

Correlates of Handgun Carrying Among Adolescents in the United States

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Michael G. Vaughn, PhD¹, Brian E. Perron, PhD²,
Arnelyn Abdon, MA³, René Olate, PhD⁴, Ralph
Groom, MA¹, and Li-Tzy Wu, ScD⁵

Abstract

Weapon-related violence, especially the use of handguns, among adolescents is a serious public health concern. Using public-use data file from the adolescent sample ($N = 17,842$) in the 2008 National Survey on Drug Use and Health (NSDUH), this study examines the behavioral, parental involvement, and prevention correlates of handgun carrying. Overall, 3.1% of adolescents between the ages of 12 and 17 reported carrying a handgun in the past year. Results from a series of logistic regression models indicated that males, selling and using illicit drugs, were robustly associated with an increased probability of handgun carrying among adolescents. Furthermore, youth who carry handguns were significantly less likely to report a parent being involved in their lives and were significantly more likely to have encountered violence and drug prevention programming compared with youth who did not carry handguns. Implications of these results for prevention and policy are discussed.

Keywords

weapon carrying, gun violence, youth violence, gang violence, parental involvement

¹Saint Louis University, St. Louis, MO, USA

²University of Michigan, Ann Arbor, MI, USA

³Asian Development Bank, Metro Manila, Philippines

⁴Ohio State University, Columbus, OH, USA

⁵Duke University Medical Center, Durham, NC, USA

Corresponding Author:

Michael G. Vaughn, Tegeler Hall, 3550 Lindell Boulevard, St. Louis, MO 63103, USA

Email: mvaughn9@slu.edu

Introduction

In recent decades handgun carrying and firearm use have become one of the central features within the culture of youth violence (Reich, Culross, & Behrman, 2002). Weapon-related violence, especially the use of handguns, among adolescents is a serious public health concern (Blum, 2001; Muula, Rudatsikira, & Siziya, 2008). Weapon carrying by adolescents in large measure represents a real or perceived need for self-protection among adolescents and predictably becomes more lethal when youth are carrying handguns (Blumstein, 2002). Youth handgun carrying is a powerful driver of youth violence and injury in the United States. As such, a better understanding of the correlates of this phenomenon is important to inform youth violence policy and prevention efforts.

Prior research on the extent of handgun carrying among youth has been carried out in various settings, including national surveys of adolescents in schools, smaller community studies of youth, and studies of high-risk populations such as youthful offenders. Wilkinson and Fagan (2001) have noted strengths and shortcomings of each of these sources. For example, national school-based survey's miss adolescents who have dropped out of school and are perhaps the most likely to carry a weapon. Studies of youthful offenders lack the representativeness necessary to generalize about handgun carrying among youth in the general population. Despite the limitations identified in these various data sources, handgun carrying can be reasonably measured by taking into account the relative merits inherent in these sources over time and the convergence of results across surveys.

Although the prevalence of weapon carrying among youth rose in the 1980's, there was a relative decline among high school students between 1991 (26.1%) and 2003 (17.1%) (Brenner, Lowry, Barrios, Simon, & Eaton, 2004). However, research indicates that adolescents continue to have relatively easy access to handguns and that youth involved in delinquent acts are more likely to carry handguns than non-delinquent youth (Brown, 2004). Prior research also shows that males are more likely to carry handguns than females. In a cross-national survey of 161,082 students from 35 countries, Pickett and colleagues (2005) found that the prevalence of weapon carrying among adolescent males ranged from 10% to 21%, whereas the range for females was 2% to 5%. Adolescent males in the United States reported the highest prevalence of weapon carrying (22%) and the highest prevalence of carrying handguns.

In addition to gender differences, research has also identified racial and ethnic variations in weapon carrying among adolescents. Studies in the

United States indicate that African Americans and Latinos are more likely to carry weapons compared with Whites (Durant, Krowchuk, Kreiter, Sinal, & Woods 1999). These racial and ethnic differences in weapon carrying may reflect geographic differences and accompanying risk associated with particular areas of a youth's environments. For example, youth from central cities where African Americans and Latinos constitute a relatively high proportion of the population report greater rates of weapon carrying than youth from suburban and small town areas (Steinman & Zimmerman, 2003; Vaughan, McCarthy, Armstrong, & Walter, 1996). Availability of handguns also seems to vary geographically, presumably in communities where persons need handguns for self-protection. In a study that tested this notion using data from a national survey, Cook and Ludwig (2004) found wide variations in gun carrying based on the local robbery rate.

A number of behavioral variables have been found to be correlated with handgun carrying in previous studies, including gang affiliation, peer misbehavior, marijuana or other drug use, selling drugs, aggression, and fighting (Kulig, Valentine, Griffith, & Ruthazer, 1998; Lizotte, Krohn, Howell, Tobin, & Howard, 2000; Wilkinson & Fagan, 2001; Vaughn, Howard, & Harper-Chang, 2006). The relationship between handguns, selling drugs, and violence is consistent with one major viewpoint known as the *drug-gun diffusion hypothesis* (Blumstein & Wallman, 2000). The drug-gun diffusion hypothesis states that youth involved in dangerous illegal drug markets are likely to carry handguns for self-protection and the resolution of disputes (Blumstein & Wallman, 2000). This is not so surprising given the nature of interpersonal encounters that are often violent or at least threatening among gang members and illicit drug sellers, which often go hand in hand. Although a lower level of attachment and parental supervision increases the likelihood of many risky behaviors, the mechanism is unresolved. Importantly, few, if any, large-scale studies have examined the association of parental involvement with handgun carrying. This is surprising because it seems plausible that handgun carrying can be attenuated by greater levels of parental involvement and general guardianship.

