	OR	
Brent et al., 1994	W. PA adolescents, affectively ill	86	63	0	0	0	—	.0001	n.s.	>.025	
Beautrais et al., 1996	Canterbury NZ adults	1225	499	0	0	0	1.4	>.05	—	—	
Cummings Grossman and Thompson, 1997	WA handgun purchasers	2109	353	4	0	3 (age, sex, ZIP code)	—	—	1.00	>.90	
Bailey et al., 1997	Female subsample of Kellermann 1992	240	120	3	3	1 (living alone)	—	—	4.6	<.025	
Shah et al., 2000	CO adolescents	44	26	3	2	0	2.60	<.05	3.91	<.05	
Conwell, Connor and Cox, 2002	Rochester area	172	86	3	0	3 (age, sex, race)	Males: 4.17 Females: 0.50	.0006 .32	4.30 1.02	.004 .985	
Kung et al., 2003	1993 Mortality Followback	9855	1463	5	5	6 (sex, race, alcohol use, marijuana, use, depression, use of mental services)	Males: 2.59 Females: 2.71	<.025 <.025	6.05 6.99	<.025 <.025	

Weibe, 2003	1993 Mortality Followback	3918	1959	8	5	8 (age, sex, race, marital status, region, income, live alone, pop. size)	3.32	–	3.44	<.025
Dahlberg, Ikeda, and Kresnow, 2004	1993 Mortality Followback	1584	1049	13	0	8 (age, sex, race, education, marital status, region, alcohol use, drug use)	Males: 10.4 Females: 2.3			<.025 =.025

Notes:

- a Unweighted number of completed suicide victims in multivariate analysis. Sample size (n) includes cases (suicides) and controls.
- b Number of control variables documented as being significantly associated with suicide at .05 (1-tailed) level. If no significance levels were shown for control variables, they were classified as nonsignificant.
- c A likely confounder is a variable that affects suicide and is also significantly correlated with gun ownership. Judgements as to whether control variables were confounders took account of external information from other researcher, as well as the study being described. We counted the maximum number of confounders controlled in any analysis in a given study, whether controlled by matching or by multivariate statistical controls.
- d The analyses labeled A involved a comparison of completers (cases) with attempters (controls), while those labeled B involved a comparison of suicide completers (cases) with psychiatric inpatients (controls).

Abbreviations: Crude OR = bivariate odds ratio (no controls for other variables), adj OR = adjusted (multivariate) odds ratio, p = 2-tailed significance.

To be sure, a number of research teams have found no significant association between exposure to firearms and suicide, either in their entire sample (Miller, 1978; Brent et al., 1988; Bukstein et al., 1993; Brent et al., 1994; Beautrais, Joyce and Mulder, 1996) or among females (Conwell, Conner and Cox, 2002; Dahlberg, Ikeda and Kresnow, 2004). Nevertheless, most case-control studies have found a significant guns/suicide association. The question is whether this association reflects a causal effect of exposure to firearms on suicide, or is spurious and the product of confounding factors.

If an association is spurious, controlling for confounding variables will cause the odds ratio to weaken to the point where it is no longer significantly different from one, the value representing no association. We need not speculate what happens to the guns/suicide association once suicidal intent (SI) is controlled, because Brent and his colleagues (1988) measured SI and controlled for it while estimating the suicide/guns association. Before controlling for SI, there was a strong, significant association (crude odds ratio=4.5, $p<.025$). Once the researchers introduced a control for SI, the association was no longer significantly different from one, which indicates no association. The finding was later replicated in another analysis of a somewhat larger overlapping sample by the same group of researchers. When they introduced the control for SI, the guns/suicide association was halved, dropping from an odds ratio of 4.5 to 2.1 (Brent et al., 1991).

