

Children and Firearms in the Home: A Southwestern Ohio Ambulatory Research Network (SOAR-Net) Study

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Background: To ascertain the prevalence of gun ownership, gun safety education, and parental attitudes on gun counseling in a Midwestern sample.

Methods: Parents seeking care at participating practices in the Southwestern Ohio Ambulatory Research Network were recruited to complete a survey about gun ownership, gun safety education, and gun counseling attitudes. Attitudes and beliefs were compared between gun owners and non-gun owners.

Results: Twenty-four percent of respondents had at least 1 gun in the home. Military families were more likely to own a gun than civilian families (28% vs 18%, $P = .001$). Fifty-two percent of sample children have received gun safety education. Eight percent indicated that a physician had asked about guns or discussed gun safety issues during an office visit. A majority of parents indicated that physicians should ask about guns in the home (69%) and advise parents on safe storage (75%), but they should not advise parents to remove guns from the home (12% of gun owners, 42% of non-gun owners).

Conclusions: Despite the morbidity and mortality associated with guns, physicians in this study do not seem to be addressing this risk with families. A majority of gun owners do not agree that physicians should counsel the removal of guns from the home but agree that they should discuss safe gun storage information. (J Am Board Fam Med 2007;20:385–391.)

There are approximately 30,000 firearm-related deaths each year in the United States, 4000 of which are children.^{1–4} Although the exact number of injuries by firearms is difficult to determine, it is estimated that for each gun-related death, 4 to 7 people seek care in an emergency department for a firearm-related injury.^{2–4} In addition to the cost in lives, the economic costs have been estimated at \$100 billion per year, with \$1 billion per year in direct medical costs.^{4,5}

Approximately 18% to 54% of all households in the United States have at least 1 gun in the home.^{6–17} It is estimated that 26% to 61% of fire-

arms are stored either unlocked or loaded and that as many as 7% to 16% are stored both unlocked and loaded.^{4,6,8,12–15,17–20} A 2002 national study reported that in households with children <18 years old, 5.5% had loaded household firearms and 2.5% had firearms that were both loaded and unlocked.²¹ The American Academy of Family Physicians recommends firearm education for families in homes with weapons and supports legislation that requires firearms to be stored locked and unloaded.²² The American Academy of Pediatrics (AAP) recommends that guns be removed from the home if possible, or, at the very least, stored safely (locked and unloaded).⁴ The AAP also recommends that physicians counsel families about the risks of gun ownership. Only 8% to 11% of parents report having spoken to their child's physician about guns.^{13,15,23} Many parents state that they would not be offended if a physician brought up the topic of gun safety, and most believe it would be appropriate for a physician to do so.^{15,16}

The objectives of this study were to determine reported prevalence of gun ownership in homes with children, rates of gun safety education, and

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attitudes about whether physicians should counsel on gun safety in a sample of families from a practice-based research network from the Midwestern region of the United States. We tested the hypothesis that parents who did not own guns would be more likely to agree that physicians should counsel parents on gun safety as compared with parents who owned guns.

Methods

Study Participants

This cross-sectional study was completed using convenience samples of parents visiting the primary care pediatric clinic at Wright-Patterson Air Force Base and 15 physicians from 8 community practices; all military and civilian participating sites are members of the Southwestern Ohio Ambulatory Research Network. At the Wright-Patterson Air Force Base clinic, 89% of pediatric patients were white, 9% were African-American, and 2% were another race. Four percent of patients were Hispanic. One hundred percent of patients were covered by private insurance; no patients were enrolled in Medicaid. In the 8 civilian practices, 60% of patients were white, 35% African-American, 5% were of another race, and 3% were Hispanic. Fifty-nine percent of patients were enrolled in Medicaid, 33% had private insurance, and 8% were self-pay or other.

Surveys were distributed between December 2002 and June 2004 to parents of children ≤ 18 years old at the time of the clinic visit. Each of the 15 civilian physicians distributed 30 to 35 surveys. All of the surveys were numbered to allow the investigators to track their distribution and return. Parents were informed that the survey was anonymous and that their willingness to complete it would not affect their care at the clinic. The clinical investigations committee at Wright-Patterson Medical Center and the Institutional Review Board of The Children's Medical Center of Dayton, OH, reviewed and approved the study protocols.