To extend the notion that adolescents carry handguns for self-protection into practical prevention efforts, answers to several questions need to be addressed. For example, what are the sociodemographic and substance use correlates of handgun carrying? To what extent are youth who carry handguns less likely to have a parent involved in their lives and in what aspects? Do youth who carry handguns encounter or participate in drug and/or violence prevention programs? National studies have not established the role that behavioral variables such as substance use, parental involvement and

supervision, and contact with prevention services has on handgun carrying among youth. Thus, we employ a data set (National Survey on Drug Use and Health [NSDUH]) that has the necessary variables to answer these questions. With respect to substance use, it is useful to know what particular illicit drugs are associated with handgun carrying as this suggests they are criminogenic. Variables that reflect particular forms of parental involvement and supervision are included because merely targeting behavioral risk factors without prevention or policy efforts that strengthen parenting and parental ties to adolescents may be inefficient since parents are involved in the supervision and socialization of youth. It is also important to know what the influences of school and community prevention and treatment programming have on youth who carry handguns. As such, the goal of the present study is to answer the aforementioned research questions and contribute to the empirical foundation that informs prevention and policy developments aimed toward reducing handgun carrying among adolescents in the United States.

Method

Sample and Procedures

This study is based on public-use data from the 2008 NSDUH (Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). NSDUH is designed to provide population estimates of substance use and health-related behaviors in the U.S. general population. It uses multistage area probability sampling methods to select a representative sample of the U.S. civilian, non-institutionalized population aged 12 years or older for participation in the study. Multistage sampling designs are commonly used designs when attempting to provide nationally representative estimates. This is because interviewing all participants is not feasible so larger units are the first stage selected from with subsequent levels of strata partitioned until individuals from households are selected. With respect to the NSDUH, all 50 states and the District of Columbia were employed. Within this state-level stage one sample, secondary sampling units (stage two) were based on regions within states with large states composed of 48 regions and remaining states parsed in 12 regions. Census tracts within these secondary sampling regions were then used to select household or dwelling units and individuals from. Study participants include household residents; residents of shelters, rooming houses, and group homes; residents of Alaska and Hawaii; and civilians residing on military bases. To improve the precision of drug use

estimates for subgroups, adolescents aged 12 to 17 years and young adults aged 18 to 25 years were oversampled.

NSDUH study participants were interviewed in private at their places of residence. Potential participants were assured that their names would not be recorded and that their responses would be kept strictly confidential. Participants were paid US\$30 for their participation. All field interviewers signed a confidentiality agreement, and the procedures and protections were carefully explained to potential participants in the informed consent protocol. The NSDUH interview uses a computer-assisted interviewing (CAI) methodology to increase the likelihood of valid respondent reports of illicit drug use behaviors (SAMHSA, 2009). The CAI methodology includes a combination of computer-assisted personal interviewing (CAPI) and audio computer-assisted self-interviewing (ACASI) methodologies. ACASI is designed to provide the respondent with a highly private and confidential means of responding to questions and is used for questions of a sensitive nature (e.g., substance use). Respondents read questions on the computer screen or questions were read to respondents through headphones, and then respondents entered their responses directly into the computer.

A total of 68,736 respondents aged 12 years or older completed the 2008 survey. Weighted response rates were 89% for household screening and 74.4% for interviewing (SAMHSA, 2009). Each independent, cross-sectional NSDUH sample was considered representative of the U.S. general population aged 12 years or older. NSDUH design and data collection procedures have been reported in detail elsewhere (SAMHSA, 2009). The current study restricted analyses to the adolescents aged 12 to 17 years ($N = 17,842$). The mean age of the sample is 14.6 years old ($SD = 1.7$). The respondents were evenly distributed between males (51.0%) and females (49.0%), but are unevenly distributed in terms of race/ethnicity. More than half of the respondents are White (58.7%), 17.7% are Hispanic, and 14.0% are African American. The annual family income of 15.8% of the sample is less than US\$20,000; 32.6% have income between US\$20,000 and US\$49,999; 19.4% have income between US\$50,000 and US\$74,999; and 32.2% have more than US\$75,000 annual family income.

Measures

Handgun carrying. Adolescents who carried handguns ($N = 628$) were identified based on whether they responded affirmatively to the question "During the past 12 months, how many times have you carried a handgun?"

