

The Association Between Presence of Children in the Home and Firearm-Ownership and -Storage Practices

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ABSTRACT. *Objective.* American children's ready access to firearms contributes to high rates of firearm-related injuries. Understanding the factors that influence storage decisions is critical for prevention. This study examined the influence of geography and presence of children <16 years old in the home on firearm-ownership and storage decisions of northeast-Ohio residents.

Methods. Analysis was based on 522 responses to randomized telephone surveys of urban and rural households in northeast Ohio. Relationships between 4 dependent variables (firearm ownership, type of firearm owned, reasons for owning, and storage) and 2 independent variables (geography and presence of children in the home) were evaluated using odds ratios and multinomial logistic regression.

Results. Firearms were significantly more common in rural (31%) than in urban (13%) households. Twenty-two percent of gun owners reported securing all firearms with trigger locks or storing them in locked safes, drawers, or gun cabinets; 12% reported storing guns unlocked and either loaded or together with ammunition. Most gun owners (66%) reported storing all firearms unlocked, unloaded, and separate from ammunition. Rural respondents without children were approximately twice as likely as those with children to have handguns, but children did not influence long-gun ownership. In the urban group, the presence of children was not related to likelihood of firearm ownership. Having children in the home was not significantly associated with higher rates of safe storage for either group.

Discussion. These results illustrate the inadequacy of 1-size-fits-all interventions and highlight the need to better understand gun owners' reasoning about children and guns to design and implement successful interventions. Physicians and others interested in reducing pediatric exposure to firearms cannot be credible messengers on gun-safety topics if they cannot demonstrate an understanding of the issues from the perspective of patients and their families. *Pediatrics* 2005;115:e38–e43. URL: www.pediatrics.org/cgi/doi/10.1542/peds.2004-1105; *child safety, family environment, firearms, injury prevention and control, parental attitudes.*

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ABBREVIATIONS. OR, odds ratio; CI, confidence interval.

Firearms are the third leading cause of death for American children 5 to 16 years old, exceeded only by motor vehicle traffic-related causes and malignant neoplasms. In 2002, 920 children in this age group were killed, and 3758 were injured by firearms.¹ American children's ready access to firearms contributes to their high rates of firearm-related injuries, both intentional and unintentional.^{2–5} Firearms in the home are the source of a majority of unintentional firearm injuries to children, as well as suicides and school-associated homicides.^{6–9}

Estimates of American gun-ownership rates are primarily based on responses to telephone surveys, a practice validated by several studies.^{10–12} Although ~40% of all American homes are believed to contain at least 1 firearm, estimates of firearm prevalence in homes with children are generally ~33%.^{13–20} However, research has documented significant regional differences in firearm-ownership rates, with rural households being more likely to have guns than urban households and residents of southern states having higher gun-ownership rates than those from other parts of the country.^{13,21–24} The majority of both intentional and unintentional firearm fatalities and injuries result from handgun use.^{25–28} Although gun ownership is highest in rural households, rural gun owners are more likely to report owning long guns for hunting and recreational purposes, rather than handguns, which are generally kept for self-protection or home defense.^{22,24} Although intentional firearm mortality and morbidity is highest in poor, inner-city areas, low-income urban minorities have the lowest reported rates of gun ownership.^{17,22}

Surveys generally find that only half of individuals who have firearms in their homes report making an effort to make guns inaccessible by securing them with trigger locks or storing them in locked safes, drawers, or cabinets.^{13,15} For respondents with children <18 years old in their homes, estimates of the proportion of homes in which firearms are stored locked or locked up range from 39% to 65%.^{17,29} Parents' firearm-storage decisions may be based in part on unrealistic expectations about children's developmental levels. One survey of households with children 5 to 15 years old found that nearly 90% of parents and caregivers reported believing that their children could be trusted not to touch or play with firearms they found.³⁰ In stark contrast to parental expectations, controlled investigations have demon-

strated that most children will readily handle a firearm, given the opportunity, regardless of how much previous gun-safety education they have received.^{31–33} Likewise, previous gun-safety training for adults does not seem to have a positive correlation with likelihood of safe storage of firearms: a study of gun owners in 1 rural midwestern area found that respondents who had taken a firearm-safety course were twice as likely to keep guns loaded and unlocked as those who had not received such education.²⁴

Given the prevalence of firearms in American homes with children and the dangers of giving children ready access to firearms, understanding the factors that influence storage decisions is a critical part of preventing pediatric firearm injuries. Studies of gun ownership and storage in homes with children have generally focused on the subset of households with children rather than examining differences in homes with and without children.^{14,16,17,23} For clinical and public health professionals interested in minimizing children's exposure to risk of intentional or unintentional firearm violence, it is important to understand how the presence of children influences individuals' decisions regarding ownership and storage of firearms. This study focuses on comparison of gun ownership and storage in homes with and without children in 1 clearly defined geographic region in the US Midwest, exploring the relationship between the presence of children in the home and gun ownership and storage for urban and rural residents of northeast Ohio.