Survey Instrument

The survey was a single double-sided sheet with questions that addressed 4 categories: (1) demographic data about the family, including the respondent's relation to the child, age, education level, and number of adults in the home; (2) the number of children in the home and, for the child

having the clinic visit (index child), the child's age and gender, and information about gun safety education; (3) whether guns were present in the home or the homes where the child visits and whether the parent knew a child hurt by a gun; and (4) whether a physician had ever addressed firearms with the family and whether the respondent feels it is appropriate for a physician to do so. Three specific questions related to the appropriateness of physician counseling were asked: (1) Should doctors ask about guns in the home? (2) Should doctors advise parents about safe gun storage? and (3) Should doctors advise parents to remove guns from the home? The survey was a study-generated instrument and was pilot tested at a civilian site before use.

Data Analyses

All categorical data are presented as the percentage of nonmissing data for a variable. Continuous data are presented as the mean \pm SD. Bivariate analyses comparing demographics, gun safety, and physician gun safety counseling between non-gun owners and gun owners were performed with χ^2 or Fisher's exact tests for categorical variables and two-sample *t* tests for continuous variables. Appropriateness of physician gun counseling was also compared between demographic variables that were found to be significantly different between non-gun owners and gun owners. Rates of gun ownership, demographics, and physician gun safety counseling were determined for each of the 9 practices and compared between practices with χ^2 or Fisher's exact tests or one-way analysis of variance.

Multilevel logistic regression analyses were performed to determine the associations between gun ownership and responses to gun safety counseling questions after adjusting for differences between practices and significant demographic variables. Gun ownership and other demographic variables were included in each model as level-one predictors with fixed effects, and practice was entered as the level-two variable with a random effect. Age was centered on the grand mean for each model. Adjusted odds ratios with 95% confidence intervals were determined for each level-one predictor. The intraclass correlation, a measure of the degree of dependence of the outcomes on characteristics shared by parents within practices, was estimated using the latent variable method described by Snijders and Bosker.²⁴ All bivariate analyses were

Table 1. Comparison of Characteristics of Non-Gun Owners and Gun Owners

Characteristic	All Respondents (n = 951)	Non-Gun Owners (n = 727)	Gun Owners (n = 224)	P
Respondent's relation to child [n (%)]				.112
Mother	727 (77)	565 (78)	162 (72)	
Father	171 (18)	120 (17)	51 (23)	
Other	48 (5)	37 (5)	11 (5)	
Respondent's education [n (%)]				.005
≤High school	225 (28)	186 (31)	39 (20)	
>High school	577 (72)	422 (69)	155 (80)	
Single-parent household [n (% yes)]	204 (22)	190 (26)	14 (6)	<.001
Child's gender [n (% male)]	500 (53)	387 (54)	113 (51)	.445
Respondent's age (mean ± SD)	35 ± 9 (n = 813)	34 ± 9 (n = 620)	37 ± 7 (n = 193)	<.001
Child's age (mean ± SD)	7.3 ± 5.3 (n = 926)	7.2 ± 5.4 (n = 706)	7.8 ± 4.9 (n = 220)	.120
Number of children in the home (mean ± SD)	2.2 ± 1.1 (n = 936)	2.2 ± 1.1 (n = 712)	2.2 ± 1.2 (n = 224)	.652

Percentages in the table are the percentages of nonmissing responses for each variable. *P* values for categorical variables are from χ^2 tests; *P* values for continuous variables are from two-sample *t* tests.

performed with SAS version 9.1 (SAS Institute, Cary, NC), and multilevel analyses were performed with HLM version 6.0 (Scientific Software International, Lincolnwood, IL).²⁵

Results

A total of 951 completed surveys were analyzed; 500 were from the pediatric practice at the local air force base and 451 were from the 8 civilian practices in the Southwestern Ohio Ambulatory Research Network. For the military practice, 854 surveys were distributed, of which 614 (72%) were returned. Twenty-eight of the 854 were refused by the parent, 212 were accepted but not returned, 28 were returned blank, 82 were too incomplete to analyze, and 4 were excluded because they were completed by a child. For the civilian practices, 478 surveys were distributed, of which 461 (96%) were returned. Nine surveys were accepted by the parent but not returned, 8 parents refused to participate, and 10 surveys were too incomplete to include in the analyses.