Behavioral variables. A host of risk-related variables including substance use and delinquent behaviors were used. Substance use variables assessed were self-reported past-year use of alcohol, tobacco, and illicit drugs (marijuana, inhalants, hallucinogens, cocaine/crack, heroin). These were dichotomously measured as use and nonuse. Delinquent variables were self-reported past-year selling of illegal drugs, stealing an item worth US\$50 or more, attacking someone with the intent to injure, arguing or fighting with a parent, serious fighting at school or work, and carrying a handgun. These were also measured dichotomously (i.e., *yes* or *no*). Two dichotomously coded items were used to assess risk propensity including, "How often do you get a real kick out of doing things that are a little dangerous?" and "How often do you like to test yourself by doing something a little risky?"

Sociodemographic and mental health covariates. The following demographic variables were used: Gender, race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, and Other [American Indian or Alaska Native, Asian, other Pacific Islander or Native Hawaiian, and persons reporting more than one race]), school status (in school vs. not in school), having a father in the home or not, ever jailed or incarcerated, total annual family income (less than US\$20,000, US\$20,000 to US\$49,999, US\$50,000 to US\$74,999, and US\$75,000 or more), and metropolitan population density (classified as large, ≥ 1 million; small, ≤ 1 million; and nonmetropolitan areas). Family income was ascertained by asking respondents: "Of these income groups, which category best represents your total combined family income during the previous calendar year?" Because adolescents are often unable to provide accurate estimates about family household income responses from an adult or other household member were provided. In addition, we also examined lifetime history of depression and anxiety. This was based on whether respondents were told by a doctor or medical professional that they had either of these disorders.

Parental involvement covariates. Seven items were used to assess various forms of parental involvement. The original questions had a response format of always, sometimes, seldom, and never. These were subsequently dichotomized into always/sometimes and seldom/never to enhance interpretability. Sample items included "During the past 12 months, how often did your parents provide help with your homework when you needed it?" "During the past 12 months, how often did your parents limit the amount of time you went out with friends on school nights?" and "During the past 12 months, how often did your parents tell you they were proud of you for something you had done?"

Youth experience covariates. Seven items (0 = *no*, 1 = *yes*) were used to assess experiences that youth had with prevention programming both in and

out of school. Sample items included “During the past 12 months, have you participated in a violence prevention program where you learn ways to avoid fights and control anger?” “During the past 12 months, have you participated in an alcohol, tobacco or drug prevention program outside of school where you learn about the dangers of using and how to resist using, alcohol, tobacco, or drugs?” and “During the past 12 months, in how many different kinds of school-based activities, such as team sports, cheerleading, choir, band, student government, or clubs, have you participated?”

Statistical Analysis

Weighted prevalence estimates and standard errors were computed using Stata 11SE (StataCorp, 2007). This system implements a Taylor series linearization to adjust standard errors of estimates for complex survey sampling design effects including clustered data. A series of multiple logistic regression analyses were conducted to first assess the associations between demographic and behavioral variables and handgun carrying. Next, we examined the associations of prior youth experiences, including contact with prevention programming, with handgun carrying. Finally, we assessed the associations of indicators of parental supervision and involvement with handgun carrying. Final adjusted models controlled for the influences of age, race/ethnicity, gender, family income, and lifetime anxiety and depression. Adjusted odds ratios (AORs) and 95% confidence intervals are presented to reflect association strength. AORs were considered statistically significant only if associated confidence intervals did not include the value 1.0.

Results

Sociodemographic and Behavioral Correlates of Handgun Carrying

The overall prevalence of handgun carrying in the past year by youth aged between 12 and 17 years was 3.1%. Table 1 shows the sociodemographic and behavioral characteristics of youth who have and have not carried a handgun. Adolescents reporting a history of handgun carrying were significantly more likely to be male ($OR = 4.57$, 95% CI = [3.43, 6.09]) and to have been incarcerated ($OR = 3.83$, 95% CI = [2.84, 5.18]). There were no significant differences found with respect to race/ethnicity, not in school, and not having a father in the home.

Table 1. Demographic, Psychological, and Behavioral Associations With Carrying a Handgun Among Respondents 12 to 17 Years of Age

	Handgun Carrying			No Handgun Carrying			Unadjusted OR			Adjusted OR ^a		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Sex												
Male	4.97	[4.41, 5.60]		95.03	[94.40, 95.59]		4.53	[3.41, 6.03]		4.57	[3.43, 6.09]	
Female	1.14	[0.88, 1.47]		98.86	[98.53, 99.12]		1.00			1.00		
Race/Ethnicity												
African American	3.31	[2.61, 4.20]		96.69	[95.80, 97.39]		1.03	[0.77, 1.37]		1.07	[0.79, 1.46]	
Hispanic	2.59	[1.94, 3.45]		97.41	[96.55, 98.06]		0.80	[0.57, 1.11]		0.79	[0.55, 1.13]	
Other	2.81	[1.59, 4.90]		97.19	[95.10, 98.41]		0.87	[0.48, 1.57]		0.84	[0.44, 1.59]	
White	3.23	[2.82, 3.70]		96.77	[96.30, 97.18]		1.00			1.00		
School status (in school vs. not in school)												
Yes	3.08	[2.75, 3.45]		96.92	[96.55, 97.25]		0.91	[0.59, 1.39]		0.95	[0.58, 1.56]	
No	3.38	[2.26, 5.02]		96.62	[94.98, 97.74]		1.00			1.00		
Father in home												
No	3.35	[2.82, 3.96]		96.65	[96.04, 97.18]		1.12	[0.89, 1.40]		1.10	[0.86, 1.42]	
Yes	3.00	[2.62, 3.44]		97.00	[96.56, 97.38]		1.00			1.00		
Ever Incarcerated												
Yes	10.59	[8.42, 13.23]		89.41	[86.77, 91.58]		4.41	[3.33, 5.86]		3.83	[2.84, 5.18]	
No	2.61	[2.31, 2.96]		97.39	[97.04, 97.69]		1.00			1.00		
Sold illegal drugs												
Yes	29.46	[24.44, 35.04]		70.54	[64.96, 75.56]		17.90	[13.44, 23.85]		16.09	[11.64, 22.24]	
No	2.28	[2.01, 2.59]		97.72	[97.41, 97.99]		1.00			1.00		
Stole > US\$50												
Yes	17.66	[14.57, 21.25]		82.34	[78.75, 85.43]		8.82	[6.76, 11.50]		7.50	[5.69, 9.88]	