METHODS

Analysis was based on a subset of responses to 2 institutional review board–approved telephone surveys of urban and rural households in northeast Ohio that addressed a broad range of gun-safety topics. The first survey was conducted in 2001 and sampled 400 urban and 400 rural households with children <16 years old, and the second survey was conducted in 2002 and sampled 800 (400 urban and 400 rural) households without children. The urban group consisted of residents of Cleveland and East Cleveland, Ohio, and the rural group comprised residents of Concord and Madison Townships, which lie to the east of the greater Cleveland metropolitan area and beyond the outer ring of suburbs (rural is used here as a reflection of population size, population density, accessibility, and level of urbanization, not as a description of predominantly agricultural land use).

Demographics of the 2 groups were representative of urban/rural population dynamics in this area: the urban survey drew from a parent population that was predominantly black (60%), with a significant white minority (34%), whereas the rural survey drew from a parent population that was almost exclusively white (98%). Because no other ethnic group comprised >3% of either sample, only black and white race were considered when analyzing the relationship of ethnicity to other variables.

For each survey, a list of 4000 telephone numbers in each of the identified areas (rural/urban) of homes either likely or unlikely to have children <16 years old was obtained by an independent market research firm. Within this survey frame, calls were randomized by dialing numbers from the lists on a 10th-name basis until the desired number of responses had been obtained for each group. Respondents had to be ≥18 years old to participate. Phones were either unanswered or disconnected for the majority of attempted calls (~70%). An average of 7 calls were made for each completed survey obtained, with ineligibility rates averaging 6% and refusal rates averaging 11%.

Analysis was based on answers to 1 question asked of all respondents ("Is there currently a gun in your home?") and 4 questions asked of respondents who indicated having ≥1 firearm

in their homes ("What kind(s) of firearm(s) do you have in your home?"; "Who is the owner of the firearm?"; "What are your reasons for having a gun?"; and "How is the gun currently stored?"). Gun-owning respondents who reported not having children were asked whether having children in the home would affect ownership or storage decisions. For analysis, firearms were categorized as handguns, long guns, and other (antiques, unknown, etc). Reasons for gun ownership were categorized as self-defense, hunting/sport, and other (job related, inherited, no reason, etc).

Cases were omitted from analysis if the respondent reported not knowing whether there was a firearm in the home, reported the presence of a gun in the home but was unable to provide details about firearm type or storage, or declined to provide demographic information. Because of large differences across age strata in likelihood of having children in the home and generational differences in firearm-related attitudes and practices, analysis was restricted to responses from the 25- to 44-year-old age cohort to ensure comparability. Relationships between the 4 dependent gun-related variables (firearm ownership, type of firearm owned, reasons for owning, and storage) and 2 independent variables (geography and presence of children in the home) were evaluated by using χ^2 testing and odds ratios (ORs). Multinomial logistic regression was used to examine the relationship between dependent variables and the presence of children in the home while controlling for geography. Data were analyzed with SPSS 12.0 (SPSS Inc, Chicago, IL), with significance defined as $P < .05$.

RESULTS

A total of 1600 people were interviewed (800 urban and 800 rural). Nearly one third (525) of records were omitted from analysis because respondents did not know whether there were firearms in their homes or declined to answer questions about gun ownership, age, race, income range, or highest education level attained. From the 1075 interviews remaining (523 from urban respondents and 552 from rural respondents), the data set was winnowed further to those respondents between 25 and 44 years old. Analysis was based on a total of 522 records (238 from the urban group and 284 from the rural group). Even after exclusions, both survey groups (urban and rural) met sample-size requirements for validity of estimates based on population size in this age group and a desired confidence level of 95%.

