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Social Science & Medicine 64 (2007) 656–664

SOCIAL SCIENCE & MEDICINE

www.elsevier.com/locate/socscimed

State-level homicide victimization rates in the US in relation to survey measures of household firearm ownership, 2001–2003

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Available online 27 October 2006

Abstract

Two of every three American homicide victims are killed with firearms, yet little is known about the role played by household firearms in homicide victimization. The present study is the first to examine the cross sectional association between household firearm ownership and homicide victimization across the 50 US states, by age and gender, using nationally representative state-level survey-based estimates of household firearm ownership. Household firearm prevalence for each of the 50 states was obtained from the 2001 Behavioral Risk Factor Surveillance System. Homicide mortality data for each state were aggregated over the three-year study period, 2001–2003. Analyses controlled for state-level rates of aggravated assault, robbery, unemployment, urbanization, per capita alcohol consumption, and a resource deprivation index (a construct that includes median family income, the percentage of families living beneath the poverty line, the Gini index of family income inequality, the percentage of the population that is black and the percentage of families headed by a single female parent). Multivariate analyses found that states with higher rates of household firearm ownership had significantly higher homicide victimization rates of men, women and children. The association between firearm prevalence and homicide victimization in our study was driven by gun-related homicide victimization rates; non-gun-related victimization rates were not significantly associated with rates of firearm ownership. Although causal inference is not warranted on the basis of the present study alone, our findings suggest that the household may be an important source of firearms used to kill men, women and children in the United States.

Keywords: Homicide; Firearms; Guns; Violence; Epidemiology; USA

Introduction

Approximately two in three homicide victims in the US are killed with guns(Centers for Disease Control and Prevention), yet the role of household firearms in homicide victimization has not been well characterized. Case-control studies suggest that the presence of a gun in the home is a risk factor for homicide in the home (Kellermann et al., 1993), that the risk is higher for women than for men (Bailey et al., 1997a, b), and that when any family member purchases a handgun all members of the household are at increased risk of homicide victimization (Cummings, Koepsell, Grossman, Savarino, & Thompson, 1997). Limitations of existing case–control studies include not controlling for (1) possible differential recall of firearm ownership by

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0277-9536/$ - see front matter © 2006 Published by Elsevier Ltd.
doi:10.1016/j.socscimed.2006.09.024

cases compared to controls, and (2) possible reverse causation—i.e. gun ownership may sometimes be a response to an increased risk of homicide victimization (Hemenway, 2004; Hepburn & Hemenway, 2004; National Research Council, 2005).

Most (Brearly, 1932; Brill, 1977; Cook, 1979; Duggan, 2001; Lester, 1988, 1990; Seitz, 1972), but not all, (Kaplan & Geling, 1998; Kleck & Patterson, 1993) ecologic studies have found a positive association between various measures of firearm availability and overall rates of homicide. Among nationally representative studies, those using surveys to estimate household firearm ownership have been limited to evaluating variation across the 9 US Census regions. With only 9 units of observation, these studies have not been able to control for potential ecologic confounders. Until now, for state, city and county analyses, researchers have been forced to use proxies of firearm ownership (Duggan, 2001; Miller, Azrael, & Hemenway, 2002; Price, Thompson, & Dake, 2004), the use of which has been criticized by a recent NAS report as possibly introducing bias (National Research Council, 2005). It is only since the 2001, Behavioral Risk Factor Surveillance System (2001) added questions about household firearm ownership that large-scale survey data have been available on household firearm ownership for all 50 states. The present investigation is the first nationally representative study to use state-level, survey-based estimates of household firearm ownership to examine the association between household gun ownership and homicide rates.