(continued)

Table 1. (continued)

	Handgun Carrying		No Handgun Carrying		Unadjusted OR		Adjusted OR ^a	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Attacked someone								
No	2.37	[2.08, 2.70]	97.63	[97.30, 97.92]	1.00		1.00	
Yes	14.82	[12.48, 17.50]	85.18	[82.50, 97.52]	7.78	[6.10, 9.93]	6.99	[5.39, 9.06]
No	2.19	[1.90, 2.51]	97.81	[97.49, 98.10]	1.00		1.00	
Serious fight at school								
Yes	7.40	[6.35, 8.60]	92.60	[91.40, 93.65]	4.06	[3.24, 5.10]	3.83	[3.02, 4.86]
No	1.93	[1.65, 2.25]	98.07	[97.75, 98.35]	1.00		1.00	
Lifetime ecstasy use								
Yes	12.56	[8.92, 17.40]	87.44	[82.60, 91.08]	4.84	[3.24, 7.22]	5.33	[3.43, 8.28]
No	2.88	[2.57, 3.23]	97.12	[96.77, 97.43]	1.00		1.00	
Lifetime hallucinogen use								
Yes	12.09	[8.74, 16.48]	87.91	[83.52, 91.26]	4.68	[3.20, 6.85]	4.09	[2.69, 6.22]
No	2.85	[2.54, 3.20]	97.15	[96.80, 97.46]	1.00		1.00	
Lifetime cocaine or crack use								
Yes	16.48	[11.97, 22.26]	83.52	[77.74, 88.03]	6.73	[4.55, 9.94]	7.68	[5.06, 11.65]
No	2.85	[2.54, 3.20]	97.15	[96.80, 97.46]	1.00		1.00	
Lifetime marijuana use								
Yes	7.77	[6.59, 9.13]	97.83	[97.49, 98.12]	3.79	[3.01, 4.78]	4.12	[3.16, 5.37]
No	2.17	[1.88, 2.51]	92.23	[90.87, 93.41]	1.00		1.00	
Lifetime heroin use								
Yes	15.79	[7.05, 31.66]	84.21	[68.34, 92.95]	5.94	[2.39, 14.79]	5.25	[1.92, 14.38]
No	3.06	[2.74, 3.41]	96.94	[96.59, 97.26]	1.00		1.00	

(continued)

Table 1. (continued)

	Handgun Carrying		No Handgun Carrying		Unadjusted OR		Adjusted OR ^a	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Lifetime depression								
Yes	3.77	[2.42, 5.83]	96.23	[94.17, 97.58]	1.24	[0.77, 1.98]	1.62	[0.94, 2.81]
No	3.07	[2.73, 3.44]	96.93	[96.56, 97.27]	1.00		1.00	
Lifetime anxiety								
Yes	2.53	[1.30, 4.84]	97.47	[95.16, 98.70]	0.81	[0.41, 1.60]	0.81	[0.37, 1.80]
No	3.11	[2.78, 3.48]	96.89	[96.52, 97.22]	1.00		1.00	
Kick out of doing dangerous things								
Sometimes/Always	5.09	[4.45, 5.83]	94.91	[94.17, 95.55]	4.51	[3.29, 6.17]	4.37	[3.13, 6.10]
Seldom	2.68	[2.12, 3.40]	97.32	[96.60, 97.88]	2.32	[1.60, 3.35]	2.47	[1.68, 3.64]
Never	1.18	[0.89, 1.55]	98.82	[98.45, 99.11]	1.00		1.00	
Like to do risky things								
Sometimes/Always	5.45	[4.73, 6.27]	94.55	[93.73, 95.27]	5.16	[3.62, 7.33]	4.71	[3.23, 6.87]
Seldom	2.75	[2.24, 3.37]	97.25	[96.63, 97.76]	2.54	[1.73, 3.71]	2.58	[1.72, 3.86]
Never	1.10	[0.81, 1.51]	98.90	[98.49, 99.19]	1.00		1.00	

Note: Point estimates in bold are statistically significant. Results for the variables lifetime anxiety is adjusted for the effect of depression and results for lifetime depression is adjusted for the effect of anxiety. Odds ratios in bold are statistically significant.

