

Firearms and Suicide in the United States

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Abstract: Regional United States suicide rates in the mid 1970s were associated with the household prevalence of all guns and of pistols. The term "regional" applies to the nine Census divisions of the four US census regions. A literature review suggests that the

relation may be etiologic, and that more definitive studies and pilot programs are needed. Arming may be an etiologic factor common both to individual and to national self-destructive behaviors. (*Am J Public Health* 1984; 74:123-127.)

*"No more, Pistol. I would not have you go off here.
Discharge yourself of our company, Pistol."*¹

Introduction

For many years vital statistics have indicated marked geographic variation in suicide rates across regions of the United States and across nations.² It has been suggested that much of the variation across nations in both suicide and homicide rates results from differences in the availability of lethal agents for use in self-destruction.³ Increasing rates of suicide⁴⁻⁶ and homicide^{5,7} have been linked to the increased availability of firearms, particularly handguns. Attempts at evaluating the benefits of reducing the availability of firearms in the US have tended to neglect the possible impact on suicide.⁴ Etzioni and Remp, for example, limited their evaluation of the impact of gun control to accidental deaths, homicidal deaths, and other crimes,⁸ despite the fact that US suicides consistently outnumber homicides.* Lester and Murrell found a significant correlation between the strictness of US state gun control legislation and state suicide rates, particularly for males, but did not indicate whether strict legislation was associated with low firearm prevalence.¹⁰ Other investigators have interpreted data as indicating that cultural factors have more influence than firearm availability on suicide rates.^{7,11}

To evaluate and quantify the relation between firearm availability and suicide rates, we compared the prevalence of firearms, as determined by recent national surveys, with the incidence of suicide in the nine US Census-defined divisions,** excluding Alaska and Hawaii.

Method

Data on proportion of households with guns were obtained from National Opinion Research Center (NORC) surveys conducted in 1973, 1974, 1976, and 1977 on samples of "the total non institutionalized English-speaking popula-

tion of the continental United States 18 years of age or older."¹² Each sample consisted of about 1,500 interviews. One individual from each selected household was interviewed. Since the number of subjects was quite small in several subgroups, we have combined the data from the four years; the total four-year sample involved 6,017 interviews.

The survey interview asked the following question: "Do you happen to have in your home (IF HOUSE: or garage) any guns or revolvers?" Forty-seven and one-half per cent of the 6,017 subjects interviewed answered "yes" to this question; no answer was obtained from 1.2 per cent (73). Those who responded "yes" were then asked: "Is it a pistol, shotgun, rifle or what?"

Of the 6,017 interviewees, 20.9 per cent reported having pistols, 28.6 per cent reported shotguns, and 28.5 per cent reported rifles. The NORC data indicated the proportions of the surveyed population having the different forms of firearms according to sex, color,** age group, and census region.

Regional suicide rates were calculated using numbers of deaths by cause, color, sex, and state from Tables 1-27 in reports of Vital Statistics of the US for the years 1973, 1974, 1976, and 1977.¹³ The Eighth Revision, International Classification of Diseases codes E950-E959 were used for total suicides, and code E955 for firearm suicides. Population estimates were obtained from Current Population Reports of the US Census for spring 1976.¹⁴ This publication was selected because it provided age breakdowns which may be utilized in further analyses.

Linear regression analyses were performed on an IBM 4341 mainframe computer using the Statistical Analysis System (SAS). We conducted both unweighted and weighted regressions.¹⁵ For the latter, we multiplied each region's data by the given sex/color's relative population size, setting the weight of the smallest region's population at unity. Among the nine sex/color categories, the resultant weights varied the least among White males (from 1.000 in the Mountain region to 3.867 in the East North Central region), and the most for non-White females (from 1.000 in the New England region to 14.502 in the South Atlantic region).

Results

Suicide Rates by Sex, Color, and Region

For the four years 1973-1974 and 1976-1977, the overall suicide rate for the contiguous US was 12.6 per 100,000 person-years, as shown in Table 1. Among the nine regions, it ranged from 17.3 per 100,000 person-years in the Mountain and Pacific regions, down to 9.3 in the Mid-Atlantic. Male rates were more than twice female rates in all regions and in both White and non-White groups. With the exception of

*US Government statistics for 1977, for example, show 28,681 suicides compared to 19,968 homicides.

**Whereas the US Bureau of the Census divides the US into nine "divisions" and groups these into four "regions," we shall use the term "regions" in this report to refer to the nine smaller divisions.

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***White or non-White.