Methods

In this analysis, outcomes are state-level rates of homicide, firearm homicide and non-firearm homicide, aggregated over the 3-year study period, 2001–2003. Homicide mortality data for each state were obtained through the CDC's Web-based Injury Statistics Query and Reporting System (Centers for Disease Control and Prevention). Homicide data, grouped by firearm (ICD-10 E-codes X93-X95) and non-firearm methods (E-codes X85-X92, X96-Y09, Y87.1), were further stratified by gender and age (5–14, 15–17, 18–34, and 35 years of age and older). Non-firearm homicide from terrorism (E-code U01.1) was excluded from analyses. Mortality data are aggregated (2001–2003) to provide a sufficient number of observations to allow comparisons across age and gender sub-groupings. Gun-related deaths of undetermined intent constituted less than 3% of all gun-related deaths and were excluded from the analyses.

The key independent variable of interest is household firearm prevalence. State level data on the percentage of individuals living in households with firearms were obtained from the 2001 Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS, the world's largest telephone survey (over 200,000 adult respondents annually), is an ongoing data collection program sponsored by the Centers for Disease Control and Prevention (CDC), with all 50 states participating. Data were representative of the US in 2001 at the state and national level. BRFSS questionnaires and data are available on the Internet at www.cdc.gov/brfss; the BRFSS uses a complex sampling and weighting scheme described in detail elsewhere . Firearm prevalence estimates presented exclude respondents who did not know or refused to answer the BRFSS firearm questions (fewer than 4% of all respondents). The verbatim firearm question and the preface to the questions reads: "The next question is about firearms, including weapons such as pistols, shotguns, and rifles; but not BB guns, starter pistols, or guns that cannot fire. Are any firearms now kept in or around your home? Include those kept in a garage, outdoor storage area, car, truck, or other motor vehicle."

Multivariate analyses adjust for several potential confounders previously identified in the literature: rates of aggravated assault and robbery (Hsieh & Pugh, 1993), urbanization (Fingerhut, Ingram, & Feldman, 1992), unemployment (Karpati, Galea, Awerbuch, & Levins, 2002; Reed, Smith, Helmer, Lancaster, & Carman, 2003), alcohol use (Goodman et al., 1986), the percentage of the population 18–34 years of age (Gastil, 1971; Land, McCall, & Cohen, 1990; Loftin & Hill, 1974), the percentage divorced (Land et al., 1990), and a binary indicator variable for living in the southern census region (Gastil, 1971; Huff-Corzine, Corzine, & Moore, 1986; Land et al., 1990). In addition, we use principal components analysis (Wall, Rechtsteiner, & Rocha, 2003) to generate a "resource deprivation index", a construct originally described by Land et al. (1990) to have an invariant relationship with homicide rates across time and space. As in Land et al. (1990), our resource deprivation index includes three income variables (median family income, the percentage of families living beneath the poverty line, and the Gini index of family income inequality)

and two social indicators (the percentage of the population that is black and the percentage of families headed by a single female parent).

Rates of aggravated assault and robbery in 2001 were obtained from the Federal Bureau of Investigation's Uniform Crime Reports (Federal Bureau of Investigation, 2002). Alcohol consumption data were identified in each state during each year 1999–2002 and the average of these four values for each state were used as our state level alcohol variable. Alcohol consumption data came from the National Institute on Alcohol Abuse and Alcoholism (National Institute on Alcohol Abuse and Alcoholism, 2005). The percentage of people living at or under the poverty level, divorced, the percent living in metropolitan areas, and the percent of the workforce 16 years and older who are unemployed pertain to the year 2000 only, and come from Census 2000 (US Bureau of the Census, 2004). The percentage of the population between 18 and 34 years of age in 2001 come from the National Center for Injury Prevention and Control database (available at http://webapp.cdc.gov/sasweb/ncipc/mortrate10.html).

To derive estimates of the association between household firearm prevalence and homicide, we used negative binomial regression models and generalized estimating equations to estimate regression parameters. Negative binomial regression is appropriate for estimating models for count data that are overdispersed (i.e. the variance is greater than the mean) (Lawless, 1987), as is the case with state-level homicide data. Likelihood ratio tests rejected the null hypothesis that the distributions were Poisson. To take into account the possibility that the data may be spatially correlated, in this case within census region, we ran models that clustered observations within regions and made appropriate adjustments to standard errors for accurate hypothesis testing. Model coefficients were converted to incident rate ratios so that effects could be expressed in terms of percentage changes in homicide rates for each one-percentage point change in household firearm prevalence. We used 2-tailed tests of significance and $[\alpha] \leqslant 0.05$ for rejecting the null hypothesis of no effect.