Twenty-four percent (221 of 951) of the parents surveyed stated that there were 1 or more guns in the home (Table 1). Respondents were mostly mothers (77%), and 72% had completed at least some college. There were significant differences in the demographic characteristics of parents who did and did not own guns. Compared with non-gun own-

ers, parent gun owners were older, more likely to have education beyond a high school degree, and less likely to be in a single-parent household (Table 1).

Whether or not a parent owned a gun was significantly associated with how parents responded to questions about gun safety (Table 2). Gun owning parents were less likely to know if there were guns in the homes that their children visit (22% vs 38%, *P* < .001). Children of parents with guns were more likely to have been taught gun safety (66% vs 48%, *P* < .001). Regardless of gun ownership status, children who received gun safety education received it from their parent (88% gun owner vs 89% non-gun owners). In this sample, the percentage of parents who reported that their child's doctor had talked with them about guns was 8% overall, and there was no significant difference between the 2 groups (Table 2).

Overall, the majority of parents felt that physicians should inquire about the presence of guns in the home, although the proportion was significantly higher in non-gun owners compared with gun owners (72% vs 59%, *P* < .001) (Table 3). The majority of parents also agreed that doctors should advise families about safe gun storage, with a significantly higher number of non-gun owners agreeing compared with gun owners (77% vs 69%, *P* = .012). However, when asked if doctors should advise families to remove guns from the home, the percentage of parents who

Table 2. Comparison of Responses to Gun Safety Questions Between Non-Gun Owners and Gun Owners

Question	All Respondents, n (%)	Non-Gun Owners, n (%)	Gun Owners, n (%)	P
Are there guns in the homes where your child visits?				<.001
No	474 (51)	399 (56)	75 (34)	
Yes	215 (23)	153 (22)	62 (28)	
Don't know	243 (26)	157 (22)	86 (38)	
Do you know a child hurt by a gun? [n (% yes)]	107 (11)	84 (12)	23 (10)	.534
Has child been taught gun safety? [n (% yes)]	491 (52)	347 (48)	144 (66)	<.001
If yes, was child taught by parent?	435 (89)	308 (89)	127 (88)	.857
If yes, was child taught by formal course?	48 (10)	30 (9)	18 (13)	.190
Has your child's doctor ever talked to you about guns? [n (% yes)]	74 (8)	51 (7)	23 (10)	.110

Percentages in the table are the percentages of non-missing responses for each question. *P* values are from χ^2 tests.

agreed was much lower, with the larger drop seen for parents with guns in the home (12% gun owners, 42% non-gun owners, $P < .001$).

Parents who reported that physicians should ask about guns in the home were significantly younger than those who did not (34 ± 9 years vs 36 ± 8 years, $P < .001$). Parents who agreed that physicians should provide safe gun storage counseling were also significantly younger (34 ± 8 years vs 37 ± 8 years, $P < .001$) and more likely to be single parents (82% vs 74% of parents in households with 2 or more adults, $P = .018$). When asked whether physicians should counsel parents to remove guns from the home, there was no difference in age between parents who responded that physicians should versus should not counsel. However, parents from single-parent households were more likely to report that doctors should counsel parents to remove guns from the home (47% vs 31%, $P < .001$). Parents with less than or equal to a high school education were more likely to agree that

physicians should advise about gun removal than parents with more than a high school education (45% vs 31%, $P < .001$).