TABLE 1—Total Suicide Rates, Contiguous US, Four-Year Mean, (1973–1974 and 1976–1977) by Nine Regions, Color and Sex

Regions	Suicide Rate times 100,000 Person-years								
	Total			White			Non-White		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
New England	10.1	15.2	5.3	10.3	15.5	5.4	5.2	8.0	2.7
Mid-Atlantic	9.3	14.1	4.9	9.8	14.7	5.2	5.9	9.6	2.8
East North Central	11.7	17.5	6.1	12.2	18.2	6.5	7.5	12.1	3.6
West North Central	11.6	18.3	5.2	11.8	18.7	5.3	7.9	12.4	3.5
South Atlantic	13.8	21.0	7.1	16.1	24.1	8.5	5.8	9.6	2.3
East South Central	11.7	18.4	5.3	13.5	21.3	6.2	4.7	7.7	1.9
West South Central	12.4	18.8	6.3	13.6	20.7	7.0	5.4	8.7	2.2
Mountain	17.3	26.2	8.6	17.2	25.8	8.7	19.0	32.2	7.1
Pacific	17.3	23.9	11.0	18.2	25.0	11.6	9.7	13.7	6.0
Total Contiguous US	12.6	18.8	6.7	13.4	20.0	7.2	6.7	10.7	3.1

males in the Mountain region [where in 1975 native Americans made up 48.7 per cent of the non-White population (derived from¹⁶) and 56.8 per cent of non-White deaths (derived from¹⁷)], White suicide rates were higher than non-White rates. Non-White rates were lowest in the East South Central region, and non-White females consistently had the lowest rates in all regions.

Overall, firearm suicides made up slightly more than half of all suicides; among males, it was considerably more than half; among females, considerably less. As shown in Table 2, firearm suicide rates were highest in the Mountain region and lowest in the Mid-Atlantic for both males and females. The ratio of the rate for the highest region to that for the lowest was greater than three, while the comparable ratio for total suicide rates was less than two. The contrast between male and female rates was also more striking for firearm suicides than for total suicides, about a five-fold difference for the former, and less than three-fold for the latter. As in total suicides, White rates were roughly double non-White rates.

Non-firearm suicide rates (derivable from Tables 1 and 2) were highest in the Pacific region, which was also one of the highest regions for total suicides. Unlike firearm suicides, non-firearm suicide rates were lowest in the East South Central region. The rates for males were consistently

higher than those for females, but were relatively closer to the female rates than was the case for the firearm suicide rates.

Gun Prevalence Rates by Sex, Color, and Region

About half the people surveyed lived in a household with some kind of gun. As shown in Table 3, gun prevalence was highest (74.9 per cent) in the East South Central region, and lowest (24.3 per cent) in New England, higher for males (54.3 per cent) than females (45.7 per cent), and higher for Whites (51.3 per cent) than non-Whites (37.3 per cent).

Pistol prevalence, at 20.9 per cent, was about one-third total gun prevalence (57.1 per cent); the regional distribution of pistols, shown in Table 4, was generally similar to that of total firearm prevalence. Relative differences among the regions were larger for pistol than for non-pistol gun prevalence: the extremes for pistols were 5.6 per cent and 35.6 per cent, whereas for non-pistol guns they were 18.7 per cent and 34.3 per cent.

Regression Analyses

Total suicide rates showed significant ($p = .05$) weighted regression on gun prevalence for all demographic groups examined except non-White females. For all demographic groups combined, the correlation coefficient was 0.81 ($p =$

TABLE 2—Firearm Suicide Rates, Contiguous US, Four-Year Mean (1973–1974 and 1976–1977) by Nine Regions, Color and Sex

Regions	Suicide Rate times 100,000 Person-years								
	Total			White			Non-White		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
New England	3.8	6.8	0.9	3.9	7.0	1.0	1.7	3.1	0.5
Mid-Atlantic	3.3	6.2	0.7	3.6	6.5	0.8	1.7	3.3	0.5
East North Central	5.9	10.3	1.7	6.1	10.6	1.7	4.3	7.5	1.6
West North Central	6.6	11.8	1.7	6.8	12.1	1.7	4.8	8.2	1.5
South Atlantic	9.0	15.1	3.3	10.5	17.4	4.0	3.7	6.7	1.1
East South Central	9.0	14.9	3.4	10.4	17.2	4.0	3.5	6.0	1.2
West South Central	8.8	14.4	3.6	9.8	15.9	4.1	3.8	6.4	1.2
Mountain	11.2	18.6	4.0	11.3	18.6	4.1	10.8	19.2	3.2
Pacific	8.2	13.5	3.1	8.6	14.2	3.2	4.2	6.9	1.7
Total Contiguous US	6.9	11.8	2.3	7.4	12.5	2.5	3.7	6.4	1.2