The relationship between each covariate and homicide rates is presented for the population as a whole (Table 3). With the exception of southern census region, which is a binary variable, all covariates in Table 3 are standardized so they each have a mean of zero and a standard deviation of one unit. Standardization was performed to facilitate an intuitive comparison across covariates.

Fig. 1 shows a scatter plot of household firearm prevalence vs. firearm homicide victimization rate for the population as a whole, controlling for the robbery rate. Three regression lines are drawn (weighted by the square root of the population), one for states with robbery rates greater than one standard deviation from the mean, one for states within one standard deviation of the mean, and one for states with robbery rates lower than one standard deviation from the mean. Slopes derived

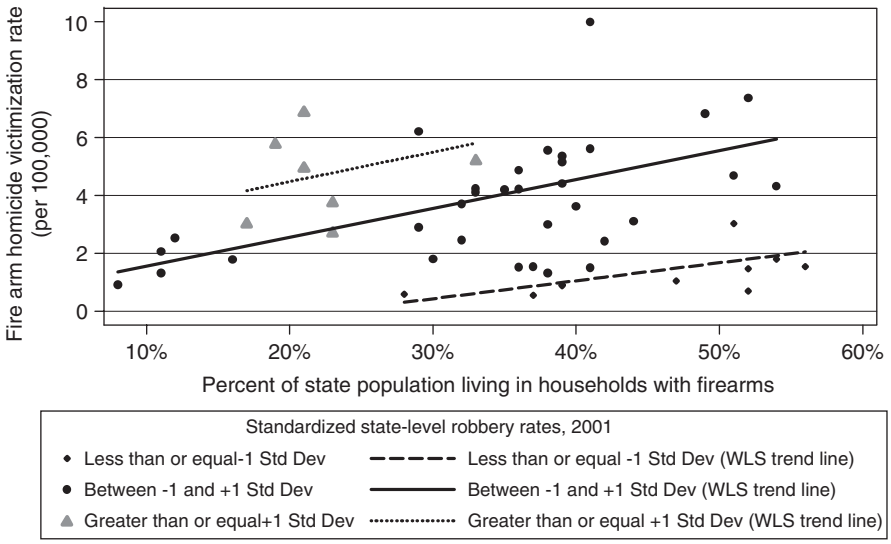

Fig. 1. Household firearm ownership and firearm homicide victimization rate, by state-level standardized robbery rates.

from these three regression lines are reported in the results section.

Results

For the population as a whole, over the three year study period the (unweighted) mean number of homicides, firearm homicides and non-firearm homicides per state (+standard deviation; range) were, respectively, 1043 (+1301; 28 to 7150), 693 (+909; 16 to 5181), and 351 (+ 405; 8 to 1969). The median number of homicides, firearm homicides and non-firearm homicides per state were, respectively, 586, 358, and 224. Our measure of state level household firearm ownership had a mean of 35%, a standard deviation of 12% and a range from 8% to 56%; the median household firearm ownership prevalence was 37%.

Unadjusted (bivariate) results showed a significant relationship between household firearm prevalence and rates of firearm homicide victimization for women but not for men. Firearm prevalence was not associated with rates of non-firearm homicide for any age–sex subgroup or for the population as a whole (Table 1).

In multivariate analyses, homicide victimization rates and firearm homicide victimization rates were significantly related to the prevalence of household firearm ownership for each of our age–sex strata and for the US population as a whole (Table 2). Overall, each one-percentage point difference in household firearm ownership was associated with a 3.3% difference in firearm homicide victimization (95% CI 2.4%, 4.2%) and a 2.2% difference in the rate of homicide victimization (95% CI 1.4%, 2.9%). Non-firearm homicide victimization was not associated with firearm prevalence.