There was wide variation in the rates of gun ownership, age, level of education, and number of participants from single-parent households among the 9 practice sites that were surveyed (Table 4). The results of the multilevel modeling to account for clustering of patients within practices, as well as to adjust for demographic differences between gun owners and non-gun owners, are shown in Table 5. Statistically significant effects of practice were seen for all 3 of the outcome variables, indicating that patients within practices tended to have similar responses. After adjusting for age, education level, and number of adults in the home, non-gun owners were significantly more likely to agree that physicians should ask about guns in the home and advise about removal of guns. However, there was no difference between the 2 groups regarding doctors advising about safe gun storage.

Table 3. Comparison of Responses to Gun Safety Counselling by Physicians Between Non-Gun Owners and Gun Owners

Question	All Respondents, n (% yes)	Non-Gun Owners, n (% yes)	Gun Owners, n (% yes)	P
Should doctors ask parents about the presence of guns in the home?	623 (69)	496 (72)	127 (59)	<.001
Should doctors advise parents on the safest ways to store guns in the home?	676 (75)	529 (77)	147 (69)	.012
Should doctors advise parents to remove guns from the home?	299 (34)	274 (42)	25 (12)	<.001

Percentages in the table are the percentages of nonmissing responses for each question. *P* values are from χ^2 tests.

Table 4. Respondent Characteristics and Attitudes About Physician Gun Counselling Among the Practices Surveyed

Practice (sample size)	Age, mean ± SD (n)	Gun Owners, n (%)	≤High School Education, n (%)	Single-Parent Household, n (%)	n (%) responding yes to:		
					Should doctors ask about guns in home	Should doctors advise about safe storage	Should doctors advise parents to remove guns
1 (500)	36 ± 7 (472)	142 (28)	72 (15)	54 (11)	294 (61)	312 (65)	114 (24)
2 (148)	30 ± 10 (108)	14 (10)	57 (58)	71 (49)	106 (77)	120 (90)	66 (51)
3 (61)	31 ± 13 (46)	6 (10)	32 (71)	26 (43)	44 (82)	46 (87)	24 (56)
4 (30)	32 ± 9 (19)	11 (37)	4 (22)	4 (14)	20 (77)	20 (80)	8 (33)
5 (66)	36 ± 8 (56)	19 (29)	17 (34)	13 (20)	52 (80)	56 (86)	22 (36)
6 (30)	33 ± 9 (20)	2 (7)	5 (33)	16 (53)	15 (56)	23 (85)	11 (42)
7 (57)	30 ± 8 (46)	12 (21)	25 (57)	13 (23)	45 (83)	49 (91)	28 (57)
8 (30)	42 ± 7 (24)	10 (33)	6 (25)	1 (3)	23 (79)	23 (79)	13 (46)
9 (29)	28 ± 8 (22)	8 (28)	7 (32)	6 (21)	24 (86)	27 (96)	13 (50)
<i>P</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001

Values for categorical variables are the number and percent of nonmissing responses.

Discussion

Because of the risk of significant morbidity and mortality associated with guns, the AAP recommends that guns be removed from homes and communities to prevent firearm-related injuries to children.⁴ However, this is a very controversial issue in American culture. This study sheds light on gun ownership, attitudes of parents regarding counseling about guns, and rates of physician counseling about gun safety.

Children and their parents need to be educated about the risks associated with guns and gun ownership; unfortunately, a substantial minority of the study population does not agree that physicians should discuss gun issues. This study suggests that as many as 31% of parents believe that physicians

should not ask about the presence of guns in the home, which is considerably higher than the 6% reported in other studies.¹⁶ The questionnaires returned blank and the non-returned surveys may be a reflection of those not interested in gun safety or to whom gun safety is not relevant.

