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Firearm Possession Among Adolescents Presenting to an Urban Emergency Department for Assault

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KEY WORDS

firearms, adolescents, violence, emergency department

ABBREVIATIONS

CTS—Conflict Tactics Scale

ED—emergency department

RA—research assistant

Dr Carter carried out the analyses, drafted the manuscript, and reviewed and revised the manuscript; Drs Walton and Zimmerman were responsible for the initial conceptualization and design of the study, design of data collection elements, and reviewed and revised the manuscript; Drs Newton and Whiteside assisted with the analysis, drafting of the manuscript, and critical review of the manuscript; Mr Clery assisted with the drafting of the manuscript and critical review of the manuscript; Dr Cunningham was responsible for the initial conceptualization and design of the study, design of data collection elements, aided in the analysis, and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: Violence involving firearms is a leading cause of death among US youth ages 14 to 24. The emergency department is the primary medical setting for care of assault-injured youth and an underused but important setting for violence-prevention programs.



WHAT THIS STUDY ADDS: Among assault-injured youth seeking emergency department care, firearm possession rates are high, most obtained outside of legal channels. Higher rates of negative retaliatory attitudes and substance use among those youth with firearms increases risk of future lethal violence.

abstract



BACKGROUND AND OBJECTIVES: Firearm violence is a leading cause of death among youth. The objectives of this study were (1) determine firearm possession rates and associated correlates among youth seeking care for assault in an emergency department (ED); (2) understand differences in risk factors for youth with firearm possession; and (3) identify firearm possession characteristics in this population: type, reason for possession, and source of firearms.

METHODS: Youth (14 to 24 years old) presenting to a Level 1 ED with assault were administered a computerized screening survey. Validated instruments were administered, measuring demographics, firearm rates and characteristics, attitudes toward aggression, substance use, and previous violence history.

RESULTS: Among 689 assault-injured youth, 23% reported firearm possession in the past 6 months. Only 17% of those reporting firearm possession obtained the gun from a legal source; 22% reported ownership of highly lethal automatic/semiautomatic weapons and 37.1% reported having a firearm for protection. Logistic regression analysis identified significant correlates of firearm possession, including male gender, higher socioeconomic status, illicit drug use, recent serious fight, and retaliatory attitudes.

CONCLUSIONS: ED assault-injured youth had high rates of firearm possession (23.1%), most of which were not obtained from legal sources. Youth with firearm possession were more likely to have been in a recent serious fight, and to endorse aggressive attitudes that increase their risk for retaliatory violence. Future prevention efforts should focus on minimizing illegal firearm access among high-risk youth, nonviolent alternatives to retaliatory violence, and substance use prevention. *Pediatrics* 2013;132:213–221

Homicide is the second leading cause of death for all US youth aged 10 to 24 years old and the leading cause of death for African American youth.¹ In 2010, firearms were responsible for 85% of homicide-related deaths among adolescents.¹ US firearm homicide rates are 19.5 times higher than other industrialized nations, with adolescent (15–24 years old) firearm homicide rates 42.7 times higher than children in 22 other developed nations.^{2–4} Data from the National Violent Death Reporting System suggest that firearm-related violence is most likely to occur in familiar settings, with 47% of firearm homicides occurring in a home, apartment, or surrounding structure and 25% occurring on local public streets.⁵

National medical organizations,^{6–8} including the American Academy of Pediatrics, recognize the importance of violence prevention and have identified assault-injured youth as a population requiring urgent attention.^{9–11} In 2011, >900 000 youth, ages 10 to 24, visited the emergency department (ED) because of violence-related injury.¹² Youth with assault-related injury are at high risk for reinjury.^{13–18} Sims et al¹⁹ found violently injured youth admitted to trauma units have readmission rates as high as 44% due to assault and 20% mortality due to homicide over a 5-year follow-up; retrospective chart reviews note similar rates.^{19–24}

