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Recreational Gun Use by California Adolescents

Katherine A. Vittes, MPH
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Most research on adolescents and firearms focuses on urban populations, handguns, and homicide. This study examines the prevalence and correlates of recreational gun use (RGU)—for hunting or target shooting—among 5,801 community-residing 12- to 17-year-old Californians. Data are from the first statewide California Health Interview Survey (CHIS), and person, design, and population weights were applied to the data. About one fifth (22.4%) of California adolescents report that they have gone hunting or target shooting. Nearly two thirds (62.8%) have hunted with a family member, typically (67.3%) their father. Recreational gun use among adolescents appears to be linked to a few basic demographic characteristics; most notably, male adolescents had an adjusted odds ratio of RGU nearly five times that of female adolescents. Some of the variables associated with RGU are consistent with those for violent gun use; differences, however, suggest that separate approaches to preventing firearm-related injury may be warranted.

Keywords: *adolescents; firearms; hunting; unintentional injuries*

Recreation is a common reason for owning a gun (Cook & Ludwig, 1997; Cunningham, Henggeler, Limber, Melton, & Nation, 2000; Senturia, Christoffel, & Donovan, 1994). There were about 13 million active hunters in the United States in 2001 (2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, California [hereafter, 2001 NSFHW], 2003). Although research suggests that relatively few unintentional firearm deaths occur while hunting in the field (Cherry, Runyan, & Butts, 2001; Copeland, 1984; Grossman, Reay, & Baker, 1999; Wintemute, Kraus, Teret, & Wright, 1989), a disproportionate number occur during hunting season (Cherry et al., 2001; Copeland, 1984; Harruff, 1992; Morrow & Hudson, 1986; Wintemute et al., 1989), indicating that activities associated with hunting, such as cleaning, loading, and transporting a firearm, place a person at elevated risk (Cherry et al., 2001; Sinauer, Annet, & Mercy, 1996; Wintemute et al., 1989). Living in a home that contains a gun also appears to increase one's likelihood of being shot (Kellermann et al., 1993; Kellermann, Rivara, Somes, & Reay, 1992; Kleck & Hogan, 1999; Miller, Azrael, & Hemenway, 2002; Wiebe, 2003a, 2003b). Moreover, because hunters and target shooters handle guns more often, they may be at higher risk for unintentional firearm injuries than persons who own a gun for protection (Frattaroli, Webster, & Teret, 2002).

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Long guns (i.e., rifles and shotguns) are used more often for recreation than handguns (i.e., pistols and revolvers) (Cook & Ludwig, 1997). Most hunting injuries from firearms are caused by shotguns (2001 U.S. Incident Summary, 2003),¹ and shotgun injuries occur most frequently in rural settings (Sing, Branas, MacKenzie, & Schwab, 1997). In 2001, in the United States, shotguns, rifles, and handguns were involved in 44%, 44%, and 13% of the self-inflicted and 72%, 24%, and 1% of the two-party unintentional hunting-related shootings (2001 U.S. Incident Summary, 2003). Shotguns are twice as lethal as handguns (Bartlett, 2003; Sherman & Parrish, 1963), and shotgun injuries typically are more serious and result in longer hospitalizations than wounds from other types of firearms (Sing et al., 1997).

Youths suffer a disproportionate share of unintentional gunshot injuries while hunting (Cole & Patetta, 1988; Morrow & Hudson, 1986). In 2001, in the United States, 10- to 19-year-olds incurred nearly one third (31.1%) of the self-inflicted unintentional hunting-related gunshot injuries and were about one fifth (19.3%) of the shooters in two-party incidents (2001 U.S. Incident Summary, 2003). Young people have been targeted in campaigns to increase the population of U.S. hunters (DiCamillo & Schaefer, 2000). Although the number of adult hunters in California has declined in the past 10 years (2001 NSFHW, 2003), and resident license sales have dropped by about 17% (by more than 56,000 licenses) ("Hunting Statistics," 2004), the number of licenses issued to persons younger than 16 years old (i.e., junior licenses) has increased (Figure 1). In 2003, the California Department of Fish & Game sold more than 25,000 junior hunting licenses, the highest number since 1986 ("Hunting Statistics," 2004). California has a lower proportion of hunters than other states (2001 NSFHW, 2003).