All but the last three studies summarized in Table 17.1 controlled for four or fewer likely confounders. Most variables that were controlled were not likely confounders, either because the authors of the study did not present any evidence that they had a significant effect on suicide or because they have no known association with gun ownership. Controlling for such variables does not help isolate the effect of gun ownership on suicide. For example, Kellermann et al. (1992) controlled for 10 variables (4 by matching, 6 by statistical controls), but only 6 of these were significantly related to suicide risk, and of these 6, only 4 have a documented significant association with gun ownership, and thus were actual confounders. Nevertheless, controlling for four confounders was better than has been done in any but three other case-control studies.

Of the 19 likely confounders we listed above, no researcher in this area has ever controlled for even half of them. Wiebe (2003) and Dahlberg, Ikeda and Kresnow (2004) made more serious efforts to control for confounders than anyone else in the area, controlling for eight likely confounders, but even they did not control for even half of the likely confounders we have identified, presumably because they analyzed a preexisting dataset (the 1993 Mortality Followback study) that did not contain measures of most of these variables.

In sum, the case-control literature accumulated so far has generated little basis for believing that the guns/suicide association is causal in nature, because researchers have done so little to control for confounding variables.

Are suicide attempts by shooting more deadly than attempts by methods likely to be substituted if guns were not available?

Individual-level evidence indicates that availability of firearms has no documented effect on whether people *attempt* suicide (Watkins and Lizotte, 2011), and macro-level studies find firearm prevalence to be unrelated to rates of depression or suicidal thoughts (Hemenway and Miller, 2002). Thus, as far as extant evidence indicates, being exposed to guns does not cause people to experience depression, mental illness, or suicidal thoughts. Nor have those who believe that firearm availability increases the risk of suicide claimed that these are the mechanisms by which gun possession might cause a higher risk of suicide. Instead, the standard explanation of the effect of gun possession on suicide, when any is offered, is the purportedly greater *lethality* of suicide attempts by shooting relative to attempts using other methods likely to be substituted if firearms were not available.

Many authors appear to uncritically take it for granted that suicide attempts by shooting are more likely to be fatal than attempts by any other suicide methods. For example, Gagne et al., (2010) flatly state that ‘firearms remain the most lethal methods (*sic*) of suicide’ (p. 247). Likewise, Kubrin and Wadsworth (2009) confidently assert that ‘guns constitute the most effective method [of suicide] and thus gun availability is expected to be associated with higher suicide rates’ (p. 1207).

In criminal assaults, it is clear that attacks with guns are more likely to result in the victim’s death than attacks using other weapons, such as knives (Kleck, 1997, pp. 227–237). The array of feasible alternative methods of killing available to prospective suicides is, however, quite different from the methods available to murderers, at least partly because there are no resisting victims in suicide attempts. Murderers almost never kill their victims by hanging them, but it is quite common for people to kill themselves by hanging. Likewise, it is quite unusual, outside of the pages of murder mysteries, for killers to push their victims from high places or to drown them (Federal Bureau of Investigation, 2016), but it is fairly common that people kill themselves by jumping from high places or drowning (Table 17.2, first column).

Hanging is the second-most common method of suicide, after shooting, a fact that itself suggests that it is the method most likely to be substituted for shooting. The high incidence of suicide by hanging indicates that large numbers of suicides had access to the means for hanging themselves and were willing to use this method. As we shall later show, hanging is also the suicide method most similar to shooting regarding its lethality. We therefore focus on the comparison between hanging and shooting as the one most relevant to the issue of what would happen if firearms were restricted and suicide attempters had to use a substitute method.

Prior research

All of the known prior studies providing fatality rate data for both shooting attempts and hanging attempts are summarized in Table 17.2. With the exception of the study by Spicer and Miller (2000), they all indicate little difference in incident fatality rates of shooting and hanging attempts. Most studies found less than a 10 percentage-point difference in fatality rates, and 2 of the 8 studies even indicated higher fatality rates for hanging attempts than for shooting attempts.