The ED is the primary medical setting for injured adolescents,^{25–28} and an important setting for violence-prevention programs.^{29–35} Given high rates of reinjury and potential for retaliatory violence, understanding the rates and correlates of firearm possession, past experiences with firearm violence, and source and reason for possession among high-risk assault-injured youth is critical to inform prevention efforts. Previous community-based adolescent firearm prevalence studies have focused primarily on high

school-based samples^{34–38} and may neglect higher risk youth who do not attend school.^{29,39,40} Previous ED-based samples^{30,41} have focused on all adolescents regardless of presenting complaint, and lacked information about firearm acquisition, type, or motivation for possession. No previous studies have focused specifically on firearm possession among high-risk ED assault-injured youth, a critical subgroup to understand for future violence-prevention initiatives.

Primary study objectives were (1) determine the rate and correlates of firearm possession among assault-injured youth presenting to an inner-city ED; (2) understand differences in risk factors among these youth seeking care with and without firearm possession; and (3) identify firearm possession characteristics in this population, including firearm type, reason for firearm possession, and sources of firearms as a means to inform intervention efforts around illegal gun diversion.

METHODS

Study Design and Setting

This study presents screening data collected as part of a 2-year longitudinal study focused on assault-injured youth seeking ED care. Hurley Medical Center is the only public hospital in Flint, Michigan, and is the major Level-1 trauma center for the region, providing care for ~75 000 adult and ~25 000 pediatric patients annually. Study procedures were approved by the institutional review board for both Hurley Medical Center and the University of Michigan; a National Institutes of Health certificate of confidentiality was obtained. Flint crime and poverty rates are comparable to other urban centers, such as Detroit, Camden, and Oakland.⁴² The study population reflects the population of Flint, Michigan, which is 50% to 60% African American,⁴³ and our study population

demographics are similar to previous studies conducted among all presenting patients to this ED.^{44,45}

Study Population

ED patients aged 14 to 24 years (February 2010–September 2011) presenting for assault-related injury completed the screening survey. Trained research assistants (RAs) approached patients in treatment areas. Exclusions included sexual assault, child abuse, suicidal ideation/attempt, or conditions precluding ethical consent (Fig 1). Youth <18 years old unaccompanied by a parent/guardian were excluded (13.7%). Unstable trauma patients were recruited on the inpatient floor if they stabilized within 72 hours.

Study Recruitment

Assault-injured patients were identified through electronic patient logs. Recruitment was 7 days per week; 21 hours per day on Tuesdays and Wednesdays and 24 hours per day Thursdays through Mondays.

Study Protocol

After providing written consent, patients self-administered a computerized survey and received a \$1.00 gift. The survey was administered privately; family or friends accompanying the patient were not allowed to observe or participate during administration and this was monitored by the RA. The RA paused the computer survey during medical evaluation or during medical procedures to ensure privacy and to avoid interfering with medical care.

Outcome Measures

Firearm Possession

The dependent variable, firearm possession, was defined as gun carriage or gun ownership within the past 6 months. All firearm questions and responses were from the Tulane