The results presented in Tables 1 and 2 are derived from incidence rate ratios and relate the *relative* difference in the dependent variable, expressed as a percentage (e.g. a three percent increase in the firearm homicide victimization rate), for each one-percentage point *absolute* difference in household firearm prevalence. Since approximately one in three US household contained firearms according to the 2001 BRFSS, each one-percentage point *absolute* difference in gun ownership reflects, on average, approximately a 3% change in relative gun ownership. Thus, since a one percentage point absolute increase in household firearm ownership prevalence is associated with a 3% increase in firearm homicide, rates of firearm homicide victimization increase in approximate proportion to (relative) increases in firearm prevalence. The coefficient of elasticity in the middle range of firearm prevalence is approximately one.

Additional multivariate analyses for the population as a whole were conducted comparing homicide victimization in the states in the highest compared to the lowest quartile of firearm ownership. Compared to states within the lowest quartile of firearm prevalence, states within the highest quartile had significantly higher firearm and overall homicide victimization rates: firearm homicide rates were

Table 1
Unadjusted results: percentage increase in homicide victimization rates (95% CIs) for each one-percentage point *absolute* increase in household firearm ownership

	Homicide	Firearm homicide	Non-firearm homicide
Kids 5–14	0.9% (−0.3%–2.1%)	1.6% (−0.3%–3.4%)	0.2% (−1.1%–1.6%)
Adolescents 15–17	−0.9% (−2.6%–0.8%)	−1.1% (−3.1%–0.9%)	−0.4% (−1.7%–1.0%)
Women			
Ages 18–34	1.3% (−0.3%–2.9%)	2.2% (0.4%–4.1%)*	0.2% (−1.3%–1.6%)
Ages 35+	1.3% (−0.4%–3.0%)	2.6% (0.5%–4.8%)*	0.4% (−1.0%–1.8%)
All Ages	1.3% (−0.2%–2.2%)~	2.4% (0.4%–4.4%)*	0.6% (−0.7%–1.8%)
Men			
Ages 18-34	−0.6% (−3.0%–1.8%)	−0.7% (−3.4%–2.0%)	−0.2% (−1.4%–1.0%)
Ages 35+	1.2% (−0.7%–3.0%)	1.8% (−0.5%–4.1%)	0.5% (−0.9%–1.9%)
All Ages	0.1% (−1.8%–2.2%)	0.0% (−2.3%–2.6%)	0.3% (−0.9%–1.4%)
Total	0.5% (−1.4%–2.3%)	0.5% (−1.8%–2.9%)	0.4% (−0.8%–1.5%)

Values derived from rate ratios computed using negative binomial regression.
~$P<0.1$;
*$P<0.05$;

Table 2
Multivariate results: percentage increase in homicide victimization rates (95% CIs) for each one-percentage point *absolute* increase in household firearm ownership

	Homicide	Firearm homicide	Non-firearm homicide
Kids 5–14	2.4% (0.0%–4.8%)*	3.8% (0.2%–7.5%)*	0.6% (−1.8%–3.1%)
Adolescents 15–17	2.4% (0.6%–4.3%)**	2.8% (0.7%–5.0%)*	0.6% (−1.1%–2.3%)
Women			
Ages 18–34	2.3% (1.2%–3.4%)***	4.0% (2.3%–5.6%)***	0.6% (−0.7%–1.9%)
Ages 35+	1.7% (0.3%–3.0%)*	4.4% (2.7%–6.2%)***	−0.2% (−1.5%–1.1%)
All ages	2.0% (1.0%–3.1%)***	4.1% (2.6%–5.6%)***	0.5% (−0.4%–1.4%)
Men			
Ages 18–34	3.0% (1.2%–4.8%)***	3.4% (1.4%–5.6%)***	0.3% (−1.6%–2.2%)
Ages 35+	2.0% (0.7%–3.2%)**	3.4% (2.2%–4.6%)***	0.7% (−0.5%–1.8%)
All Ages	2.4% (1.4%–3.3%)***	3.2% (2.2%–4.3%)***	0.6% (−0.7%–2.0%)
Total	2.2% (1.4%–2.9%)***	3.3% (2.4%–4.2%)***	0.6% (−0.5%–1.6%)