^aOdds ratios adjusted for age, sex, race/ethnicity, family income, lifetime depression, lifetime anxiety.

With respect to behavioral correlates, several variables were found to have large AORs. Youth who reported selling drugs ($OR = 16.09$, 95% CI = [11.64, 22.24]), having stolen items worth US\$50 or more ($OR = 7.50$, 95% CI = [5.69, 9.88]), attacked someone ($OR = 6.99$, 95% CI = [5.39, 9.06]), and serious fighting at school ($OR = 3.83$, 95% CI = [3.02, 4.86]) had increased odds of handgun carrying. Lifetime use of illicit substances was also strongly associated with handgun carrying, including marijuana ($OR = 4.12$, 95% CI = [3.16, 5.37]), ecstasy ($OR = 5.33$, 95% CI = [3.43, 8.28]), hallucinogens ($OR = 4.09$, 95% CI = [2.69, 6.22]), cocaine/crack ($OR = 7.68$, 95% CI = [5.06, 11.65]), and heroin ($OR = 5.25$, 95% CI = [1.92, 14.38]). Two items reflecting risk propensity (sometimes/always), including getting a kick out of doing things ($OR = 4.37$, 95% CI = [3.33, 6.10]) and liking to do risky things ($OR = 4.71$, 95% CI = [3.23, 6.87]) increased odds of handgun carrying.

To What Extent Are Youth Who Carry Handguns Less Likely to Have a Parent Involved in Their Lives and In What Aspects?

Table 2 compares the prevalence of various forms of parental involvement and supervision for adolescents reporting and not reporting carrying a handgun. Results of AORs indicate that all variables of parental involvement and supervision were uniformly and significantly associated with a reduced likelihood of handgun carrying. The strongest AORs were found for adolescents who reported that a parent told the youth they had done a good job in the past year ($OR = 0.40$, 95% CI = [0.30, 0.52]) and parents telling youth they are proud of things done in the past year ($OR = 0.40$, 95% CI = [0.31, 0.52]). The weakest, yet significant, AORs were found for parents who talked with youth about the danger of tobacco/alcohol/drugs ($OR = 0.77$, 95% CI = [0.61, 0.98]).

Do Youth Who Carry Handguns Encounter or Participate in Drug and/or Violence Prevention Programs?

Table 3 examines the associations of various prevention experiences with carrying a handgun compared with youth who have not carried a handgun. AORs revealed that adolescents carrying handguns encountered several prevention programming experiences at a higher rate than youth who did not carry handguns. However, three of the seven experiences produced significant associations. First, adolescents who reported handgun carrying were

Table 2. Associations Between Parental Involvement and Handgun Carrying Among Respondents 12 to 17 Years of Age

	Handgun Carrying		No Handgun Carrying		Unadjusted OR		Adjusted OR ^a	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Talked with parent about danger of tobacco/alcohol/drug								
Yes	2.72	[2.31, 3.21]	97.28	[96.79, 97.69]	0.74	[0.59, 0.93]	0.77	[0.61, 0.98]
No	3.65	[3.16, 4.20]	96.35	[95.80, 96.84]	1.00		1.00	
Parents check if homework done in past year								
Yes	2.75	[2.40, 3.16]	97.25	[96.84, 97.60]	0.59	[0.46, 0.75]	0.54	[0.41, 0.70]
No	4.61	[3.80, 5.58]	95.39	[94.42, 96.20]	1.00		1.00	
Parents help with homework in past year								
Yes	2.76	[2.41, 3.16]	97.24	[96.84, 97.59]	0.59	[0.45, 0.75]	0.58	[0.44, 0.75]
No	4.63	[3.78, 5.66]	95.37	[94.34, 96.22]	1.00		1.00	
Parents limit amount of TV in past year								
Yes	2.33	[1.91, 2.85]	97.67	[97.15, 98.09]	0.64	[0.50, 0.82]	0.65	[0.50, 0.85]
No	3.58	[3.14, 4.07]	96.42	[95.93, 96.86]	1.00		1.00	
Parents limit time out on school night in past year								
Yes	2.63	[2.27, 3.06]	97.37	[96.94, 97.73]	0.59	[0.46, 0.74]	0.63	[0.49, 0.80]
No	4.40	[3.71, 5.21]	95.60	[94.79, 96.29]	1.00		1.00	
Parents tell youth had done good job in past year								
Yes	2.67	[2.36, 3.02]	97.33	[96.98, 97.64]	0.45	[0.34, 0.59]	0.40	[0.30, 0.52]
No	5.75	[4.57, 7.21]	94.25	[92.79, 95.43]	1.00		1.00	
Parents tell youth proud of things done in past year								
Yes	2.62	[2.31, 2.97]	97.38	[97.03, 97.69]	0.43	[0.33, 0.56]	0.40	[0.31, 0.52]
No	5.86	[4.71, 7.27]	94.14	[92.73, 95.29]	1.00		1.00	

Note: Point estimates in bold are statistically significant. Odds ratios in bold are statistically significant.