Data on recreational firearm use itself are limited. The U.S. Department of Fish and Wildlife, in collaboration with state and national conservation organizations, has conducted a national survey on fishing, hunting, and other wildlife-related recreation every 5 years since 1955. Unfortunately, estimates of the number of hunters younger than 16 years old are unstable, as are most state-level data that rely on small sample sizes (2001 NSFHW, 2003). The peer-reviewed literature is limited as well: Studies are conducted in rural settings (Carter, 1989; Cole & Patetta, 1988; Huiras, Cogbill, & Strutt, 1990; Karger, 1996; Livingston & Lee, 1992) and tend to be dated (Applegate, 1982; Carter, 1989; Cole & Patetta, 1988; Huiras et al., 1990; Langenau & Mellon, 1980; Lizotte, Bordua, & White, 1981; Morrow & Hudson, 1986; Örnehult & Eriksson, 1987). Several studies examine the relationship between hunting and firearm injuries in other countries (Hardt-Madsen & Simonsen, 1983; Hintikka, Lehtonen, & Viinamaki, 1997; Huiras et al., 1990; Janssen, Miyaishi, Koops, Hildebrand, & Puschel, 1996; Karger, Wissmann, Gerlach, & Brinkmann, 1996; Örnehult & Eriksson, 1987), but given differences in the prevalence of gun ownership as well as in firearm-related legislation (Hemenway & Miller, 2000), these studies are of limited relevance to U.S. settings. Thus, although the literature on violence and intentional gun injuries is increasing (Christoffel & Longjohn, 2002), there remains a paucity of research on the use of firearms for recreation, particularly among adolescents and among those from urban locales.

This article describes the prevalence and correlates of hunting and target shooting among a community-based sample of California adolescents and investigates the extent to which adolescent recreational gun users hunt and target shoot with family members. Please note that, in this article, recreational gun use (RGU) refers to hunting and target shooting; when the term *hunting* is used, it refers specifically to hunting and does not include target shooting.

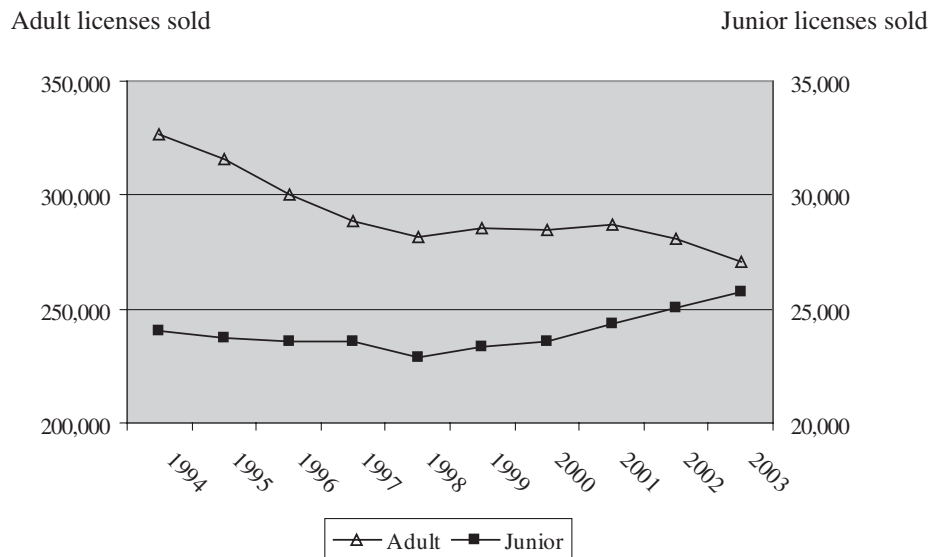


Figure 1. Adult and junior hunting license sales, California, 1994-2003.
NOTE: Data are compiled from Hunting Statistics by Item Sold (2004).