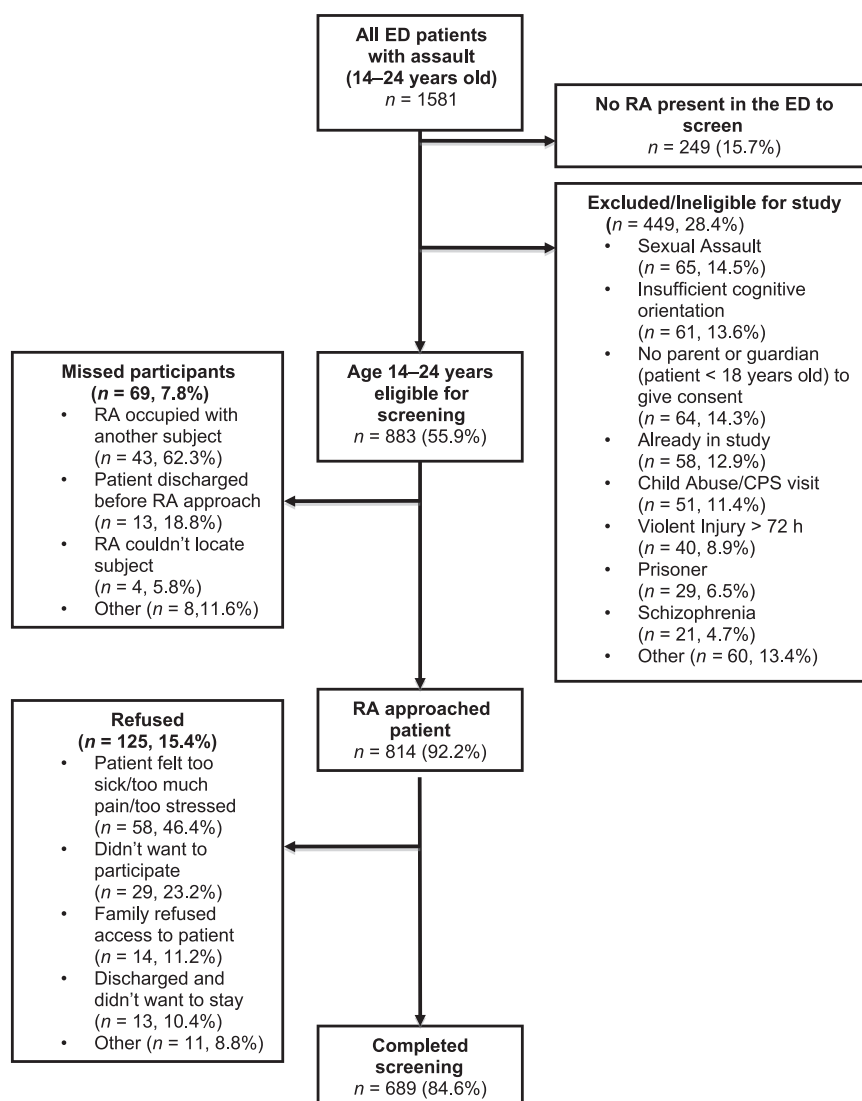


FIGURE 1
Recruitment flowchart, February 2010 to September 2011.

National Youth Study and excluded use for hunting or sporting activities. Affirmative answers to any of the 5 questions were coded as possession of a firearm.

Gun carriage was assessed with 3 questions: (1) frequency of gun carriage outside the home; (2) reason for gun carriage outside the home; and (3) source of a handgun carried outside the home.^{39,46,47} The response scale for frequency of gun carriage was modified to mirror the conflict tactics scale-2 (never, 1 time, 2 times, 3–5, 6–10, 11–20, more than 20 times). Response choices for

reason for gun carriage outside the home (Didn't carry a gun; Protection; Holding it for someone; Used gun in a crime; To scare someone; To get back at someone; Most of my friends carry guns) and source of handgun carried outside the home (Didn't carry a handgun; Given or loaned by a family member; Snuck it from home; Given/loaned from a friend; Paid cash for it; Traded something for it; Stole it) were also used to characterize gun-related activities.

Gun ownership was assessed with 2 questions: (1) type of gun owned and (2) source of a handgun paid for with cash.

An affirmative answer to either was characterized as gun ownership. The response scale for type of gun owned (No possession or ownership of a gun; Regular rifle; Automatic or semiautomatic rifle; Regular shotgun; Sawed-off shotgun; Revolver; Automatic or semiautomatic handgun) and source of a handgun paid for with cash (I didn't pay cash for the handgun; Family member; Friend; Drug addict; Drug dealer; Street dealer; Pawnshop or gun shop; Asked someone to buy it; Department or sporting goods store) were further used to characterize gun ownership. Illegal firearm access was defined as any source other than a department/sporting goods store or gun shop/pawnshop. Descriptive questions were asked about the perceived level of difficulty obtaining a handgun and history of purchasing a firearm from a legal or illegal dealer.^{39,46,47}

Demographic Information

Age, gender, race, ethnicity, employment, and receipt of public assistance were collected using measures from the National Longitudinal Study of Adolescent Health and National Institutes of Health Drug Abuse Treatment Outcome Study of Adolescents.^{48–51}