^aOdds ratios adjusted for age, sex, race/ethnicity, family income, lifetime depression, lifetime anxiety.

Table 3. Associations Between Youth Experiences and Handgun Carrying Among Respondents 12 to 17 Years of Age

	Handgun Carrying		No Handgun Carrying		Unadjusted OR		Adjusted OR ^a	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Participated in problem solving/communication/self esteem group								
Yes	3.17	2.50, 4.01]	96.83	[95.99, 97.50]	1.04	[0.79, 1.37]	1.12	[0.84, 1.50]
No	3.05	[2.69, 3.46]	96.95	[96.54, 97.31]	1.00		1.00	
Participated in violence prevention program								
Yes	4.51	[3.51, 5.78]	95.49	[94.22, 96.49]	1.60	[1.20, 2.14]	1.77	[1.30, 2.41]
No	2.87	[2.54, 3.24]	97.13	[96.76, 97.46]	1.00		1.00	
Participated in drug prevention program outside school								
Yes	4.69	[3.50, 6.26]	95.31	[93.74, 96.50]	1.66	[1.20, 2.31]	1.70	[1.21, 2.38]
No	2.87	[2.55, 3.23]	97.13	[96.77, 97.45]	1.00		1.00	
Participated in program to help drug abuse								
Yes	4.19	[2.67, 6.52]	95.81	[93.48, 97.33]	1.41	[0.87, 2.28]	1.55	[0.94, 2.55]
No	3.01	[2.69, 3.37]	96.99	[96.63, 97.31]	1.00		1.00	
Participated in youth activities								
Yes	3.06	[2.72, 3.45]	96.94	[96.55, 97.28]	0.95	[0.70, 1.29]	1.10	[0.80, 1.51]
No	3.22	[2.45, 4.21]	96.78	[95.79, 97.55]	1.00		1.00	
Exposed to drug prevention messages outside school								
Yes	2.84	[2.49, 3.24]	97.16	[96.76, 97.51]	0.71	[0.55, 0.91]	0.76	[0.59, 0.98]
No	3.97	[3.25, 4.84]	96.03	[95.16, 96.75]	1.00		1.00	
Any drug education in school								
Yes	3.01	[2.63, 3.45]	96.99	[96.55, 97.37]	0.87	[0.68, 1.12]	0.99	[0.77, 1.27]
No	3.44	[2.82, 4.18]	96.56	[95.82, 97.18]	1.00		1.00	

Note: Point estimates in bold are statistically significant. Odds ratios in bold are statistically significant.
^aOdds ratios adjusted for age, sex, race/ethnicity, family income, lifetime depression, lifetime anxiety.

77% more likely than adolescents who reported no handgun carrying to participate in a violence prevention program ($OR = 1.77$, 95% $CI = [1.30, 2.41]$). Second, handgun carrying adolescents were significantly more likely than non-handgun carrying adolescents to report participating in drug prevention programming outside of school ($OR = 1.70$, 95% $CI = [1.21, 2.38]$). Third, handgun carrying adolescents are less likely than non-handgun carrying adolescent to report exposure to drug prevention messages outside school.

Discussion

Overall, approximately 3.1% of youth carried a handgun in the past year. This translates to an estimated 766,796 of the adolescent population aged 12 to 17 years in the US. The pattern of results appears to support the drug-gun diffusion hypothesis (Blumstein & Wallman, 2000). First, male status and a range of externalizing behaviors consisting of delinquent acts, especially selling and using illicit drugs, were powerfully related to handgun carrying among adolescents. These findings corroborate other studies that have found males to be four to five times more likely than females to carry handguns (Muula et al., 2008) and behavioral correlates identified in previous reviews (Wilkinson & Fagan, 2001). Second, we extend previous studies by demonstrating a strong pattern of protective effects from parental involvement and supervision—though not surprising, results were robust and uniform greatly reducing the odds of handgun carrying. Quite simply, youth who carry handguns are far less likely to report a parent being involved in their lives. Although, perhaps not surprising, this finding is fundamentally important as it suggests that not only the greater involvement by parents and adults in the lives of youth is important but also the lack of general guardianship can have deadly consequences. Third, and perhaps most novel, are the findings related to exposure to prevention programming. Youth who carried a handgun were more likely to have encountered violence and drug prevention programming, but not in the form of messages, compared with youth who did not carry handguns. Based on this finding one might conclude that participation in these activities had possible iatrogenic effects, however, what is more likely is that youth who have been in trouble and have had contact with the criminal justice system have been exposed to these sorts of programming. What this suggests is that youth who carry handguns and engage in a wide variety of problem behaviors do indeed have contact with prevention programming to a greater degree than youth who did not report engaging in these behaviors. Of course the quality and length of exposure to these programs is unknown

and warrants additional research. To some extent, the seeming persistence of handgun carrying despite exposure to prevention programming is similar to the “DARE fallacy” and a deeper explication of the relationship both in terms of empirical study and policy thought is needed.