These studies were all based on relatively small samples of suicides, drawn from limited geographical areas (typically a single county, state, or region), and usually covering short periods of time. There could be variation in fatality rates due to differences in quality and availability of medical care, differences in the specific attributes of available methods (the lethality of guns, height of buildings, prevalence of large bodies of water, and so on) and other features peculiar to study locations. Therefore it would be useful to have data covering a large set of suicides and attempts, applying to the entire U.S. over a long period of time.

An analysis of national suicide data

Fatality rates by method can be computed for the entire United States for the period 2001–2014 by combining mortality data from the Centers for Disease Control and Prevention with estimates of nonfatal suicide attempts based on data from probability samples of patients treated in the nation's emergency

Table 17.2 Relative Lethality of Shooting and Hanging as Methods of Suicide in Prior Research

Study	Area	Years	% Attempts Fatal		Ratio of fatality rates, Shooting/Hanging
			Hanging	Shooting	
Schneidman and Farberow (1961)	Los Angeles County	1957	78.7	77.1	0.980
Card (1974)	Allegheny County, PA	1969–1970	77.5	91.6	1.182
Sayer et al. (1996)	New South Wales, Australia	1991–1993	82	75	0.915
Spicer and Miller (2000)	8 U.S. states	1989–1997	61.3	82.5	1.346
Miller et al. (2004)	7 NE U.S. states	1996–2000	82.4	90.8	1.102
Shenassa et al. (2003)	Illinois	1990–1997	90	96	1.067
Elnour and Harrison (2008)	Australia	1993–2003	83.4	90.4	1.084

rooms. Data on nonfatal suicide attempts by method were obtained from the WISQARS program at <http://webappa.cdc.gov/sasweb/ncipc/nfirates2001.html>, while data on (fatal) suicides by method were obtained from the WONDER program at <http://wonder.cdc.gov/mortSQL.html>.

The numbers of suicides are complete counts, based on death certificates reporting the cause of death as suicide, and thus are not subject to sampling error. On the other hand, the numbers of nonfatal attempts are estimates subject to sampling error, which is computed and available on the WISQARS website. Table 17.3 therefore displays three estimates of the number of nonfatal attempts: the point estimate, the lower 95% confidence interval limit, and the upper 95% confidence interval limit. Each of these is used in computing method-specific suicide incident fatality rates, i.e., fatal attempts/(fatal attempts + nonfatal attempts).

Table 17.3 shows the fatality rates for all the major methods of committing suicide in the United States, based on the largest set of suicides and suicide attempts ever employed in the computation of method-specific suicide fatality rates. The data indicate that there is no significant difference in the fatality rates

Table 17.3 Fatality Rates^a of Suicide Methods, U.S. 2001–2014

Suicide Method	Deaths	Estimate of Nonfatal Attempts			% Fatal, Using Estimate of Nonfatal Attempts		
		Point	Lower CI ^b	Upper CI	Point	Lower CI	Upper CI
Shooting	258,386	50,237	12,680	87,794	83.7	74.6	95.3
Hanging, other suffocation	118,072	35,941	22,601	49,281	76.7	70.6	83.9
Cut/pierce ^c	8,913	1,190,583	975,675	1,405,490	0.7	0.6	0.9
Drowning	5,306	2,588	1,254	3,923	67.2	57.5	80.9
Fall ^d	10,832	32,335	22,047	42,623	25.1	20.3	32.9
Fire/flare	2,262	24,720	18,412	31,027	8.4	6.8	10.9
Poisoning	86,327	3,324,926	2,777,990	3,871,861	2.5	2.2	3.0
Other land transport ^e	1,827	2,317	1,066	3,568	44.1	33.9	63.2
Struck by or against	15	182,411	153,261	211,560	0.0	0.0	0.0

Notes:

a Fatal attempts (deaths)/[fatal attempts + nonfatal attempts]

b Lower CI = Lower 95% confidence interval limit; Upper CI = Upper 95% confidence interval limit

c e.g., the attempter slashes her wrists

d e.g., jumping from a high place.

e e.g., jumping in front of a train.