METHOD

Sample

Data are drawn from the first California Health Interview Survey (CHIS), a statewide, random digit-dial, household telephone survey that collects health-related information from California residents. Respondents were sampled from each of California's 58 counties, yielding a geographically, ethnically, and culturally diverse sample of 55,428 households. The focus of this article is the sample of 5,801 adolescents (12- to 17-year-olds).

Data Collection

Between November 2000 and October 2001, interviewers called each sampled household to speak with a randomly selected adult. The response rate for all adults, regardless of whether they had an adolescent, was 37.7% (California Health Interview Survey, 2002). When that adult was the parent or guardian of an adolescent who resided in the same household, the interviewer asked for permission to interview the adolescent. When granted, the interviewer requested consent from the adolescent as well. Parents and guardians granted permission almost two thirds (63.5%) of the time (CHIS: California Health Interview Survey, 2002). Most (84.5%) adolescents who were asked agreed to be interviewed. Because it is impossible to test whether the participating and nonparticipating adults were equally likely to have an adolescent in the household, a true response rate could not be determined (Sorenson & Vittes, 2004). When multiple adolescents were eligible to participate, one was randomly selected. Interviews were offered in English, Spanish, Chinese (Mandarin and Cantonese dialects), Khmer (Cambodian), Korean, and Vietnamese. Interviews with the adolescents lasted an average of 19 minutes. About 9%

were conducted in a language other than English. The research was reviewed and approved by the University of California, Los Angeles (UCLA) Institutional Review Board.

Measures

To ascertain the prevalence of RGU, adolescents were asked, "Have you ever used a gun for hunting or target shooting?" Respondents who answered affirmatively were asked, "Have you ever gone hunting or shooting with a member of your family?" Of those who said yes, interviewers then asked, "Which members of your family have you ever gone hunting and shooting with?" The answer choices were father, mother, brother, sister, grandfather, and other family member; respondents were instructed to report all answers that applied.

Individual demographic data include gender, ethnicity (White, Black, Latino, Asian, and multiethnic/other), age (12 to 17 years old), citizenship (U.S. citizen vs. non-U.S. citizen), employment status (employed vs. unemployed during the school year and/or summer months), and school attendance (attends vs. does not attend school). Household demographic data (e.g., household size, household income, and parent's occupation) were obtained from the corresponding adult questionnaire. Percentage of federal poverty level (FPL), calculated using household size and income (DeNavas-Walt & Cleveland, 2002), is used in these analyses as an indicator of socioeconomic status (SES). Locale (rural vs. urban) was assigned based on population density. In addition to demographic variables, adolescents were asked about firearms in their homes and whether they personally have a gun or guns.

Statistical Analyses

Person, design, and population weights were applied so findings are reasonable estimates for California adolescents living in households during the study period (California Health Interview Survey, 2002). With the exception of ethnicity, age, and percentage of FPL, for which indicator variables were created, all variables were dichotomous.

Frequencies, cross-tabulations, and chi-square statistics were calculated to view the distribution of the data and to examine the relationship between each demographic, firearm exposure, and RGU variable. Standard diagnostic statistics were computed prior to running multivariate analyses.

To examine the correlates of RGU while holding other variables constant, a multiple logistic regression analysis was conducted in which RGU (the dependent variable) was regressed on all demographic and gun access variables. School attendance and SES were dropped after running the initial model because neither variable was significant at $p \leq .05$ and, when the model was run without school attendance and SES, estimates for the other predictors did not change appreciably. Multicollinearity among variables was assessed using variance inflation factors; all were within an acceptable range (Affifi & Clark, 1997). Statistics reported in the tables are not repeated in the text.

RESULTS

Prevalence of Recreational Gun Use

About one fifth (22.4%) of California adolescents have used a firearm to hunt or target shoot. As shown in Table 1, RGU varied by most demographic characteristics including gender, ethnicity, age, nativity, employment, socioeconomic status, urbanization, and living in a home with or personally having a long gun or handgun.

A higher proportion of male adolescents than female adolescents and a higher proportion of White than non-White adolescents reported RGU. Reporting RGU in lower proportions were Latino (versus non-Latino), Black (versus non-Black), and Asian (versus non-Asian) adolescents. Moreover, as shown in Figure 2, nearly one half of White male adolescents and one fifth of White female adolescents reported RGU, much higher proportions than their ethnic minority peers.