It is noteworthy that only 8% of the study sample reported that their physician asked about or discussed guns in the home. This is consistent with the reported rates in other studies of 8% to 11%.^{13,15,23} Studies have not consistently demonstrated that counseling parents is an effective method of changing their behaviors regarding gun ownership or storage.^{16–20,26–28} This, coupled with competing counseling priorities and time constraints during well child visits, may preclude op-

Table 5. Estimates for Multilevel Logistic Regression for Attitudes on Gun Safety Counselling as a Function of Individual-Level Variables and Practice

Model Parameter	Should doctors ask about guns in the home? ² (n = 750)	Should doctors advise about safe storage? ² (n = 750)	Should doctors advise parents to remove guns? ² (n = 729)
Level-one fixed effects			
Non-gun owner (reference is gun owner)	1.59 (1.10, 2.31)*	1.19 (0.80, 1.78)	4.90 (3.00, 8.06)†
Age (1-year increase)	0.98 (0.96, 1.00)	0.96 (0.94, 0.98)†	1.01 (0.99, 1.03)
≤High school education (reference is >high school)	0.65 (0.44, 0.97)*	0.40 (0.26, 0.63)†	1.11 (0.75, 1.64)
Single adult in home (reference is ≥2 adults)	1.04 (0.65, 1.67)	1.36 (0.78, 2.35)	1.08 (0.70, 1.66)
Random effects			
Practice-level variance (SD)	0.378 (0.615)†	0.529 (0.727)†	0.287 (0.536)†
ICC	0.103	0.139	0.080

Values are presented as odds ratio (95% confidence interval).

**P* < .05; †*P* < .001.

ICC, intraclass correlation coefficient.

portunities for gun safety counseling. However, in this study, 69% of parents surveyed agreed that doctors should ask about guns and 75% stated that doctors should advise about safe storage of guns. However only 34% reported that doctors should advise parents to remove guns from the home. These data suggest that parents are open to questions about gun ownership and they are more receptive to counseling about safe storage of guns rather than gun removal. Therefore, when engaging a parent in gun counseling, it may be better to discuss safe storage of guns rather than removal. In addition, this survey found that 34% of gun owners do *not* teach gun safety to their children. This is a potential topic for physicians to address during well child visits.

One limitation of this study is the disproportionate number of mothers filling out the survey. Earlier studies have found that the man in a household is more likely to own any weapons in the home and have a better understanding of how they are stored.^{10,29,30} Therefore, the prevalence of gun ownership and the number stored improperly may be even higher than the data from this sample suggest. Another limitation is possible recall bias. Parents may not recall previous discussions regarding gun safety issues.

In conclusion, this study demonstrates that a significant proportion of families have guns in their homes. In contrast, rates of physician counseling about gun safety and gun storage are quite low. Parents agree that physicians should ask questions about gun ownership and provide counseling about safe gun storage rather than removal of a gun from the home. Further research needs to be completed to elucidate effective methods of counseling on gun safety issues during well child visits, and communities should consider public health campaigns to address this issue.

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References

1. Murphy SL. Deaths: Final data for 1998. National vital statistics reports, vol. 48, no. 11. Hyattsville (MD): National Center for Health Statistics; 2000.
2. Fingerhut LA, Christoffel KK. Firearm-related death and injury among children and adolescents. *Future Child.* 2002;12:25–37.
3. Department of Health and Human Services. Web-based Injury Statistics Query and Reporting System (WISQARS). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Atlanta (GA): Centers for Disease Control and Prevention [updated 2007 April 6; cited 2006 July 1]. Available from: <http://www.cdc.gov/ncipc/wisqars>.
4. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Firearm-related injuries affecting the pediatric population. *Pediatrics.* 2000; 105:888–95.
5. Cook PJ, Ludwig J. The costs of gun violence against children. *Future Child.* 2002;12:87–99.
6. Cook PJ, Ludwig J. Guns in America: national survey on private ownership and use of firearms. Research in Brief. Washington, DC: US Department of Justice, National Institute of Justice; 1997.
7. Drongowski RA, Smith SJ, Coran AG, Cullen ML. Firearm ownership in households with children. *J Pediatr Surg.* 1998;33:589–93.
8. Senturia YD, Christoffel KK, Donovan M. Children's household exposure to guns: a pediatric practice-based survey. *Pediatrics.* 1994;93:469–75.
9. Stevens MM, Gaffney CA, Tosteson TD, et al. Children and guns in a well child cohort. *Prev Med.* 2001;32:201–06.
10. Miller M, Azrael D, Hemenway D. Rates of household firearm ownership and homicide across US regions and states, 1988–1997. *Am J Public Health.* 2002;92:1988–93.
11. Swahn MH, Hammig BJ, Ikeda RM. Prevalence of youth access to alcohol or a gun in the home. *Inj Prev.* 2002;8:227–30.
12. Farah MM, Simon HK, Kellermann AL. Firearms in the home: parental perceptions. *Pediatrics.* 1999;104:1059–63.
13. Knight-Bohnhoff K, Harris MB. Parents' behaviors, knowledge, and beliefs related to unintentional firearm injuries among children and youth in the southwest. *J Pediatr Health Care.* 1998;12:139–46.
14. Kellermann AL, Fuqua-Whitley DS, Sampson TR, Lindenmann W. Public opinion about guns in the home. *Inj Prev.* 2000;6:189–94.
15. Becher EC, Christakis NA. Firearm injury prevention counseling: are we missing the mark? *Pediatrics.* 1999;104:530–35.
16. Haught K, Grossman D, Connell F. Parents' attitudes toward firearm injury prevention counseling in urban pediatric clinics. *Pediatrics.* 1995;96:649–53.
17. Senturia YD, Christoffel KK, Donovan M. Gun storage patterns in US homes with children. *Arch Pediatr Adolesc Med.* 1996;150:265–69.
18. Conner SM, Wesolowski KL. "They're too smart for that": predicting what children would do in the presence of guns. *Pediatrics.* 2003;111:e109–14.
19. Coyne-Beasley T, McGee KS, Johnson RM, Bordley WC. The association of handgun ownership and