Multivariate results control for urbanization, resource deprivation, unemployment, divorce, percent of the population 18–34 years old, aggravated assault rate, robbery rate, per capita alcohol consumption, and Southern region.
Values derived from rate ratios computed using negative binomial regression.
*$P<0.05$;
**$P<0.01$;
***$P<0.001$

114% higher (95% CI 38%, 211%) and homicide rates were 60% higher (27%, 101%). Non-firearm homicide rates were not significantly different in the states with the highest compared to the lowest quartile of firearm prevalence.

Sensitivity analyses were conducted to see if our results held when the states most extreme in firearm ownership were excluded from analyses. Results from analyses that excluded the 5 states with the highest household firearm prevalence were similar to results obtained when all 50 states were included. Results from analyses that excluded the 5 states with the lowest household firearm prevalence were similar to results obtained when all 50 states were included. Additional sensitivity analyses found that a more parsimonious model that included only three independent variables (firearm ownership, urbanization, and resource deprivation) produced findings similar to those presented in Table 2 using the full model (not shown). For example, when covariates included only firearm prevalence, urbanization and resource deprivation, each 1-percentage point *absolute* difference (or, equivalently, each 3% *relative* change) in firearm prevalence was associated with a 4.1% relative difference in firearm homicide victimization for the population as a whole (95% CI 1.6%, 6.6%), and a 2.9% difference in homicide victimization(95% CI 0.9%, 4.9%) (not shown).

In addition to household firearm prevalence, other covariates were significantly associated with homicide and firearm homicide victimization in multivariate analyses. These included the percentage of the population living in urbanized areas, the robbery and aggravated assault rates, the resource deprivation index and living in the southern census region (Table 3). Covariates associated with non-firearm homicide victimization included the robbery rate, resource deprivation, and the divorce rate (Table 3).

Fig. 1 illustrates the simultaneous contribution of household firearm ownership and robbery on firearm homicide victimization for the population as a whole. In states with similar robbery rates, where household firearm prevalence is higher, firearm homicide victimization is higher. The slope of the lines relating household firearm prevalence to firearm homicide rates are 0.06, 0.10, and 0.10 for, respectively, states with robbery rates more than 1 standard deviation below the mean, within one standard deviation of the mean, and more than 1 standard deviation above the mean.

Discussion

States with higher rates of household firearm ownership had significantly higher homicide victimization rates in multivariate analyses. The

Table 3
Percentage increase in homicide victimization rates (95% CIs) for each one standard deviation increase in measured covariates

	Homicide	Firearm homicide	Non-firearm homicide
Household firearm ownership	29.6% (17.5%–43.1%)***	47.1% (31.0%–65.3%)***	8.3% (−4.9%–23.2%)
% of population living inside urban areas	7.7% (−4.4%–21.3%)	19.8% (6.7%–34.5%)**	−6.5% (−18.0%–6.6%)
Factor of resource deprivation	20.7% (13.4%–28.5%)***	28.0% (18.1%–38.9%)***	9.3% (2.6%–16.5%)**
Unemployment rate	0.1% (−5.3%–5.8%)	−1.5% (−8.5%–6.0%)	2.4% (-1.1–6.1%)
% population, divorced	5.1% (−3.0%–14.0%)	4.0% (−6.5%–15.6%)	7.4% (1.0%–14.3%)*
% of population, ages 18-34	2.0% (−3.2%–7.4%)	1.4% (−6.1%–9.6%)	2.8% (0.0%–5.7%)*
Aggravated assault rate	9.5% (2.5%–17.0%)**	10.9% (2.5%–20.1%)*	6.8% (−0.9%–15.2%)
Robbery rate	35.7% (29.8%–41.9%)***	42.5% (33.6%–51.9%)***	26.1% (22.0%–30.3%)***
South[a]	23.2% (17.8%–28.8%)***	38.4% (33.4%–43.6%)***	1.5% (−5.7%–9.2%)
Per capita alcohol consumption	−5.8% (−10.7%–−0.6%)*	−6.9% (−13.1%–−0.3%)[1]*	−4.4% (−9.3%–0.9%)**