Gender was the only demographic the urban and rural groups shared in common: in both groups, two thirds of respondents were female. Rural respondents were almost exclusively white (99%), were more likely than urban respondents to be married (84% vs 46%), and reported higher education (average of 2-year college degree) and income (average of \$45 000–\$54 999 per year) levels than their urban counterparts. In comparison, 63% of urban respondents were black, the average education level was a high school diploma or general equivalency diploma, and the average household income range was \$35 000 to \$44 999 per year. Rural respondents were almost twice as likely as urban respondents to have children in the home (OR: 1.865; 95% confidence interval [CI]: 1.235, 2.818), reflecting the lower average age of urban respondents (46% were 25–34 years old, compared with 37% of rural respondents) and significant differences in respondents' marital status.

Aggregate Data

Table 1 provides frequencies of gun-ownership and -storage variables. Of 522 respondents, 117 (22%)

TABLE 1. Frequency of Gun-Ownership and -Storage Variables in the Survey Population and Its Subgroups

Variable	<i>n</i> = 522	With Children <16 y (<i>n</i> = 402)	Without Children (<i>n</i> = 120)	Urban (<i>n</i> = 238)	Rural (<i>n</i> = 284)
Firearms in the home	22.4% (117)	20% (82)	29% (35)	13% (30)	31% (87)
Handguns in the home	12% (61)	9.5% (38)	19.2% (23)	10% (24)	13% (37)
Firearms for self-defense	7% (35)	5% (20)	12.5% (15)	7% (17)	6% (18)
Long guns in the home	14.5% (75)	15% (58)	14% (17)	3% (8)	24% (67)
Firearms for hunting/sport	13% (68)	13% (53)	12.5% (15)	3% (7)	20% (61)
Subnumber of firearm owners	117	82	35	30	87
Stores all guns locked/locked up	22% (26)	20% (16)	29% (10)	30% (9)	20% (17)
Stores all locked, separate from ammo	8% (9)	6% (5)	11% (4)	0	10% (9)
Stores any unloaded	78% (91)	80% (66)	71% (25)	70% (21)	80% (70)
Any loaded	.8% (1)	0	3% (1)	3% (1)	0
Any with ammo	11% (13)	4% (3)	29% (10)	13% (4)	10% (9)
All separate from ammo	66% (77)	77% (63)	40% (14)	53% (16)	70% (61)

TABLE 2. ORs With 95% CIs for Gun-Ownership and -Storage Variables for Subgroups of the Survey Population

Variable	Population	Subgroup	OR	95% CI
Has children in the home	Rural vs urban		1.8653*	1.2347, 2.8179
Has a firearm in the home			3.0619*	1.9360, 4.8430
Has a handgun			1.3357	0.7742, 2.3043
Has a long gun			9.0861*	4.2640, 19.3616
Stores all locked or locked up			0.5667	0.2205, 1.4561
Has a firearm for self-defense			0.8797	0.4428, 1.7477
Has a firearm for hunting/sport			9.0269*	4.0418, 20.1605
Has a firearm in the home	Respondents without children vs those with children		1.6069*	1.0120, 2.5515
Has a handgun			2.2713*	1.2920, 3.9929
Has a long gun			0.9647	0.5381, 1.7295
Stores all locked or locked up			1.65	0.6612, 4.1172
Has a firearm for self-defense			2.7286*	1.3503, 5.5136
Has a firearm for hunting/sport			0.9407	0.5094, 1.7371
Has a firearm in the home	Respondents without children vs those with children	Urban	2.0756	0.9473, 4.5481
Has a handgun		Rural	1.9607*	1.0508, 3.6585
		Urban	2.2759	0.9653, 5.3657
Has a long gun		Rural	2.56*	1.1870, 5.5213
		Urban	NA	Small <i>n</i>
Stores all locked or locked up		Rural	1.4103	0.7165, 2.7757
		Urban	2.0313	0.4173, 9.8167
		Rural	1.299	0.4001, 4.2177
Stores all locked or locked up	Respondents with children vs those without, controlling for geography		0.657	0.259, 1.669

NA indicates not available.

* Significant differences.

reported having firearms in their homes. Half of them described themselves as the firearms' owner (60 of 117); the remainder attributed ownership to spouses (44%) or other family members (5%). As expected, firearms were significantly more common in rural households (31%) than in urban households (13%). Of 117 respondents who had firearms in their homes, only 8% (9) stored firearms in the manner recommended to best reduce pediatric exposure: locked or locked up, unloaded, and separate from ammunition. Because the small number of respondents who reported optimal storage methods precluded more detailed analysis, safe storage was defined for the purposes of this study as being locked with a trigger lock or kept in a locked safe, locked drawer, or locked gun cabinet. Under this definition, 22% of gun owners (26) reported storing all firearms in the household safely. Only 1 gun owner specifically reported storing at least 1 gun loaded and unloaded, whereas 11% reported storing loaded guns

locked or locked up. Another 11% of respondents reported storing guns unloaded and unloaded but together with ammunition.