Characterization of Assault Resulting in Index ED Visit

Participants were asked about relationships (ie, spouse, girlfriend/boyfriend, friend, stranger) and aggressive behaviors (ie, threatened or used a gun) in the altercation prompting presentation. A modified Conflict Tactics Scale (CTS)⁵² similar to the Timeline Followback Spousal Violence Interview⁵³ was used. This has excellent test-retest reliability.^{53,54}

Chart Review

Chart review data (admit/discharge) were collected. Five percent of charts were audited; the error rate was 3.1%.⁵⁵ A trained RA calculated injury severity scores from ED chart data.⁵⁶

Attitudes Toward Violence and Revenge

Attitudes toward aggression were assessed by using a retaliation subscale of children's perceptions of environmental violence.^{57,58} Items were reverse-coded (higher scores indicated more willingness to endorse retaliation). A mean summary score was created for each participant and then all mean summary scores were averaged for the bivariate comparison.

Violence and Firearm-Related Violence

Previous 6-month violence measures (serious physical fight, causing injury requiring treatment) were from the National Longitudinal Study of Adolescent Health.^{49,50} Gang affiliation was assessed by using questions from the Tulane Youth Study.^{39,46,47} Previous 6-month intimate partner violence was assessed with the revised CTS-2.⁵⁹ Frequency of firearm-related aggression or victimization within the past 6 months was assessed by using the modified CTS-2 response scale.

Substance Use

Past 6-month substance use, including alcohol, illicit drug use (cocaine, methamphetamine, inhalants, hallucinogens, marijuana, or street opioids) and non-medical prescription drug use was assessed by using the Alcohol Use Disorders Identification Test and Alcohol, Smoking, and Substance Use Involvement Screening Tests.^{60–63} Binge drinking was defined as 5 or more drinks on 1 occasion in the previous 6 months. Substance use measures were dichotomized. Using standard measures from the adolescent health survey⁴⁹ with the modified CTS-2 response scale, participants were also asked how often they drank alcohol or used drugs while carrying a weapon (gun or knife).

Statistical Analysis

Descriptive statistics were computed and bivariate analyses conducted

comparing gun possession (yes/no) in relation to demographics, visit characteristics, substance use, and violence. A logistic regression model was constructed with firearm possession (yes/no) as the outcome. Independent variables were included in the model based on theory and significance in the bivariate analysis. Illicit drug use and binge drinking were too highly correlated to be included in one regression model; therefore, given drug use was more common in this population, it was retained in the final model. Gang membership, although included in the descriptive analysis, was dropped from the final model, as only 3% of the sample ($n = 24$ of 689) endorsed gang membership. There was no evidence of multicollinearity in the final model.

RESULTS

During recruitment, 1581 assault-injured patients (14–24 years old) presented (Fig 1), most (84.5%) during recruitment hours. Research staff approached 92.2% of eligible patients ($n = 814$); 689 (84.6%) completed the survey. Refusals were more likely male (18.0% vs 12.5%, $P < .05$) and less likely African American (10.3% vs 17.1%, $P < .01$). No age differences were noted in refusal rates. The institutional review board did not allow collection of additional chart data from refusals. The mean screen completion time was 30 minutes (SD = 17.5 minutes).

Rates of Firearm Possession

Among assault-injured youth, 23.1% ($n = 159$) reported firearm possession (Table 1) in the past 6 months. Among those with firearms, 41.5% ($n = 66$) reported carrying outside the home in the past 6 months. Of participants with firearms, 67.3% were seen for peer-related violence and 14.5% for intimate partner-related violence; 3.4% reported threatening someone with a firearm during the altercation that

prompted the visit. Of those with firearms, 4 (2.5%) reported an ED mental health visit within the past year.

Bivariate Analysis

Participants with firearms were more likely male, less likely African American, and less likely to receive public assistance (ie, higher socioeconomic status [SES]). Of those with firearms, 14.5% ($n = 23$) were younger than 18 and 32.1% ($n = 51$) have children.

