Homicide, Handguns, and the Crime Gun Hypothesis: Firearms Used in Fatal Shootings of Law Enforcement Officers, 1980 to 1989

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A B S T R A C T

Objectives. Many policies seeking to limit handgun violence rest on the largely untested "crime gun hypothesis," which holds that subclasses of handguns differ in their risk for use in violent crime. This study tests that hypothesis for handguns used in homicides of law enforcement officers and describes the population of homicide-involved handguns.

Methods. A cross-sectional study was done of civilian (criminal) handguns used in homicides of law enforcement officers from 1980 to 1989. Life tables were generated for each year's cohort of new handguns to estimate gun-years at risk, analogous to person-years, for rate and relative risk calculations.

Results. Four hundred thirty-five deaths involved 428 civilian handguns. Revolvers were at greater risk than pistols. For both, risk was lowest for .22-caliber handguns. Risk was greatest for .32-caliber pistols and .38-caliber revolvers. Forty-six percent of handguns had a barrel length of 3 in or less.

Conclusions. Subclasses of handguns differ substantially in their risk for use in fatal shootings of law enforcement officers. Such epidemiological data may be useful in formulating efforts to prevent these and similar instances of firearm violence. (*Am J Public Health.* 1994; 84:561–564)

Introduction

Regulatory efforts to prevent firearm violence often address specified classes of firearms. In the 1960s, the proliferation and criminal use of inexpensive, small-caliber handguns—Saturday Night Specials—led to severe restrictions on their importation under the Gun Control Act of 1968. In 1990, similar concerns regarding certain high-capacity semiautomatic weapons led to an administrative ban on their importation.

Such policies are grounded in a belief in the validity of the "crime gun hypothesis," which holds that all firearms are not at equal risk for use in a violent crime. This hypothesis has clearly been validated in the case of handguns generally, as compared with rifles and shotguns. While handguns constitute perhaps 40% of firearms produced in the United States in the past 2 decades, they account for 80% of all violent crimes involving firearms.[1]

The crime gun hypothesis has not been rigorously tested for the various classes of handguns because the necessary data have been lacking. While information on the characteristics of handguns released into circulation—as approximated by data on handguns manufactured or imported—is compiled only on a national basis, no nationally based data on handguns actually used in violent crimes have been available.

Previous explorations of this issue have yielded conflicting results. In the 1970s, half or more of all handguns confiscated by police agencies were of small caliber, had short barrels, or both.[2,3] Later critics noted that many of these "crime guns" had not actually been used in violent crime; some had no criminal associations at all.[4,5] In contrast, two surveys of convicted felons suggested that such criminals most often use high-quality, high-caliber handguns, particularly if they rely heavily on firearms in committing crimes.[6,7] Both studies were based entirely on self-report; new data on handguns actually confiscated from violent career felons at the time of their arrest show that both large- and small-caliber handguns are in common use by this group.[8] None of these studies estimated the actual or relative risk of different classes of handguns being used in crime.

The present study attempts to provide a more exact, albeit narrowly focused test of the crime gun hypothesis. Its subjects are the civilian handguns used in homicides of law enforcement officers in the United States from 1980 to 1989; this is the only instance in which detailed, nationally based data on firearms actually used in violent crime have been compiled. Such data are compatible with the nationally based information used to estimate handgun availability.

I estimate absolute and relative risks for involvement in these fatal shootings by handgun type (revolver or pistol) and caliber, the two characteristics for which availability data are collected, and I test two hypotheses: (1) that risk will be positively associated with handgun caliber; and (2) that risk will be higher for pistols than for

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revolvers. As for the first hypothesis, small area studies have found an association between larger caliber and higher case-fatality rates for assaultive violence involving handgun use.[2,4,9] As for the second, pistols have been reported anecdotally to be used with increasing frequency in violent crime, including the crime at issue here. Pistols carry more ammunition than revolvers do, typically between 9 and 16 rounds, and automatically bring a new round into firing position each time a round is discharged. Revolvers generally carry only 5 to 6 rounds, and many must be recocked manually each time the gun is to be fired.

Finally, I describe this population of homicide-involved handguns with regard to characteristics for which the existing data do not permit an estimation of risk.