Although adolescents who engage in a wide variety of problem behaviors and are at high risk to carry handguns are in need of redirection, this may not be so simple as surrounding these youth in a net of extant prevention programming. These youth may possess difficult temperaments, are impulsive, may have been rejected from prosocial peers, or may be the offspring of parents who are themselves antisocial. As such, just as some youth are predisposed toward aggression, some may be more likely to carry weapons. Interestingly, a recent study by Beaver, DeLisi, Vaughn, and Barnes (2010) found evidence of a genetic risk to carry weapons. Using a large sample of adolescents who provided genetic information, the investigators found that male adolescents who carried the low activity monoamine oxidase A (MAOA) gene were not only more likely than those who did not carry the gene to join a gang but also were more likely to use weapons while in the gang. Thus, confronting the possibility of “bottom up” selection effects suggests that prevention efforts need to be enacted far earlier in the problem behavior trajectory and not merely assign these youth to cursory prevention programs. The present study also suggests that effective parenting, communication, and parental supervision can play an important role in reducing the risk for handgun carrying. Parents are therefore an early prevention target (e.g., family-based interventions to improve effective parenting and communication).

Although greater research attention has been paid to behavioral and individual-level factors compared with larger economic and social factors, these types of factors provide a helpful context for understanding handgun carrying among adolescents. These factors include poor housing, high population density, unemployment, and resource deprivation. In short, areas experiencing relatively high levels of community disintegration are most likely to see adolescents carrying handguns, mostly for self protection (Lizotte et al., 2000). Future research should explore these factors conjointly and longitudinally. Another obvious yet overlooked factor involves the long-term consequences stemming from handgun production. Handguns are comprised of metal and other durable materials, allowing usage for decades. Cook and Ludwig (2004) observed that, “It is easy to believe that any moderate program to reduce gun violence is doomed by the simple fact that there are over 200 million guns in circulation.” (p. 589)

Due to the huge numbers of handguns circulating in the United States (Cook & Ludwig, 2004) and the resulting pessimism has led to a situation

where some believe little can be done and removing the large number of guns is a largely futile enterprise. Another major source of pessimism stems from the view that American civilization has historically protected the rights of citizens to own weapons for sport, hunting, or self-defense. This provides another source for adolescents to obtain handguns. The sheer numbers of handguns circulating, however, should not mean that reasonable policies and prevention programs strategies cannot reduce handgun carrying. Fortunately, prevention strategies that reduce gang involvement and drug dealing have been reported to have indirect positive effects on reducing handgun carrying among adolescents. For example, in a study of the life-course factors that influence gun carrying among young urban males, Lizotte et al. (2000) found that membership in a gang was a major factor for handgun carrying during early adolescence, whereas drug dealing, drug use, and peers effects had stronger effect during later adolescence. Targeting efforts around gang-involved youth and adolescent drug abuse (Vaughn, Howard, & Harper-Chang, 2006) may prove useful. Although not without design flaws, an evaluation of the Boston's Operation Ceasefire program observed a substantial reduction in gun violence by holding all gang members accountable if one member illegally used a handgun (Braga & Pierce, 2005). Cook and Ludwig (2004) have advocated for two approaches. The first one is to increase the likelihood of legal sanctions. Despite many adolescents lacking foresight, quick and severe sanctions may possess a deterrent effect. Their second major approach consists of a set of supply side strategies that would require internal locks on all new handguns and the creation of smart handguns, which only allow the lawful owner of a gun to fire it.

Findings from the present study suggest additional efforts could prove useful. Specifically, powerful protective effects were identified for all items assessing parental involvement and supervision, suggesting that educational or focused intervention efforts aiming at strengthening the ability for parents to spend time with their children would have widespread benefits. However, this is all too easy to suggest when in reality lack of parental supervision and involvement could be directly tied to the daily struggles to maintain employment and associated stress among low income families, which in turn reduces time spent with youth and the overall effectiveness of parenting. Economic stress on families and associated deprivation may also heighten the probability of youth selling illicit substances, which increases the need for greater self-protection and hence handgun carrying. This is especially likely for adolescents who are risk prone, using illicit substances themselves, living with substance-using parents, or affiliating with deviant peers.

Findings from the current investigation should be interpreted in light of several limitations. First, the assessment of handgun carrying was based on one item and did not capture the frequency and use of the handgun or the specific reasons for carrying it. Second, given that the study data are cross sectional, causal conclusions regarding handgun carrying and study variables cannot be drawn. Another limitation is that the NSDUH relies on respondent recall and is therefore subject to underreporting or overreporting. Although the NSDUH is a nationally representative sample and the scope is perhaps unsurpassed, it does not include important contextual, situational, and precipitating information, which are necessary for a fuller illumination of handgun carrying among adolescents. Despite these limitations, findings from this investigation revealed useful insights into the relationships between behavior, parental involvement, prevention programming, and handgun carrying among adolescents in the United States.