Sources: Deaths – WONDER website at <http://wonder.cdc.gov/mortSQL.html>; Nonfatal attempts – WISQARS website at <http://webappa.cdc.gov/sasweb/ncipc/nfirates2001.html>.

of suicide attempts by shooting and attempts by hanging. While the point estimate of the shooting fatality rate is 1.09 times higher than the hanging fatality rate, there is heavy overlap between the confidence intervals surrounding estimates of the two fatality rates. This lack of any significant difference in lethality is not surprising, since it is basically what the diverse findings of the seven smaller-scale studies reviewed in Table 17.2 indicated. Further, another national-scale study indicated that in 1992 there were 18,169 firearm suicides and an estimated 5,197 nonfatal firearm suicide attempts (Annest et al., 1995, p. 1752), implying a fatality of only 77.8% for shooting attempts – lower than the hanging incident fatality rate of 83.7% for 2001–2014.

Even the slight difference in the point estimates of hanging and shooting fatality rates shown in Table 17.3 is partly an artifact of limits in the classification of suicide methods. In earlier versions (9th revision and earlier) of the International Classification of Diseases (ICD), hanging suicide deaths were distinguished from other kinds of suffocation suicide deaths involving less lethal suicide methods, especially suffocation by placing a plastic bag around the attempter's head, while later ICD revisions lump hanging attempts and plastic bag attempts together. Based on data reported by Card (1974, pp. 39–40), only 54.76% of plastic bag attempts were fatal, compared to 77.53% of hanging attempts. Thus, the fatality rate of hanging attempts alone is even higher than the fatality rate for all suffocation attempts, which includes the less lethal plastic bag attempts.

While suicides (i.e., fatal attempts) are fairly accurately counted (Kleck, 1988), nonfatal suicide attempts are almost certainly undercounted. Emergency room data like those from the WISQARS program can only count attempts resulting in medical care at a hospital. Those suffering the least serious injuries are less likely to do this. One study of college students who survived suicide attempts found that 44% of those who were injured in a suicide attempt did not seek medical attention (Meehan et al., 1992, p. 43). Further, even among those who did seek medical care, those who suffered nonfatal suicide attempts by shooting often misrepresented their injuries as being accidental. De Moore et al. (1994) studied 33 patients treated in a hospital for self-inflicted gunshot wounds, 18 of whom initially claimed that they had accidentally shot themselves. The authors concluded that at least 7 of these 18 (39%) had actually intentionally injured themselves. Five patients even initially denied that the injury was self-inflicted, but eventually admitted making a suicide attempt (p. 423).

If suicide counts are roughly accurate but estimates of nonfatal attempts are too low, the result is that fatality rates are too high, because the denominator of the rate is too small. This by itself would not distort *comparisons* of fatality rates across methods if undercounting of nonfatal attempts was the same for all methods, but problems would arise if the level of undercounting differed across methods. There is direct evidence that nonfatal suicide attempts by shooting are undercounted in medical data (Meehan et al., 1992; De Moore et al., 1994), but we do not have comparable data on undercounting of attempts using other methods, and so cannot adjust the data for this problem.

Is suicide method substitution likely to occur

The feasibility of method substitution

Would substitution of other lethal methods occur in the absence of firearms? It needs to be stressed that the array of highly lethal methods is wider than a narrow focus on just shooting and hanging would suggest. There is wide variation in fatality rates of suicide attempts within broad method categories. Jumping from a 300-foot height is more likely to be fatal than jumping from a 30-foot height, swallowing 50 barbiturate tablets is more likely to have fatal consequences than swallowing just 3 or 4, and gunshot wounds to the head or chest are far more likely to kill than wounds to peripheral parts of the body (Schneidman and Farberow, 1961, p. 35). Likewise, a nonswimmer who jumps into a large, deep body of water when there is no one around is far more likely to suffer death by drowning than a strong swimmer who jumps into a small, shallow body of water when there are many potential saviors in the vicinity. Indeed, there are probably subtypes of virtually all the major suicide methods whose fatality rates approach 100%. Thus, the array of highly lethal suicide methods is considerably wider than is suggested by an examination limited to the *average* fatality rates of broad categories of suicide methods shown in Table 17.3.