Methods

Data Sources

Data on all firearm homicides of law enforcement officers in the United States from 1980 to 1989 were provided by the Uniform Crime Reporting Program of the Federal Bureau of Investigation (FBI). Information in the dataset is collected from local law enforcement agencies, FBI field divisions, and the agency's Bureau of Justice Assistance. Reports are cross-checked for validity and completeness.[10]

Data on new handgun availability were provided by the Bureau of Alcohol, Tobacco and Firearms, which collects such information from manufacturers and importers by handgun type and caliber, but not by barrel length or ammunition capacity. Information on handguns manufactured in the United States was first collected in 1973; comparable data on imported handguns were not collected until 1988. Data on exported handguns, which account for about 10% of domestic manufactures, do not exist.

Data Management

Not all records were complete, presumably owing to failure to obtain the weapon involved. Missing information was sought from manufacturer catalogs, lay publications, and scholarly manuals of firearms identification.[11,12] Data were added for 52 handguns when this supplemental review established that only one value for the missing variable was possible. Residual frequen-cies for missing data were greater than 5% for gun type (7%), manufacturer (25%), and barrel length (34%).

Seven shootings were reported in which more than one law enforcement officer appeared to have been killed with the same handgun. Only one observation was retained.

Analysis

Numerators for rate and relative risk estimates were taken directly from the FBI data. Because imported handguns were missing from the denominator dataset until 1988, homicides involving such weapons were excluded until that year.

Denominators were expressed as gun-years at risk, an analog to person-years, for each gun type and caliber. Gun-years at risk accumulated from 1980 to 1989 were estimated for each annual cohort of new handguns produced from 1973 through 1989, specific to handgun type and caliber, by generating demographic life tables.[13,14]

The size of each annual cohort at inception was approximated by the number of handguns manufactured for 1973 to 1987, and by the number of handguns manufactured plus the number of handguns imported for 1988 to 1989. The annual attrition rate was also estimated, as nationally based data on the persistence of handguns in circulation are not available. Police handgun confiscation studies from the 1970s found that approximately half of those weapons had been manufactured within 3 to 5 years of confiscation.[2,3,15] The life tables were therefore first constructed under the assumption that the annual rate of attrition was 0.10 for each gun type and caliber. Rates were calculated under this model.

To estimate the sensitivity of the results to variations in the survival model, gun-years at risk for each annual cohort of new handguns were also calculated for rates of attrition of 0.05 and 0.20. Confidence intervals (CIs) for relative risk (RR) estimates were derived by the method of Katz[16] using Confidence Interval Analysis software.[17]

Results

There were 735 firearm homicides of law enforcement officers from 1980 to 1989, of which 435 (59%) were committed with the 428 civilian (criminal) handguns that are the subjects of the present study. Of these guns, 296 (69%) were revolvers, 104 (24%) were pistols, and 28 (7%) were of unknown type. Most handguns (53%) were of medium caliber (.38 or 9 mm). Small-caliber (.22 to .32) handguns accounted for 20% of all weapons.

Short-barreled handguns predominated among both pistols and revolvers; of 288 guns for which information was available, 134 (47%) had a barrel length of 3 in or less. Such weapons accounted for 78% of all .22- to .32-caliber handguns and 54% of all .38-caliber or 9-mm handguns.

Firearms manufacturers based in the United States accounted for 82% of the 322 handguns for which a manufacturer was identified; the four most frequently identified firms produced 59% of these weapons.

Revolvers were at greater risk than pistols (RR = 1.40; 95% CI = 1.10, 1.77). For pistols and revolvers alike, handgun caliber was associated with large differences in their rates of use in these events (Figure 1). Rates were lowest for .22-caliber handguns. Among pistols, .32-caliber weapons were at greatest risk (RR = 15.3; 95% CI = 5.56, 41.9), but these relatively uncommon weapons accounted for only 9% of all homicide-involved pistols. Nearly half (49%) of all pistols were of .38 or 9-mm caliber (RR = 7.28; 95% CI = 3.65, 14.5). Among revolvers, risk was highest for .38-caliber weapons (RR = 9.02; 95% CI = 5.31, 15.3). This group accounted for 57% of all revolvers of known caliber and 42% of all handguns for which both gun type and caliber were known. Rates for the largest caliber handguns were lower than those for weapons of intermediate caliber.