Association Between the Presence of Children in the Home and Gun Ownership and Storage

Seventy-seven percent of respondents reported having children <16 years old in their households. Table 2 lists ORs for various gun-ownership and -storage variables for subgroups of the survey sample. Respondents who did not have children had 1.6 times the odds of having guns in their homes as those with children: 20% of respondents with children reported having at least 1 firearm, whereas 29% of those without children reported having guns in the home. The presence of children in the home was not significantly associated with higher rates of safe storage: 20% of gun-owning respondents who had children reported storing guns locked or locked up, compared with 29% of those without children. Even

after controlling for geography, the presence of children in the home did not increase the odds that firearm owners would store guns safely.

Gun-owning respondents without children in their homes ($n = 35$) were asked if the presence of children would affect their decision-making. Twenty-three percent of urban respondents (3 of 13) and 14% of rural respondents (3 of 22) said children would influence the decision to have firearms in the home. Rural respondents (23%) were significantly less likely than their urban counterparts (61%) to report that having children in the home would affect their storage decisions (OR: 0.1838; 95% CI: 0.0411–0.8219).

Association Between Geography, Gun Ownership, and Storage and the Presence of Children in the Home

Rural respondents were 3 times more likely than urban respondents to report having firearms of any kind and were 9 times as likely to have long guns or to have guns for hunting or sport. Thirty-one percent of rural respondents and 13% of urban respondents reported having ≥ 1 firearm in their homes. Twenty-four percent of rural respondents reported having at least 1 long gun, compared with 3% of urban respondents. There were no significant differences between the rural and urban groups in the proportion of respondents who reported having handguns in the home (10% urban, 13% rural) or having guns for self-defense (7% urban, 6% rural). The 2 groups also reported similar rates of safe storage; 30% of urban respondents and 20% of rural respondents reported storing all guns either locked with a trigger lock or locked up in a safe, drawer, or gun cabinet. None of the urban gun owners reported storing all firearms in the safest manner, both locked or locked up and separate from ammunition; 10% of rural firearm owners reported this storage method for all firearms in the home.

Additionally, analysis focused on whether there were any geographic differences in the association between the presence of children in the household and ownership or storage decisions. In the rural group, respondents without children were twice as likely as those with children to report having guns in general and 2.5 times as likely to report having handguns in particular. The presence of children in the home did not influence rates of long-gun ownership in rural households. In the urban group, the presence of children in the home was not related to likelihood of having a firearm in general or a handgun in particular, and rates of long-gun ownership (8 of 238 respondents) were too low to allow for valid significance testing. Having children in the home did not increase the likelihood that all firearms in the home would be locked or locked up in either geographic group.

DISCUSSION

Limitations

Restricting analysis to records from respondents between 25 and 44 years old significantly reduced the sample size, although the number of households surveyed was sufficient to obtain a 95% confidence

level for estimates. Limitation of analysis to this age group was necessary to increase the validity of results by controlling for likelihood of having children and for generational differences in firearm-related attitudes and practices.

Because of the makeup of the study sample, with its preponderance of female respondents, this study may underestimate rates of firearm ownership in this population, because male respondents are more likely to report having firearms in the home than female respondents.³⁴ Additionally, not everyone who reports having a firearm in the home is the owner or primary user of the gun. Respondents who reported the presence of firearms in their homes were asked to describe their relationships to the guns' owners, with approximately half (51%) of the respondents claiming ownership of firearms in their homes. Respondents who attributed gun ownership to other household members were not asked if they ever used the firearms. Thus, although safe storage was reported by less than one fourth of respondents with firearms in their homes, the true rate may be even lower, because relying on storage information provided by nonusers may lead to overreporting of safe storage.^{35,36} Finally, respondents were asked about how the guns were stored at the time of the interview but were not asked if they ever stored guns loaded. These survey results thus provide a snapshot of ownership and storage at 1 point in time.