A lethally minded attempter does not need more than one lethal method to produce death, so it does not matter that one or two lethal methods are not available if at least one highly lethal method is accessible. The likelihood of substitution of some other lethal method for shooting depends on the answer to the following question: among persons sufficiently lethal in their suicide intentions to put a firearm to their head and pull the trigger if a gun were available, how many would not be able to substitute *any* of the lethal alternatives? That is, how many such lethally minded attempters would be (a) unable to fashion a noose and secure it to a sturdy support, *and* (b) unable to locate a sufficiently high place to jump from, *and* (c) unable to get to a body of water suitable for a fatal suicide attempt, *and* (d) unable to access a supply of prescription drugs sufficient for a fatal overdose, *and* (e) have no other lethal means of committing suicide? Given the near-universal availability of at least one of these resources, the answer to this question is likely to be close to zero.

Strength of suicidal intent and method substitution

Method-specific suicide incident fatality rates necessarily reflect not only the lethality of the method itself, but also the lethality of those who use the methods. Some people who attempt suicide strongly intend, at the moment of the attempt, to kill themselves, while others have no such intention, but rather intend only to make a suicidal gesture or 'cry for help' designed to communicate their suffering to others (see Schneidman and Farberow, 1961 for a classic discussion). Thus, higher fatality rates for some methods could reflect

higher average 'lethality' of suicide *attempters* using the method, rather than (or in addition to) the higher lethality of the *method*. Unfortunately, there are no data that quantify the average attempter lethality of those using each major suicide method.

There is nevertheless considerable empirical evidence indicating that suicide attempters who use firearms and other frequently fatal methods are more seriously motivated to kill themselves than attempters who use less frequently fatal methods. One indicator of serious intent is inflicting injury on vital areas of the body. Among those who survive gun suicide attempts, almost all the gunshot wounds were inflicted on vital areas of the body, such as the head, chest, or abdomen. One study of 30 firearms suicide attempt survivors found that all 30 had shot themselves in the head, chest, or abdomen (Peterson et al., 1985). Thus, the locations of the gunshot wounds suggest that, at the moment of the attempt, the attempter wanted to die.

Miller et al. (2013) found that, among people who survived suicide attempts, those who used firearms and other more lethal methods were more likely (compared to those using cutting or drug overdose) to make a subsequent suicide attempt. This confirmed the findings of three earlier studies by Tuckman and Youngman (1963, 1968) and Eisenthal, Farberow and Shneidman (1966), who all found that attempters who used firearms and other more lethal methods were more likely to than those using less lethal methods to subsequently commit suicide.

Confirming the link between method lethality and strength of suicide intent even more directly, Brent et al. (1988) found that suicide completers who used firearms scored higher on a suicidal intent index than those using other methods. In a later study, Brent et al. (1991, p. 2992) found that suicide completers and attempters with guns in their homes had higher suicidal intent scores than those without guns. Confirming the earlier research, Denning et al. (2000) studied completed suicides and constructed a suicidal intent scale based on 'observable behaviors' surrounding the suicide event such as communicating a suicidal intent to others or taking precautions to avoid intervention. They found the average 'suicide intent' score to be far higher for those who used firearms (average = 53) than for those using any other method (average for all methods = 8.4). The next highest average suicidal intent was for hanging (average = 34). Fox and Weissman (1975, p. 34) asked people who survived suicide attempts whether their intentions were serious and they truly wanted to die. Those who had used the 'more violent or active' methods (which included shooting) were more likely to say that they truly wanted to die.