Values derived from rate ratios computed using negative binomial regression.
States with firearm prevalence more than one standard deviation above the mean: Alabama, Arkansas, West Virginia, Mississippi, South Dakota, Idaho, Alaska, Montana, Wyoming.
States with firearm prevalence more than one standard deviation below the mean: Hawaii, Massachusetts, Rhode Island, New Jersey, Connecticut, New York, Illinois, California, Maryland
*$P<0.05$;
**$P<0.01$;
***$P<0.001$.
[a]Because South is a binary variable, rate ratios refer to Southern vs. non-Southern census region location.

association between firearm prevalence and homicide victimization in our study was driven by gun-related homicide victimization rates; non-gun-related victimization rates were not significantly associated with rates of firearm ownership. This result held overall, for women and for men, and across age groups, consistent with previous ecologic work that relied on a proxy measure for household firearm ownership rather than direct survey estimates (Miller et al., 2002).

Consistent with findings from individual-level studies that found household firearm ownership was associated with lethal victimization of women (Bailey et al., 1997b; Wintemute, Parham, Beaumont, Wright, & Drake, 1999) and with studies that found a gun in the home was a risk factor for homicides in the home perpetrated by family members, intimates or acquaintances (Kellermann et al., 1993), we found that household firearm prevalence was associated with firearm homicide victimization of women in unadjusted as well as in multivariate analyses. Our finding from *unadjusted* analyses that women (but not men) appear to be at increased risk of homicide victimization from household firearms suggests that household guns may play a more direct role in femicides than in homicide involving male victims. Although direct information about the location of lethal shootings and the source of firearms used in homicides do not exist for our national data set, prior work on the distribution of homicide location by gender is consistent with this possibility. For example, findings from the Chicago Homicide Dataset (Block, 1987), found that more than half of all female homicide victims but fewer than a quarter of all male homicide victims were killed in a home.

Young adult males are often killed by other young adult males and are more often killed in the street than are other homicide victims (Block, 1987). Three possible mechanisms may help explain why state-level household firearm prevalence is associated with homicide victimization of young adult males in our multivariate analyses. First, states with high rates of gun ownership tend to have less stringent regulations of firearm sales (Brady Campaign to Prevent Gun Violence, 2006), perhaps making it easier to obtain guns from a variety of street sources. Second, theft in states with high levels of gun ownership may be more likely to result in a ready source of illegal firearms. And third, altercations that escalate to physical violence may be more likely to prove fatal when firearms, including household firearms, are present.

In our analyses we have the advantage of being able to use survey measures of household firearm ownership. However, because our firearm prevalence estimates come from a survey of adults we do not have direct information about firearms that

minors may have in the home that are not known to their parents. In addition the BRFSS firearm question does not provide potentially important information about many characteristics of firearm availability that may be related to the rate of homicide. For example, our measure does not differentiate handguns from long guns, or provide information on the number of firearms in gun owning households, the caliber of gun(s), or the ease with which firearms can be obtained in secondary market transfers.