A higher proportion of older adolescents (i.e., 16- and 17-year-olds), U.S. citizens, wealthy adolescents (i.e., from families making at or above three times FPL), and rural dwellers participated in RGU than younger adolescents, non-U.S. citizens, less wealthy adolescents, and urban dwellers. A lower proportion of 12- and 13- year-olds and adolescents from families earning less than twice FPL reported RGU.

The proportion of adolescents living in a home with and personally having a long gun or handgun was greater among hunters and target shooters. Moreover, nearly one third (31.4%) of adolescents reporting RGU lived in a home with a long gun, and slightly under one quarter (23.7%) lived in a home with a handgun (compared with 8.0% and 5.9% of adolescents not reporting RGU). Likewise, a significantly higher proportion of adolescents reporting RGU, compared with adolescents not reporting RGU, had their own long gun (10.4% vs. 0.1%) and handgun (3.5% vs. 0.1%) (data not tabled).

Recreational Gun Use With a Family Member

About three fifths (62.8%) of recreational gun users reported hunting or shooting with a family member (Table 2). Of these adolescents, the highest proportion participated in RGU with their father (67.3%), followed by an "other family member" (42.6%), a brother (24.3%), a grandfather (15.1%), a mother (11.6%), and a sister (6.1%). Relatively few demographic characteristics were significantly associated with RGU with a family member: A higher proportion of female adolescents, Whites, adolescents living in a home with a handgun or long gun, or personally having a long gun (but not a handgun) participated in RGU with a family member. A lower proportion of Latino adolescents reported RGU with a family member compared with non-Latinos. Similarly, as shown in Table 2, few demographic attributes were significantly associated with RGU with a specific family member.

Multivariate Analysis: Correlates of Recreational Gun Use

After considering other variables, most personal demographic and gun ownership variables continued to be associated with RGU (Table 3). Male, White, employed, U.S. citizen, and rural adolescents had greater odds of RGU than female, non-White, unemployed, non-U.S. citizen, and urban adolescents, respectively, independent of other variables in the model. When controlling for all other variables, a positive, linear relationship

Table 1. Recreational Gun Use by Demographic Characteristics of California Adolescents (in percentages)

Demographic characteristics	Recreational Gun Use		$\chi^2(df)$
	No	Yes	
Total (100)	77.6	22.4	
Gender			
Male (51.4)	66.7	33.3	$\chi^2_{(1)} = 417.8^{***}$
Female (48.6)	89.1	10.9	
Ethnicity			
White (45.4)	66.0	34.1	$\chi^2_{(4)} = 384.5^{***}$
Latino (35.8)	87.4	12.6	
Black (6.7)	86.3	13.8	
Asian (8.5)	91.0	9.0	
Multi/other (4.7)	77.0	23.0	
Age			
12 years (16.4)	88.6	11.4	$\chi^2_{(5)} = 179.3^{***}$
13 years (17.7)	84.7	15.3	
14 years (16.5)	78.5	21.5	
15 years (16.7)	74.6	25.5	
16 years (16.0)	67.3	32.7	
17 years (16.7)	71.3	28.7	
Citizenship			
U.S. citizen (89.4)	75.9	24.1	$\chi^2_{(1)} = 77.8^{***}$
Non-U.S. citizen (10.6)	91.6	8.4	
Employment status			
Paid job (41.9)	68.7	31.3	$\chi^2_{(1)} = 190.4^{***}$
No job (58.1)	84.0	16.0	
School attendance			
Attends school (98.0)	73.6	26.4	$\chi^2_{(1)} = 1.08 (ns)$
Does not attend school (2.0)	77.7	22.3	
Locale			
Rural (14.1)	65.3	34.7	$\chi^2_{(1)} = 84.8^{***}$
Urban (85.9)	79.6	20.4	
Federal poverty level			
0%-99% (21.5)	86.5	13.5	$\chi^2_{(3)} = 109.5^{***}$
100%-199% (21.0)	80.8	19.2	
200%-299% (14.7)	76.1	23.9	
300% and above (42.8)	72.1	27.9	
Gun ownership			
Long gun in home (13.4)	52.0	48.0	$\chi^2_{(1)} = 480.5^{***}$
Handgun in home (9.9)	46.2	53.8	
No gun in home (73.2)	16.1	83.8	$\chi^2_{(1)} = 536.3^{***}$
Adolescent has own long gun (2.5)	6.4	93.6	
Adolescent has own handgun (0.9)	12.1	88.0	$\chi^2_{(1)} = 129.3^{***}$
Adolescent has no gun (97.0)	79.8	20.2	

NOTE: Person, design, and population weights were applied to the data.