In sum, a wide variety of evidence indicates that people who use firearms to attempt or commit suicide have stronger intentions to die than those using other methods. This stronger motivation among those who use shooting to attempt suicide has three implications. First, a substantial part of the difference in incident fatality rates between attempts by shooting and by other methods is due to the stronger intent to kill themselves among shooters, rather than any inherent lethality of the method itself. Even the difference between shooting

and hanging reflects a substantial difference in intent. Second, those who would prefer to commit suicide by shooting if a firearm were available but who are denied access to a gun are especially likely to nevertheless attempt suicide by substituting some alternative method. Third, these attempters are likely to substitute a similarly lethal method, commensurate with their highly lethal intentions.

Some methods require more time to execute than attempts with firearms, so it might be speculated that a person's desire to die, even though strong when the person first decided to commit suicide, might not persist long enough to carry out the suicide attempt using a method that required a longer preparation time. For people who already own or have access to a firearm, it may take no more than a minute or two from the time a person decided that they wanted to die to the time they committed the suicidal act, but it would take somewhat more time to fashion a noose and locate a sturdy support, get to a sufficiently high location for a fatal jump, or get to a large, deep body of water when no other people are around.

The relevant issue, then, is whether suicidal intentions persist long enough for more time-consuming methods to be implemented. The desire to end one's life does not have to persist very long for substitution of a different lethal method to occur. Suicidal attempts as a whole rarely take a long time to carry out, regardless of the method used. The time from when a person decides to attempt suicide to the time they make the attempt is short, generally under an hour, and usually much less than an hour. Diesenhammer et al. (2009) studied a sample of surviving suicide attempters, who used a variety of methods, and found that 74.4% of them reported taking less than 10 minutes from the time they decided to commit suicide to the time they made their suicide attempt. About 89% took no more than an hour (estimated from their Figure 2 on p. 21). Indeed, it is so easy to quickly implement suicidal intentions that Simon, Swann, Powell, Potter, Kresnow, and O'Carroll (2001) found that fully 24% of the survivors of near-fatal suicide attempts took *less than five minutes* between deciding to commit suicide and making the attempt.

We are not aware of any evidence that serious suicide motivations, such as those prevailing among people willing to attempt suicide with a firearm, persist for less than an hour. At least one of the lethal substitute methods previously discussed could be implemented within an hour of the person deciding to kill themselves. It does not take more than an hour to fashion a noose and secure it around a suitably sturdy support such as a tree limb or house beam, to get to a high place to jump from, or reach a large, deep body of water with no potential saviors around. Although some alternative methods cannot be carried out *as* quickly as shooting attempts, the more relevant point is that they are quick *enough* to be implemented before the suicidal intent passes.

Is hanging the most likely substitute suicide method for shooting?

We assume that suicide attempters who otherwise would have preferred to use shooting as their method but who could not access a firearm are likely to

substitute the method that is most similar in lethality to shooting, among the methods available to them. As we have seen, the suicide method most similar in lethality to shooting is hanging (Table 17.3). Further, suicide by hanging requires neither arcane technical knowledge nor rare materials to carry it out – one needs only rope or something similar with which to fashion a noose, and a sturdy support to which one can secure the noose. Even prison inmates manage to fashion nooses from their bedclothes and hang themselves from their cell's bars, so it would be rare that a person in the free world could not get the materials needed for a hanging suicide.

National examples of suicide method substitution

Finally, experience with large-scale efforts to eliminate materials involved in suicides suggests that method substitution does indeed occur, and that the substituted methods tend to be similar in lethality to the methods that were blocked. For example, at one time, suicide by domestic coal gas was the most common way that people in Great Britain committed suicide. When the nation gradually detoxified its domestic gas supplies by substituting North Sea natural gas for coal gas in the 1950s and 1960s, domestic gas suicides inevitably declined. Beginning in 1970, however, by which time domestic gas had reached nontoxic levels, there was a large increase in the use of motor vehicle carbon monoxide in suicides (Clarke and Lester, 1987, p. 116; Kleck, 1997, p. 278). At that time, vehicle exhaust was highly toxic. Likewise, after Australia banned many types of firearms in 1996, *firearms* suicides among males decreased, but suicides by *hanging* increased at a virtually identical rate during the same period (DeLeo et al., 2003).