The relative risk estimates were minimally sensitive to fourfold variations in the hypothesized rate at which handguns disappear from circulation. The ranking of handgun types and calibers by their relative risk for use in these events was not affected (Table 1).

Discussion

The crime gun hypothesis appears to be valid for the specific crime of homicide of a law enforcement officer. Among commonly available handguns, differences in risk for use in these fatal shootings are associated with specific design characteristics. Some of these differences are substantial; all are only modestly affected by large variations in

the hypothesized rate at which handguns are removed from circulation.

The finding that small-caliber handguns are at relatively low risk was expected. Handguns used in homicides are substantially more likely than handguns used in nonfatal assaults to be of large caliber.[2,4,12] The finding of low risk at low caliber may be specific to homicide, reflecting the lower lethality of these handguns.

The relatively low rates among the highest caliber weapons were not expected but may be partly explained by price elasticity in handgun acquisition decisions by criminal users. High-caliber handguns are often substantially more expensive than low-caliber weapons—by as much as 50% or more at retail list prices and perhaps more at street pricing.

The predominance of handguns with short barrels—a key factor in weapon concealability—is consistent with earlier reports. Police studies have consistently found a high frequency of short-barreled weapons among confiscated handguns.[2,3,4] Convicted felons report that concealability was one of the chief factors influencing their handgun selection.[7] A Florida survey of convicted felons and gun owners in the general population found that the latter group was far less likely to report owning a handgun with a barrel length of 3 in or less (odds ratio = 0.22; 95% CI = 0.15, 0.34; this author's calculation).[6]

The quality of the data available for this study raises several caveats. The FBI data frequently omit handgun manufacturer and barrel length. However, there is no a priori reason to expect that values for these variables are related to the frequency of missing data, and no bias is expected. The Bureau of Alcohol, Tobacco and Firearms data describing handguns in the United States do not include characteristics such as barrel length; the association between these characteristics and risk for use in firearm violence cannot be quantified.

A direct measure of guns sold at retail does not exist. Over a brief period of time, fluctuations in the inventory of unsold handguns could result in a significant difference between the number of handguns available for sale and the number actually sold (or stolen) and entering the population at risk for criminal use. However, it is unlikely that such a difference would persist across the 17-year period used here.

Similarly, no nationally based data exist on the persistence of handguns in
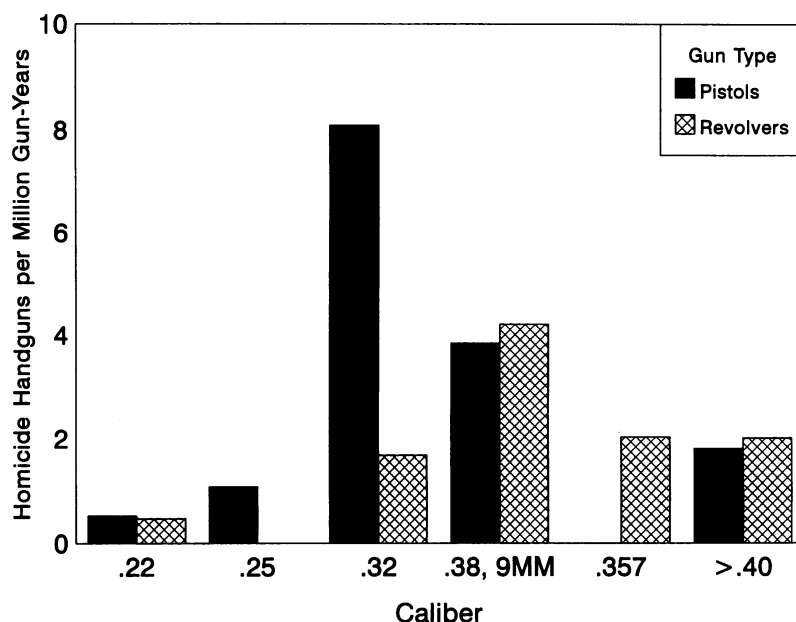
Note: Homicide handguns per million gun-years is defined as the number of guns used in homicides divided by the estimated total number of handguns times their duration in circulation (in millions of years). See the Methods section.