Principal Findings

Twenty percent of respondents with children < 16 years old reported having firearms in their homes, compared with 29% of those without children. Only 20% of 82 respondents with children who had firearms reported storing all guns locked or locked up; this number is lower than some estimates based on other studies of firearm ownership in homes with children but are in keeping with wide geographic variation in rates of ownership and safe storage.^{13,14,16,17,23,24,29} An even smaller percentage (6%) stored guns in the manner that best minimizes pediatric exposure: unloaded, locked or locked up, and separate from ammunition. Although only 1 of 117 respondents with firearms in their homes specifically reported storing at least 1 firearm loaded and unlocked, storing unlocked firearms unloaded but together with ammunition is essentially no different from storing firearms loaded and unlocked. Children had easy access to both guns and ammunition in 4% of gun-owning households surveyed, and firearms were readily accessible in more than three fourths of the homes with children. Although many parents reported storing ammunition separately from unlocked firearms, children are curious and resourceful and are often aware of exactly where guns and ammunition are located in their homes. Additionally, a child's possession of a firearm has the potential for tragic consequences, even if the gun is unloaded, because police, security guards, armed peers, or others who are confronted with a weapon displayed by a child or teenager have no way of knowing whether the firearm is loaded.

Aggregating data from urban and rural surveys

did not provide an accurate picture of ownership in either community, but few geographic differences existed in storage patterns for those who did have firearms. In keeping with results of similar studies, firearm ownership in general and long-gun ownership in particular were higher in rural households. Thirty-one percent of rural households contained at least 1 firearm, compared with 13% of urban households. Twenty-four percent of rural respondents reported having at least 1 long gun, and 13% had handguns. Ten percent of all urban households contained at least 1 handgun, whereas only 3% contained a long gun. There were no significant differences between urban and rural respondents in the proportion of gun owners who stored guns safely (locked or locked up). Rural respondents with children were half as likely as those without children to have any firearms in their homes or to have handguns, but the presence of children did not affect long-gun ownership rates. For urban respondents, on the other hand, having children in the home did not decrease the likelihood of firearm ownership. Regardless of geography, however, respondents who had children in their homes were no more likely to report storing firearms safely than those without children. Controlling for the influence of geography, the presence of children was negatively associated with having any firearms and having handguns but was not associated with having long guns or storing guns safely.

Implications for Prevention

For pediatricians, health care professionals, and public health personnel interested in reducing pediatric exposure to firearms, understanding geographic differences in types of firearms owned, reasons for having guns, and common storage methods are important underpinnings of any intervention effort, as is an understanding of how the presence of children influences individuals' firearm-ownership and -storage decisions. Although telephone surveys such as the one described here provide information regarding the strength and direction of associations between presence of children in the home and likelihood of gun ownership and safe storage, they do not offer insight into the thought processes that underlie these associations. Surveys such as this can be used to identify areas for additional investigation in the effort to design effective interventions. More detailed, in-person interviews with gun owners could be used in subsequent studies to expand our understanding of the associations identified in surveys.

The results of this study illustrate the inadequacy of 1-size-fits-all interventions. For rural respondents, the presence of children in the home was associated with lower rates of firearm ownership in general, and handgun ownership in particular, but was not associated with rates of long-gun ownership. These results indicate that rural residents of northeast Ohio think differently about having guns in homes with children based on the type of firearm in question. Future surveys or interviews with rural residents could be used to examine differences in attitudes and beliefs about long guns and handguns in relation to children. For example, if rural residents view long-

gun ownership as more of a social experience, one that can be shared with children, the approach to reducing pediatric exposure will be much different from that which would be used for individuals who view firearms as something from which children must be protected.

For urban respondents, on the other hand, having children did not affect the likelihood of having firearms in the home regardless of firearm type. Firearms in urban homes were primarily handguns kept for defensive purposes, indicating that public health approaches to decreasing pediatric exposure and increasing safe storage in greater Cleveland and similar urban areas should focus on handgun ownership and more deeply examine the cultural beliefs and social norms that make firearm ownership as common in homes with children as in those without.

Regardless of geography, the presence of children in the home was not associated with safer storage of firearms. These troubling findings highlight the urgent need to better understand gun owners' reasoning about children and guns to design and implement successful interventions. Focused, in-depth interviews with gun owners who have children in their homes is a logical next step in teasing out the intersection between parental beliefs about children's developmental levels and ability or inability to resist the temptation to handle firearms, parents' personal definitions of safe storage, and the actual storage decisions they make. This information is vital to physicians and others interested in reducing pediatric exposure to firearms: physicians cannot be credible messengers on gun-safety topics if they cannot demonstrate an understanding of the issues from the perspective of patients and their families and craft their messages accordingly.

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The Association Between Presence of Children in the Home and Firearm-Ownership and -Storage Practices

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