If shooting is not actually a uniquely lethal way for seriously intended suicide attempters to kill themselves, why is shooting the most common way that Americans commit suicide? Certainly, sheer availability plays a significant role, since most Americans either have a gun in their home or could easily acquire one. The materials needed for implementing other methods, however, are even more widely available, as was noted in connection with hanging. There is little strong empirical evidence bearing on this question, but it has been hypothesized that some prospective suicide attempters may favor shooting because they *believe* it is uniquely lethal, even if that is not factually true. The frequent use of guns in homicides may contribute to this perception. One could also hypothesize that, for men, shooting is perceived as a more masculine method of suicide given the association of firearms with men and military combat. Also, shooting may be regarded as offering more control over the suicide event because a firearm suicide can be committed quicker than suicide methods, reducing the chances of someone intervening, and because, unlike with poisoning, there is little doubt about the 'dosage' needed to produce death. For a fuller discussion, see Kleck (1991, pp. 223–231).

Macro-level studies of firearms levels and suicide rates

Another body of research is relevant to the question of the effect of firearms on suicide, but is not covered in this chapter because it has already been thoroughly reviewed elsewhere (Kleck, 2018). This is research that studies aggregates such as entire nations, regions, states, or cities, rather than individual persons. A comprehensive review of the findings of this body of research indicates that most analyses find a significant positive association between firearms prevalence and the rate of *firearms* suicide, consistent with the view that where guns are more widely available, more people will commit suicide *with guns*.

On the other hand, the literature appears to be evenly split on the issue of whether firearm prevalence affects the *total* suicide rate – 15 of 29 analyses did not find any significant association of firearms prevalence with the total suicide rate. The appearance of an even split, however, is misleading. Research done by Matthew Miller, Deborah Azrael, and David Hemenway (MAH) almost invariably (10 of their 11 findings) yielded a significant positive association between gun levels and total suicide rates, while the rest of the research community has generally found *no* significant association. MAH contributed two-thirds of the findings of a significant positive association between firearm prevalence and the total suicide rate.

This stark contrast cannot be attributed to the superior character of the research done by MAH, since they studied very small samples (some as small as $n=7$) of extremely large and heterogeneous areas like regions or states, used contaminated measures of gun prevalence (the measures contained components that were also part of the suicide rate), and made little effort to control for confounders. In 7 of their 11 analyses they did not control for a single variable shown to be significantly related to total suicide rates, while most of those that they did control in the remaining 4 analyses were probably not confounders (Kleck, 2018; Table 17.3). If we exclude the poor quality studies done by MAH, macro-level research is overwhelmingly contrary to the proposition that higher gun levels cause higher total suicide rates.

Conclusions

The best available evidence supports the following conclusions about the relationship between guns and suicide:

- 1 The case-control research conducted so far has little of a convincing nature to say about the causal effect of exposure to firearms on suicide, because researchers have done so little to control for variables known or likely to confound the gun/suicide association.
- 2 Empirical research has not yet established any mechanism by which availability of firearms can cause more suicide. The method most likely to be substituted for shooting where firearms are not available is probably

- hanging, and there is no significant difference in fatality rates of attempts by hanging and attempts by shooting.
- 3 Availability of firearms affects how many people commit suicide *by shooting t*, but does not appear to affect the total number of people who kill themselves.
 - 4 The policy implication of these conclusions is that the best available scientific evidence does not at present provide any sound foundation for believing that restrictions on availability of firearms are likely to reduce the incidence of suicide.

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