FIGURE 1—Rates of handgun use in homicides of law enforcement officers, by caliber and gun type, United States, 1980 to 1989.

TABLE 1—Relative Risk for the Involvement of Handguns in Homicides of Law Enforcement Officers, by Estimate of the Proportion of Handguns Lost from Circulation Each Year: United States, 1980 to 1989

Gun Type/ Caliber	0.05		0.10		0.20	
	Relative Risk	95% Confidence Interval	Relative Risk	95% Confidence Interval	Relative Risk	95% Confidence Interval
Revolver						
.22	1		1		1	
.32	3.58	1.70, 7.52	3.61	1.72, 7.58	3.63	1.73, 7.63
.38	9.07	5.34, 15.4	9.02	5.31, 15.3	8.92	5.25, 15.1
.357	4.48	2.56, 7.84	4.36	2.49, 7.62	4.17	2.39, 7.29
> .40	4.51	2.36, 8.65	4.31	2.25, 8.26	4.35	2.27, 8.32
Pistol						
.22	1		1		1	
.25	2.03	0.95, 4.33	2.05	0.96, 4.38	2.08	0.98, 4.45
.32	16.90	6.17, 46.5	15.30	5.56, 41.9	12.80	4.68, 35.2
.38/9 mm	7.36	3.69, 14.7	7.28	3.65, 14.5	7.15	3.58, 14.3
> .40	3.45	1.51, 7.87	3.45	1.51, 7.85	3.45	1.51, 7.86

circulation. The robustness of the relative risk estimates across widely varying hypothesized rates of attrition suggests that a reasonable assessment of relative risk, if not of absolute risk, can be made without this information. However, the results depend on the design of the model used to generate them. We have assumed that all subclasses of handguns are lost from circulation at the same rate. This may not be the case. In particular, the guns most at risk for use in violent crime may also be most at risk for confiscation and for abandonment. If this is true, then gun-years for these weapons have been overestimated and the relative risks presented here are artificially low.

Other limitations arise from the absence of more generally applicable information. First, handguns used in homicides of law enforcement officers may not be representative of all handguns used in homicides. While .22- to .32-caliber handguns made up 20% of the weapons in this series, they constituted 33% to 52% of homicide-involved handguns in four major cities in studies conducted during the 1970s.[2,9] The creation of a firearm fatality reporting system has recently been recommended[18] and could be implemented with relative ease.

Second, the handguns most at risk for use in homicide may be quite different from those most at risk for use in nonfatal assaultive violence. To begin to address this issue, it might be feasible to acquire information on firearms used in nonfatal shootings of law enforcement officers. From 1980 through 1989, 29 339 assaults on law enforcement officers with firearms were reported, of which 6496 (22%) involved injury.[10] The Department of Justice, the Consumer Product Safety Commission, and the Centers for Disease Control and Prevention have also explored adding firearm injuries to the existing National Electronic Injury Surveillance System.[19,20]

Concerns about generalizability do not pertain to the implications of these findings for law enforcement personnel themselves. This group is at high risk for occupational homicide, with rates of 20 to 25 homicides per 100 000 officers per year.[21,22] Most such deaths involve firearms; nearly half result from wounds to the front upper torso, and nearly 60% occur when the shooter and the victim officer are separated by 5 ft or less.[10] Our data show that 9-mm or .38-caliber handguns are most commonly involved. Law enforcement policymakers should consider requiring the use of soft "body armor," which provides protection against such weapons at close range.

Law enforcement officers also need enhanced safeguards against assaults using their own firearms. During 1980 to 1989, 21% of officers killed with a handgun were shot with their own service weapon, and others were killed with a handgun taken from a fellow officer. Law enforcement agencies often avoid purchasing handguns with trigger arresters or other safety devices in order to minimize the time delay to firing when the officer is in control of his or her own weapon.[23,24] These data suggest that attention should be given to modifications of firearm design that would not impede the officer's ability to use the weapon but would make it more difficult for others to do so.

The question of whether broad limitations on the availability of handguns would reduce the incidence of these events is outside the scope of this study. My data do indicate, however, that restrictions limited to imported firearms—a characteristic of much of American firearms policy—will not be effective. □

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