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References

- Beaver, K. M., DeLisi, M., Vaughn, M. G., & Barnes, J.C. (2010). MAOA genotype is associated with gang membership and weapon use. *Comprehensive Psychiatry*, *51*, 130-134.
- Blum, R. W. (2001). Trends in adolescent health: Perspectives for the United States. *International Journal of Adolescent Medicine and Health*, *13*, 287-295.
- Blumstein, A. (2002). Youth, guns, and violent crime. *Future of Children*, *12*(2), 39-54.
- Blumstein, A., & Wallman, J. (2000). The recent rise and fall of American violence. In A. Blumstein & J. Wallman (Eds.), *The crime drop in America* (pp. 1-12). Cambridge, UK: Cambridge University Press.
- Braga, A. A., & Pierce, G. L. (2005). Disrupting illegal firearms markets in Boston: The effects of operation ceasefire on the supply of new handguns to criminals. *Criminology & Public Policy*, *4*, 717-748.

- Brener, N., Lowry, R., Barrios, L., Simon, T. R., & Eaton, D. (2004). Violence-related behaviors among high school students—United States, 1991-2003. *Journal of the American Medical Association, 292*, 1168-1169.
- Brown, B. (2004). Juveniles and weapons: Recent research, conceptual considerations, and programmatic interventions. *Youth Violence and Juvenile Justice, 2*, 161-184.
- Cook, P. J., & Ludwig, J. (2004). Does gun prevalence affect teen gun carrying after all? *Criminology, 42*(1), 27-54.
- Cook, P. J., & Ludwig, J. (2004). Principles for effective gun policy. *Fordham Law Review*. Manuscript submitted for publication.
- DuRant, R. H., Krowchuk, D. P., Kreiter, S., Sinal, S. H., & Woods, C. R. (1999). Weapon carrying on school property among middle school students. *Archives of Pediatrics and Adolescent Medicine, 153*(1), 21-26.
- Kulig, J., Valentine, J., Griffith, J., & Ruthazer, R. (1998). Predictive model of weapon carrying among urban high school students: Results and validation. *Journal of Adolescent Health, 22*, 312-319.
- Lizotte, A. J., Krohn, M. D., Howell, J. C., Tobin, K., & Howard, G. J. (2000). Factors influencing gun carrying among young urban males over the adolescent-young adult life course. *Criminology, 38*, 811-834.
- Muula, A. S., Rudatsikira, E., & Siziya, S. (2008). Correlates of weapon carrying among high school students in the United States. *Annals of General Psychiatry, 7*. Retrieved from <http://www.annals-general-psychiatry.com/content/pdf/1744-859X-7-8.pdf>
- Pickett, W., Craig, W., Harel, Y., Cunningham, J., Simpson, K., Molcho, M., . . . Currie, C. E. (2005). Cross-national study of fighting and weapon carrying as determinants of adolescent injury. *Pediatrics, 116*, e855-e863.
- Reich, K., Culross, P. L., & Behrman, R. E. (2002). Children, youth, and gun violence: Analysis and recommendations. *Future of Children, 12*(2), 5-24.
- StataCorp. (2007). *Stata Statistical Software: Release 10*. College Station, TX: StataCorp LP.
- Steinman, K. J., & Zimmerman, M. A. (2003). Episodic and persistent gun-carrying among urban African American adolescents. *Journal of Adolescent Health, 32*, 356-364.
- Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2009). *Results from the 2008 National Survey on Drug Use and Health: National Findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration.
- Vaughan, R. D., McCarthy, J. F., Armstrong, B., Walter, H. J., Waterman, P. D., & Tiezzi, L. (1996). Carrying and using weapons: A survey of minority junior

high school students in New York City. *American Journal of Public Health*, 86, 568-572.

Vaughn, M. G., Howard, M. O., & Harper-Chang, L. (2006). Do prior trauma and victimization predict weapon carrying among delinquent youth? *Youth Violence and Juvenile Justice*, 4, 314-327.

Wilkinson, D. L., & Fagan, J. (2001). What we know about gun use among adolescents. *Clinical Child and Family Psychology Review*, 4(2), 109-132.

Bios

Michael G. Vaughn, PhD, is currently an associate professor in the School of Social Work and Holds appointments in Public Policy and the Department of Community Health, Division of Epidemiology, Saint Louis University School of Public Health, St. Louis, Missouri, United States. His research of more than 100 publications has examined juvenile psychopathy, school dropout, adolescent substance abuse, self-regulation, and violence.

Brian E. Perron, PhD, is an associate professor at the University of Michigan, School of Social Work, Ann Arbor, Michigan, United States. His research focuses on issues related to the serious mental illnesses and substance use disorders. He is involved in a variety of research activities, including analysis of nationally representative data and clinic-based surveys, and collaborating on field-based interventions.

Arnelyn Abdon, MA, is a research consultant with the Bank of Manila, Philippines and is interested in applications of econometric models to policy questions.

René Olate, PhD, is an assistant professor of Social Work at Ohio State University, Columbus, Ohio, United States. His interests include youth violence and the study of Latino gangs in comparative context.

Ralph Groom, MA, is an MSW student at Saint Louis University, who is interested in juvenile justice and cruelty to animals.

Li-Tzy Wu, ScD, is an associate professor in the Department of Psychiatry and Behavioral Sciences at Duke University Medical Center, Durham, North Carolina, United States. She has published extensively on the epidemiology of forms of substance abuse and treatment effectiveness.