*** $p \leq .001$.

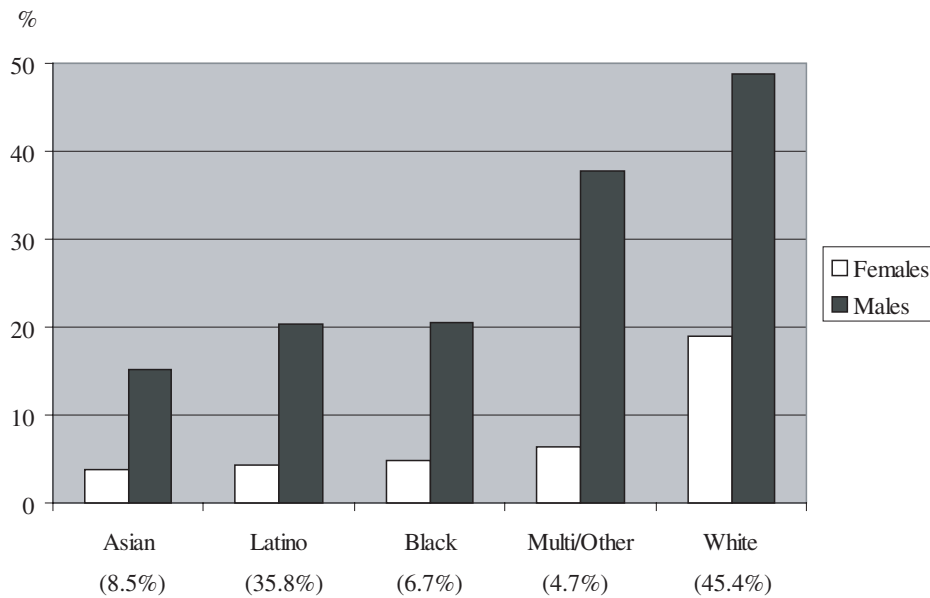


Figure 2. Recreational gun use among California adolescents, by gender and ethnicity.

between age and RGU indicated that for each 1-year increase in age, the odds of reporting RGU increased by almost one third.

Living in a home with or personally having a firearm were significant predictors of RGU: Adolescents who lived in a home with a long gun or handgun had greater odds of reporting RGU compared with adolescents not living in a home with a long gun or handgun. Independent of all other variables in the model, the largest odds multipliers were for adolescents who reported having their own long gun or handgun.

DISCUSSION

A substantial minority of California adolescents has used a gun to hunt or target shoot. About one third of those who hunt live in a home with a rifle or shotgun, and about one quarter live in a home with a handgun. One in 10 California adolescents who report hunting or target shooting has his or her own long gun and, although fewer than 1% of all California adolescents own a handgun (Sorenson & Vittes, 2004), 3.5% of adolescent recreational gun users own a handgun. In sum, young California hunters and sports shooters have ready access to firearms.

Most adolescent recreational shooters in California, like adolescent hunters in Michigan (Hintikka et al., 1997) and adult hunters nationwide (2001 NSFHW, 2003), are male and White. Unlike self-protective gun users in urban areas (Nance et al., 2002), however, recreational gun users are more often from rural locales and have long guns instead of handguns. If recreational and self-protective gun users are two distinct groups, the approaches that are successful in reducing firearm injuries in one may not meet similar success in the other (Carter, 1989; Nance et al., 2002).