TABLE 3—Total Gun Prevalence, Contiguous US, Four-Year Mean (1973–1974 and 1976–1977) by Nine Regions, Color and Sex

Regions	Total %			White %			Non-White %		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
New England	24.3	30.7	19.1	25.6	31.9	20.6	12.9	(20.0)	(6.3)
Mid-Atlantic	29.6	31.1	28.4	32.1	33.8	30.7	9.4	6.1	11.8
East North Central	52.4	56.6	48.6	53.3	57.6	49.5	45.4	49.1	41.2
West North Central	53.7	62.9	44.6	55.2	65.8	44.4	40.0	35.0	44.0
South Atlantic	62.7	68.8	57.3	65.5	72.5	59.1	49.5	50.5	48.8
East South Central	74.9	78.4	71.9	75.7	77.6	74.1	70.3	(87.5)	57.1
West South Central	57.8	61.2	54.2	61.6	62.5	60.7	26.0	(43.7)	17.7
Mountain	64.9	68.4	62.3	64.7	68.5	61.8	(66.7)	(66.7)	(66.7)
Pacific	39.3	45.1	37.1	42.1	45.8	38.8	27.9	36.4	17.9
Total Contiguous US	49.7	54.3	45.7	51.3	55.9	47.3	37.3	41.0	34.3

() = based on sample of less than 20 interviews.

.0077) with a slope of 0.19 ± 0.05 (SE). Comparable unweighted regression analyses were not significant.

Firearm suicide related to gun prevalence with greater uniformity than did total suicide across the nine demographic groups and the two methods of weighting. For the entire population, the unweighted correlation coefficient was 0.82 ($p = .0066$) with a slope of 0.13 ± 0.03 ; weighting changed the coefficient to 0.90 ($p = .0008$), and slope to 0.12 ± 0.02 .

Of the 18 regression analyses of non-firearm suicides on gun prevalence, all but two (total males and White males, both with negative slopes) produced coefficients which were not statistically significant.

Limiting the analyses to pistols created only minor differences from the results for all forms of guns. The weighted regression coefficient of total suicide on pistols for the entire population was 0.77 ($p = .0159$), with a slope of 0.42 ± 0.13 . One unweighted analysis of total suicide (that for White males) produced a significant coefficient, 0.74 ($p = .0217$), with a slope of 0.26 ± 0.09 .

The analyses of firearm suicide and pistols produced correlation coefficients which generally were more significant than those of firearm suicide and total guns. For the entire population, the unweighted coefficient was 0.92 ($p = .0004$) and the slope 0.23 ± 0.04 ; weighting changed these to 0.96 ($p = .0001$), and 0.29 ± 0.03 , respectively.

None of the coefficients for non-firearm suicide regressed on pistols reached significance.

Figure 1 illustrates the significant unweighted regression of total suicide and firearms suicide on pistol prevalence for White males. Table 5 gives the probability values for the significance of all correlation coefficients.

Discussion

Unweighted comparison of regional suicide rates and firearms prevalence has indicated a strong association between pistol prevalence and White male suicide rates. When comparisons were weighted to account for regional differences in population size, the association became stronger. Suicides coded to firearms as the agent showed particularly sharp differences across region, sex, and color, and particularly high correlations with firearms prevalence, supporting the validity of the firearms prevalence data.

These correlations should be interpreted cautiously in the context of the statistical properties recently described by Morgenstern for multiple group comparison studies.¹⁸ Cross-level bias, or "ecological fallacy," can result if a region's firearm prevalence influences the individual death rate from suicide for reasons other than the region's firearm prevalence itself. One could hypothesize, for example, that some factor common to the southern US culture causes both a

TABLE 4—Pistol Prevalence, Contiguous US, Four-Year Mean (1973–1974 and 1976–1977) by Nine Regions, Color and Sex

Regions	Total %			White %			Non-White %		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
New England	5.6	5.5	5.7	5.9	5.3	6.4	3.2	(6.7)	(0.0)
Mid-Atlantic	10.9	14.3	8.1	11.5	15.5	8.3	5.1	2.0	7.4
East North Central	18.2	19.9	16.6	17.6	19.3	16.2	25.0	28.1	12.6
West North Central	18.0	24.7	11.3	18.7	25.5	11.7	13.3	20.0	8.0
South Atlantic	28.9	32.7	25.6	29.7	34.4	25.4	25.2	24.7	25.6
East South Central	35.6	39.6	32.3	36.9	39.2	35.0	27.0	(37.5)	19.1
West South Central	29.8	34.9	25.4	30.8	35.4	26.6	20.0	(37.5)	11.8
Mountain	34.7	35.7	33.9	35.3	37.0	34.1	(41.7)	(33.3)	(50.0)
Pacific	19.3	22.8	16.1	19.8	24.1	15.9	13.1	9.1	17.9
Total Contiguous US	20.9	24.2	18.2	21.2	24.8	18.1	18.8	20.3	17.6

() = based on sample of less than 20 interviews.