Our study does not establish a causal relationship between guns and homicide. It is possible that a non-causal relationship explains our findings or that the association we observe might have arisen because individuals in states with historically high homicide rates acquired more guns (than did individuals in low-homicide states), as a defensive response to actual high homicide rates in their communities (i.e. "reverse causation"). This broad notion of reverse causation, while consistent with our association between household firearms and firearm and overall homicide, does not explain why firearm ownership is *not* also significantly associated with rates of non-firearm homicide. Furthermore, rates of robbery and aggravated assault are not associated with household firearm prevalence, even after controlling for urbanization and resource deprivation (not shown). Since individuals who obtain firearms in an attempt to protect themselves from violence plausibly respond to non-fatal violence (which is far more common than fatal violence), the lack of association between firearm prevalence and non-lethal violent crime militates against reverse causation as an adequate explanation for our findings. In addition, although several studies have documented that individuals obtain firearms for various reasons, including self-defense, almost nothing is known about whether the specific perceptions that motivate individuals to acquire firearms for self-defense have any relationship to actual homicide rates, overall or for any group.(-Azrael, Miller, & Hemenway, 2000; Hemenway, 2004; Hemenway, Solnick, & Azrael, 1995; Howard, Webster, & Vernick, 1999; Senturia, Christoffel, & Donovan, 1994; Smith, 1998; Webster, Wilson, Duggan, & Pakula, 1992).

Consistent with previous work, we found that homicide rates were higher in areas with higher rates of urbanization (Parker & Smith, 1979), robbery (Baker, O'Neill, Ginsburg, & Li, 1992; Fingerhut et al., 1992; Hsieh & Pugh, 1993; Parker & Pruitt, 2000) and resource deprivation (Land et al., 1990); like others we also find that homicide rates are higher in the South (Gastil, 1971; Huff-Corzine et al., 1986; Land et al., 1990).

A limitation of the study is that other factors not included in the analyses may affect homicide rates. In addition, the measures for the control variables that we do use are only approximations (e.g. rates of aggravated assault come from police reports which generally underreport actual incidence) and represent aggregate, not individual-level information about our dependent and independent variables.

Our aggregate measures avoid the case–control problem of recall bias (e.g. cases being more likely to recall a firearm in the home than for controls), but this advantage comes at the possible interpretative cost of assuming group-level associations reflect individual risk factors (i.e. the ecologic fallacy) (Piantadosi, 1994). Nevertheless, our results accord with finding from prior individual-level studies (Bailey et al., 1997b; Kellermann et al., 1993; Wintemute et al., 1999).

Although we do not know whether the firearm used in a given homicide came from the victim's home, our results do not strictly require this interpretation; our results are also consistent with the possibility that the ease with which firearms may be obtained by potential perpetrators of homicide is related to the local prevalence of household firearms. For some types of homicide victimization this may reflect the use of guns from the victim's home, as might be the case in intimate partner homicides. For other types of homicide victimization, as might characterize a large proportion of inner city youth homicide, this may reflect the use of guns obtained through local burglaries. Unfortunately, our group-level data do not allow examination of these speculations.

Our study has additional limitations. Firearm prevalence data for this study comes from 2001, whereas mortality data are state-level aggregates over the 3-years 2001–2003. Although our outcome data (homicide) do not precede our exposure data, we nevertheless use household firearm measures from 2001 to assess homicide not only in 2001, but in 2002 and 2003. The effect of this temporal discrepancy on our results is likely to be small since guns are highly durable. In fact, the correlation coefficient relating state level household firearm ownership from the BRFSS in 2001 compared to 2002 is 0.99. Other studies have shown that the cross sectional pattern of household firearm ownership

tends to be quite constant over longer time periods as well (Azrael, Cook, & Miller, 2004). Moreover, the pattern of association between household firearm prevalence and homicide we present using aggregate mortality data (2001–2003) is very similar to the pattern when outcome data are limited to any one of these years (not shown), though subgroup analyses are limited due to small numbers in some subgroups.

Despite these limitations, our cross-sectional finding that household firearm prevalence is a risk factor for homicide victimization of Americans is consistent with many previous studies, as summarized in a recent review (Hepburn & Hemenway, 2004). Our findings that household firearm ownership rates are related to firearm and overall homicide rates, but not to non-firearm homicide rates, for women, children and men of all ages, even after controlling for several potential confounders previously identified in the literature, suggests that household firearms are a direct and an indirect source of firearms used to kill Americans both in their homes and on their streets.

Acknowledgement

This study was supported by the Joyce Foundation.

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