Table 2. Hunting and Target Shooting With Family Members by Adolescents' Demographic Characteristics

Demographic Characteristic	Any Family Member	Father	Mother	Brother	Sister	Grandfather	Other Family Member
Overall	62.8	67.3	11.6	24.3	6.1	15.1	42.6
Gender							
Male	60.1, $\chi^2_{(1)} = 15.9^{***}$	66.6	9.5, $\chi^2_{(1)} = 12.8^*$	24.2	4.0, $\chi^2_{(1)} = 22.9^{***}$	15.1	44.1
Female	71.4	69.1	17.4	24.7	12.0	14.9	38.5
Ethnicity							
White	67.4, $\chi^2_{(4)} = 60.0^{***}$	73.8, $\chi^2_{(4)} = 56.6^{**}$	11.7	25.3	6.9	16.1	36.1, $\chi^2_{(4)} = 62.9^{***}$
Latino	58.0	50.7	10.4	16.1	5.3	12.0	66.3
Black	37.0	34.8	0	57.7	0	26.0	57.7
Asian	28.5	58.4	0.7	14.3	0	0.7	45.8
Multi/other	64.8	54.5	23.2	26.9	3.0	10.9	39.7
Federal poverty level							
0%-99%	54.3	36.7, $\chi^2_{(3)} = 104.1^{***}$	13.6	23.2	1.9	10.0	67.7, $\chi^2_{(3)} = 113.3^{***}$
100%-199%	64.1	50.5	10.9	16.8	7.7	15.7	66.4
200%-299%	61.5	76.3	6.2	22.7	7.6	17.0	40.9
300% and above	64.8	76.5	12.8	27.5	6.1	15.4	30.1

Gun ownership									
Long gun in home	76.8, $\chi^2_{(1)} = 62.7^{***}$	88.0, $\chi^2_{(1)} = 130.5^{***}$	17.5, $\chi^2_{(1)} = 23.2^{***}$	29.3	8.3, $\chi^2_{(1)} = 5.7^*$	16.2	31.1, $\chi^2_{(1)} = 36.2^{***}$		
Handgun in home	74.1 $\chi^2_{(1)} = 25.6^{***}$	87.0, $\chi^2_{(1)} = 73.7^{***}$	21.8, $\chi^2_{(1)} = 42.4^{***}$	28.3	8.3	14.6	29.1, $\chi^2_{(1)} = 31.1^{***}$		
Own long gun	89.3, $\chi^2_{(1)} = 47.6^{***}$	85.9, $\chi^2_{(1)} = 24.3^{***}$	19.0	25.1	9.8	25.9, $\chi^2_{(1)} = 14.2^{**}$	37.2		
Own handgun	61.9	82.7	19.6	15.8	9.6	25.6	58.2		

NOTE: Person, design, and population weights were applied to the data. Overall tabulations and chi-square values are shown. Follow-up tabulations and chi-square tests for multiple-category variables are available from the authors. The comparisons were made within variables on with whom the adolescent participated in hunting or target shooting.

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

Table 3. Correlates of Adolescents' Recreational Gun Use

	Adjusted Odds Ratio	95% Confidence Interval
Gender (vs. female)		
Male	4.75***	(3.79-5.96)
Ethnicity (vs. White)		
Black	0.37***	(0.19-0.51)
Latino	0.31***	(0.29-0.47)
Asian	0.27***	(0.17-0.42)
Multi/other	0.66*	(0.46-0.95)
Age ^a		
12-17 years	1.29***	(1.21-1.39)
Citizenship (vs. non-US citizen)		
U.S. citizen	1.61*	(1.02-1.53)
Employment (vs. no job)		
Work for pay	1.41**	(1.14-1.75)
Locale (vs. urban)		
Rural	1.56***	(1.24-1.97)
Gun ownership (vs. no gun)		
Long gun in home	2.57***	(1.96-3.37)
Handgun in home	1.86***	(1.36-2.54)
Adolescent has long gun	19.0***	(7.35-49.10)
Adolescent has handgun	7.52*	(1.01-55.83)

NOTE: Person, design, and population weights were applied to the data.

a. Age was treated as an ordinal variable.