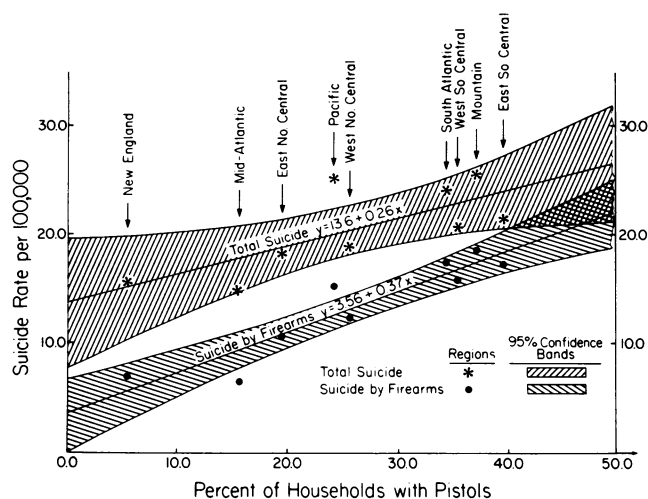


FIGURE 1—Unweighted Regressions of Total and Firearm Suicide Rates on Pistol Prevalence in Nine Regions of Contiguous United States, Four-Year Mean (1973–1974 and 1976–1977), White Males

tendency toward suicidal behavior and a tendency to have guns (e.g., see Marks and Abernathy¹¹). Studies measuring suicide rates and firearm prevalence at the individual level would eliminate such bias. Additional biases in this study may result from regional differences in the underreporting of suicide,¹⁹ and from such confounding variables as age, for which our data have not yet been controlled.

Other studies support our findings and suggest that the firearms-suicide correlation is etiologic and not due to bias. A study by Cook tends to confirm the validity of the NORC firearm prevalence data by confirming the latter's correlation with both regional suicide and homicide rates by firearms.²⁰ The firearms prevalence data in Table 3 closely resemble less detailed data from a 1968 Harris survey which found gun ownership to be 48 per cent in the West, 51 per cent in the Midwest, 33 per cent in the Northeast, and 59 per cent in the South.⁸

Farmer and Rohde examined suicide mortality in 1969–73 in 11 “developed” countries and found higher rates in

countries such as the US, Australia, and France, with the least restrictive firearm legislation.³ Lester and Murrell found a negative correlation between their Guttman scale rating of the strictness of the gun control legislation in each of 48 US states and male suicide rates for both 1959–61 and 1969–71. They felt their study provided “. . . indirect support for the notion that controlling methods for suicide may reduce the suicide rate.”¹⁰

Using variation over time, not geography, Lester and Murrell found that legislation strictness in the 48 states related negatively to both absolute and relative increases from 1959–61 to 1969–71 in male and in female total suicide rates.¹⁰ Boor examined trends in the methods of US suicides by sex and color for the years 1962–75.⁵ During this time period, the number of firearms imported or domestically produced in the US increased more than three-fold, while the overall suicide rate increased from 10.9 per 100,000 person-years in 1962 to 12.7 in 1975; virtually all the increase was accounted for by firearm suicides. Boyd increased the period of analysis to 25 years (1953–1978) and again found that firearm suicide alone account for the entire increase in total US suicides; he also concluded that the increase in suicide could not result from misclassification of self-inflicted firearm accidents.⁶

High total and firearm suicide rates have been noted in an occupational group highly exposed to firearms: a study of suicide among New York City policemen over the 1934–1940 period determined that nine out of ten killed themselves with revolvers (82 per cent were gunshot wounds in the head), and that the Department's suicide rate for the years 1934–1939 was 84.5 per 100,000 person-years, compared to the city's civilian rate of 15.2 per 100,000 person-years.²¹

The possibility that the firearms-suicide correlation is etiologic gains additional indirect support from studies suggesting that the availability of two other suicidal agents also correlates with suicide rates. Farmer and Rohde examined the relationship between suicide rates in England and Wales and the availability of coal gas. They found that, over a 100-year period, “the rise in coal gas suicides occurred coincidentally with the widespread introduction of coal gas to domestic use, . . . the increase did not appear to displace other methods of suicide.”²³ Two studies have suggested that