- storage practices with safety consciousness. *Arch Pediatr Adolesc Med.* 2002;156:763–68.
20. Coyne-Beasley T, Schoenbach VJ, Johnson RM. “Love our kids, lock your guns”: a community-based firearm safety counseling and gun lock distribution program. *Arch Pediatr Adolesc Med.* 2001;155:659–64.
 21. Okoro CA, Nelson DE, Mercy JA, Balluz LS, Crosby AE, Mokdad AH. Prevalence of household firearms and firearm-storage practices in the 50 states and the District of Columbia: Findings from the Behavioral Risk Factor Surveillance System, 2002. *Pediatrics.* 2005;116:e370–6.
 22. American Academy of Family Physicians. Policy and Advocacy: Firearms/handgun firearms, handguns and assault weapons [cited 2006 December 12]. Available from: <http://www.aafp.org/online/en/home/policy/policies/f/firearmshandgunfirearmshandgunsandassaultweapons.html>.
 23. Laraque D, Spivak H, Bull M. Serious firearm injury prevention does make sense. *Pediatrics.* 2001;107:408–10.
 24. Snijders TAB, Bosker RJ. *Multilevel analysis: an introduction to basic and advanced multilevel modeling.* 1st ed. Thousand Oaks (CA): Sage; 1999.
 25. Raudenbush SW, Bryk AS, Cheong YF, Congdon RT Jr. *HLM 6: Hierarchical Linear and Nonlinear Modeling.* Lincolnwood: Scientific Software International; 2005.
 26. Christoffel KK. Commentary: When counseling parents on guns doesn’t work: why don’t they get it? *J Am Acad Child Adolesc Psychiatry.* 2000;39:1226–28.
 27. Grossman DC, Mang K, Rivara FP. Firearm injury prevention counseling by pediatricians and family physicians: practices and beliefs. *Arch Pediatr Adolesc Med.* 1995;149:973–7.
 28. Stevens MM, Olson AL, Gaffney CA, Tosteson TD, Mott LA, Starr P. A pediatric, practice-based, randomized trial of drinking and smoking prevention and bicycle helmet, gun, and seatbelt safety promotion. *Pediatrics.* 2002;109:490–7.
 29. Azrael D, Miller M, Hemenway D. Are household firearms stored safely? It depends on whom you ask. *Pediatrics.* 2000;106:e31.
 30. Coyne-Beasley T, Baccaglini L, Johnson RM, Webster B, Wiebe DJ. Do partners with children know about firearms in their home? Evidence of a gender gap and implications for practitioners. *Pediatrics.* 2005;115:e662–7.