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

Hunting is widely perceived as a tradition that is passed down through the generations by family members (Langenau & Mellon, 1980; Lizotte et al., 1981). Thus, it is not surprising that most adolescent hunters are accompanied by an older family member, typically the father. The tradition appears to be conveyed effectively: Adolescents who hunt with a family member are more inclined to continue hunting into adulthood (Applegate, 1977).

Although serving as a potential source of training and guidance, there is a downside to shooting with others. Most (69%) unintentional hunting shootings in the United States are two-party shootings (2001 U.S. Incident Summary, 2003). In 37 U.S. states (including California), when a two-party hunting-related firearm death occurs, the shooter can be prosecuted (2001 U.S. Incident Summary, 2003). The shooter is most often a friend or relative of the victim (Morrow & Hudson, 1986).

Strengths and Limitations

This large statewide survey of adolescents expands and updates the literature on adolescent health and related behavior by including youths who are from urban and rural locales, from traditionally underrepresented minority groups, and culturally diverse households. Moreover, although studies have asked adolescents about weapon carrying (Steinman & Zimmerman, 2003), ownership (Callahan & Rivara, 1992), and exposure (Callahan & Rivara, 1992), with only one exception (Langenau & Mellon, 1980), ques-

tions about RGU have not previously been asked of a large representative sample of adolescents.

Five study limitations warrant mention. First, the question used to measure RGU did not separate hunting from target shooting; thus, the distribution of adolescent hunters and target shooters is unknown. One may assume that hunting carries greater risk if target shooting occurs only in a controlled setting such as a shooting range. However, target shooting also occurs in uncontrolled, unsupervised settings (e.g., shooters who “plink” call their practice target shooting). Second, the limitations of self-report data, which are widely known, apply to these data. That said, research indicates that survey responses to firearm questions appear to be valid measures of gun ownership (Kellermann, Rivara, Banton, Reay, & Fligner, 1990; Rafferty, Thrush, Smith, & McGee, 1995). Given that most hunters are introduced to the sport when they were young (Langenau & Mellon, 1980), one would expect similar proportions of adolescents and adults to report that they have hunted. Available data support such an assumption: According to the 2000 General Social Survey (Davis, Smith, & Marsden, 2000), 17.2% of U.S. adults have hunted, a proportion similar to our estimate of 22.4% of California adolescents. (We were unable to locate data regarding California adults' lifetime prevalence of hunting: The 1-year prevalence rate is roughly 1.0% [2001 NSFHW, 2003].) Nonetheless, questions regarding RGU, albeit legal behavior, might be considered sensitive and, therefore, subject to bias. Third, some research suggests that unintentional firearm injuries, particularly in rural areas, are more common among young children (Nance et al., 2002). These data are limited to 12- to 17-year-old adolescents. Future research might consider unintentional hunting injuries among younger children. Fourth, this survey did not ask about behavioral risk factors such as individual safety practices that may be relevant to firearm injury risk.

Finally, the survey asked about whether the adolescent had ever gone hunting or target shooting. Information about frequency and duration of RGU was not ascertained, and whether risk of injury varies with frequency and duration of RGU is not known. The case can be made that risk increases with increased gun use. It might also be argued, however, that similar to new drivers who are at higher risk for motor vehicle accidents than more experienced drivers (McCartt, Shabanova, & Leaf, 2003), inexperienced hunters and target shooters are at greater risk because they are less familiar with safety practices. Further research is needed to assess this question.

Implications for Prevention

Adolescence is a developmental period marked by feelings of invulnerability. Risky behaviors are more likely to be practiced during adolescence than during other periods of the life span. For this reason, passive public health approaches based on engineering might be most effective for reducing hunting-related morbidity and mortality among adolescents. Many unintentional firearm injuries occur because the shooter did not think the gun was loaded (Cherry et al., 2001; Harruff, 1992; 2001 U.S. Incident Summary, 2003; Vernick, Meisel, Teret, Milne, & Hargarten, 1999; Wintemute, Teret, Kraus, Wright, & Bradfield, 1987). A loaded chamber indicator, which indicates when there is a cartridge in the chamber of the gun much like a gasoline gauge on a motor vehicle, may prevent some unintentional shootings (Carter, 1989; Cherry et al., 2001; Frattaroli et al., 2002; Vernick et al., 1999; Vernick et al., 2003; Wintemute et al., 1989).