TABLE 5—Probability Values for Significance of Correlation Coefficients. Unweighted and Weighted Regression Analyses of Total and Firearm Suicide Rates on Household Gun and Pistol Prevalence, Contiguous US, Four-Year Mean (1973–1974 and 1976–1977) by color and sex

Category of Suicide	Regression Analysis	Total			White			Non-White		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
Guns										
Total	Unweighted	.3604	.1722	.7875	.5778	.0804	.6123	.2613	.4456	.5180
Total	Weighted	.0077	.0026	.0310	.0052	.0017	.0249	.0205	.0253	.1068
Firearms	Unweighted	.0066	.0052	.0086	.0025	.0030	.0042	.0560	.1667	.0402
Firearms	Weighted	.0008	.0002	.0125	.0016	.0006	.0259	.0005	.0012	.0047
Nonfirearms	Unweighted	.0696	.0353	.2066	.0794	.0360	.1947	.8846	.9008	.8236
Nonfirearms	Weighted	.1300	.1235	.1267	.0826	.0802	.0978	.3417	.4551	.3810
Pistols										
Total	Unweighted	.1507	.0952	.4441	.0716	.0217	.3783	.0739	.5467	.0632
Total	Weighted	.0159	.0075	.0610	.0129	.0039	.0634	.0094	.0406	.0325
Firearms	Unweighted	.0004	.0010	.0005	.0001	.0001	.0006	.0066	.1852	.0019
Firearms	Weighted	.0001	.0001	.0005	.0001	.0001	.0010	.0001	.0020	.0010
Nonfirearms	Unweighted	.1648	.0549	.3970	.1706	.0747	.3381	.4890	.6867	.3450
Nonfirearms	Weighted	.2719	.2580	.2912	.2348	.1894	.3120	.2778	.5768	.1787

the fall in suicide mortality in England, Wales, and Scotland since the mid-1960s was related to the change in the domestic gas supply from toxic coal gas to nontoxic oil-based gases and subsequently to natural gas.^{22,23} Boor mentioned that a reduction in the toxicity of domestic gas in Vienna was also paralleled by a reduction in the overall suicide rate.⁵ Brown noted that the decrease in Great Britain's suicide rates in the 1960s was associated with a substantial increase in the rate of unsuccessful suicide attempts.²⁴ Oliver and Hetzel found that a substantial increase over the period 1953–1968 in total suicide rates for young women in Australia was associated with a period of relaxed prescribing standards for sedative drugs, and concluded that the availability of a means of inflicting fatal self-injury (sedative drugs) bears direct relationship to the incidence of such self-injury, without much effect on other modes of self-injury.²⁵

Thus a relation appears to exist between changes in the availability of three different agents (firearms, toxic gas, and drugs) and changes in suicide rates. Boor concluded that "the physical availability of the more culturally accepted method of suicide is a major determinant of suicide rates and that suicides may be prevented by decreasing the availability of the most common methods of suicide to suicidal individuals."⁵

There may be some benefits to firearms to balance against the hypothesized excess in suicide deaths. Bruce-Briggs has pointed out that Southern and Southeastern cities which have high rates of gun ownership have low rates of burglary and that, "In rural areas and small towns, a boy's introduction to guns and hunting is an important rite of passage."²⁶ Some of the variation in gun prevalence may relate to the proportion of the population involved in agriculture, where guns may be needed for animal and pest control.³ For these reasons, it may be necessary to further quantify both the costs and the benefits of the firearms in our households.

Cultural factors seem to influence the choice of suicidal agent.^{8,11} Hanging, for example, is a common suicidal method in Germany and Belgium, where it contributes to excess suicide mortality when compared to England and Wales,³ even though it has a fatality rate in suicide attempts of 78 per cent and can be considered almost universally available.²⁷ High suicide rates seem to occur where highly lethal suicidal methods are not only available but also where they are culturally acceptable.

A relation has been suggested between human violence at the individual level and violence at international levels.²⁸ Increasing rates of self-destruction from increased individual arming seem to be paralleling increasing risk of mass self-destruction from increased international arming, particularly nuclear arming. One wonders whether the two levels of self-destructive arming may share some etiologic factors. Factors suggested for the international level include self-destructive reaction to unconscious fear,²⁹ insensitivity to terror,³⁰ and inappropriate levels of anxiety.³¹ Many cultural leaders have warned that, "Nothing is to be so much feared as fear."³²

We suggest, therefore, that three factors—namely, the statistically significant regional correlation of gun and pistol prevalence with US suicide rates, the correlations of these factors across nations and years, and the increases and decreases in suicide rates associated with changes in the availability of lethal and customary suicidal agents—indicate the need for more definitive studies and pilot programs.

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