In addition, unintentional hunting injuries may be reduced by education efforts; however, the data are inconclusive. About 14% of unintentional hunting shootings are thought

to occur because of carelessness (2001 U.S. Incident Summary, 2003). An additional 7% result from basic safety violations such as running with a loaded firearm (2001 U.S. Incident Summary, 2003). With the exception of Alaska and Louisiana, state law mandates safety training for hunting license holders (2001 Hunter Education Program Profile, 2004). Moreover, although a Denmark study found that mandatory hunter education training resulted in a 50% decrease in hunting-related unintentional firearm injuries (Hardt-Madsen & Simonsen, 1983), to our knowledge, there are no empirical evaluations of similar efforts in the United States. Widely used efforts that rely solely on behavior change, including efforts to train children to stay away from guns, have been found to be of limited benefit and, in some cases, may even be detrimental (Clayton, Cattarello, & Johnstone, 1996; Colyer, Thompkins, Durkin, & Barlow, 1996; Hardy, 2002; Ian & Irene, 2001; Lynam et al., 1999; Webster, 1993). Thus, hunter safety education in the United States merits further evaluation.

On the other hand, adolescent hunters often learn from an adult family member. Because children often adopt the behavior of their parents and caregivers, safety measures used by adults likely will influence young hunters. In practice, firearm injury prevention approaches that focus on education of hunters of all ages or even just adults, assuming the adult can and does transmit the knowledge and skill to the adolescent, might be useful.

Gun stores that sell ammunition and hunting supplies, as well as firearms, constitute a possible intervention point. Educational materials and programs could be instituted at such stores. Doing so, however, is not likely to work for adolescents directly because the purchase of firearms and ammunition is limited, largely, to persons who have reached legal age. An alternative intervention point might be hunting license renewal. As noted previously, almost all states mandate safety training for persons who hold a hunting license. However, in many states, including California, hunter education is required only for persons who have not previously held a hunting license (California Fish and Game Code 3050(a) Firearm Safety Instruction). License renewals present an opportunity to reinforce safety knowledge and awareness among all licensed hunters. Although there are penalties for hunting without a license, the proportion of hunters who obtain and renew licenses is unknown.

As noted previously, hunting with another also presents risk. A common cause of two-party hunting incidents is when a fellow hunter is mistaken for game (2001 U.S. Incident Summary, 2003). "Hunter Orange" laws, currently in effect in 39 states (California is not among them) (2001 Hunter Education Program Profile, 2004), may be effective in preventing some of these shootings. Such laws require hunters to wear a bright orange item of clothing while in the field. An evaluation of the North Carolina Hunter Orange law found that it reduced two-party hunting injuries, about one fifth of which occur because a hunter is mistaken for game (Cina et al., 1996). In 88% of two-party hunting incidents in California, the shooter was not wearing hunter orange. Adoption of a Hunter Orange law in California might reduce two-party unintentional hunting shootings. As with other types of injuries, however, it is likely that unintentional firearm hunting injuries will be most responsive to some combination of regulation, education, and legislation.

Conclusion

Certain populations receive less research attention than others, and firearm injury prevention research is no exception. Firearm injury research may be heavily influenced by gunshot wounds that occur in urban locales (Nance et al., 2002), where most firearm

fatalities are suicides or homicides committed with a handgun. Evidence suggests that injuries associated with the use of guns for recreation disproportionately harm rural youths. Moreover, hunters from rural areas are less likely than those from urban areas to stop hunting over time (Langenau & Mellon, 1980). To better understand and prevent hunting-related firearm injuries, more detailed information about the prevalence and nature of the exposure is needed.

Note

1. The Hunting Incident Clearinghouse is a component of the International Hunter Education Association (IHEA). Affiliated with the International Association of Fish and Wildlife Agencies, IHEA "is the professional association for 67 state and provincial wildlife conservation agencies, and the 70,000 volunteer instructors who teach hunter education in North America." It is recognized as the primary source of information on hunter education and hunting accident statistics and is the only organization consolidating data on hunting casualties throughout North America.

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