Attitudes Toward Violence and Revenge

Participants with firearms endorsed higher mean levels of aggression and retaliatory attitudes compared with those without firearms (Table 1). Among those with firearms, more believed “revenge was a good thing” (2.1 vs 1.9, $P < .05$) and that it was “ok to threaten to hurt someone else if they try to hurt you” (2.6 vs 2.3, $P < .01$) and “ok to hurt people if they hurt you first” (2.4 vs 2.2, $P < .01$).

Experience With Violence and Firearm-Related Violence

Participants with firearms noted more overall violent experiences in the previous 6 months (Table 1). They were also noted to have higher rates of group fighting (44.0% vs 25.3%, $P < .001$) and gang membership (9.4% vs 0.9%, $P < .001$), although only 2.9% ($n = 20$) of the overall sample ($n = 689$) endorsed gang membership. Participants with firearms were also more likely the victim or the aggressor in firearm-related violence in the past 6 months (Table 1).

Substance Use Correlates of Firearm Possession

Past 6-month binge drinking and illicit drug use were positively associated with firearm possession. Those with firearms had higher rates of prescription opioid use (19.5% vs 11.3%, $P < .01$) and consumption of alcohol

TABLE 1 Patient Characteristics for Violently Injured ED Patients With and Without Gun Possession

	Gun Possession, <i>n</i> = 159, 23.1%	No Gun Possession, <i>n</i> = 530, 76.9%	Total, <i>n</i> = 689
Demographics			
Age, mean (SD)	19.9 (2.4)	19.7 (2.7)	19.8 (2.6)
Male gender ^a	113 (71.3)	234 (44.2)	347 (50.4)
African American ^b	85 (53.5)	334 (63.0)	419 (60.8)
Public assistance ^b	101 (63.5)	404 (76.2)	505 (73.3)
Characteristics of ED presentation			
Conflict prompting presentation			
Nonpartner violence	109 (68.6)	350 (66.0)	459 (66.6)
Intimate partner violence ^b	23 (14.5)	135 (25.5)	158 (22.9)
Injury Surveillance Score, mean (SD)	3.0 (4.7)	2.4 (3.5)	2.6 (3.8)
Threatened with gun today ^p	5 (3.4)	2 (0.4)	7 (1.1)
Disposition from the ED (admitted) ^b	37 (23.3)	69 (13.2)	106 (15.4)
Past 6-month substance use			
Binge drinking ^a	63 (39.6)	144 (27.2)	207 (30.0)
Illicit drug use ^a	106 (66.7)	261 (49.3)	367 (53.3)
Attitudes toward aggression			
Aggressive attitudes, ^p mean summary score (SD)	2.6 (0.6)	2.5 (0.5)	2.5 (0.5)
Past 6-month experiences with violence			
Serious physical fight ^c	136 (85.5)	422 (79.6)	558 (81.0)
Caused injury requiring treatment ^a	73 (45.9)	109 (20.6)	182 (26.4)
Any intimate partner violence ^b	120 (75.5)	338 (63.8)	458 (66.5)
Past 6-month experiences with firearm-related violence^d			
Victim of assault ^b	91 (57.2)	225 (42.5)	316 (45.9)
Victim of gun violence ^c	34 (21.4)	78 (14.7)	112 (16.3)
Victim of penetrating trauma ^b	49 (30.8)	97 (18.3)	146 (21.2)
Threatened by gun ^a	93 (58.5)	176 (33.2)	269 (39.0)
Pulled gun in fight ^a	35 (22.0)	5 (0.9)	40 (5.8)
Shot or stabbed another person ^b	13 (8.2)	13 (2.5)	26 (3.8)
Used gun in fight with dating partner ^a	10 (6.3)	4 (0.8)	14 (2.0)

All values are *n* (%) unless noted otherwise.

^a *P* < .001.

^b *P* < 0.01.

^c *P* < 0.05.

^d Including current ED visit.

before a physical fight (33.3% vs 19.8%, *P* < .01). They also reported using substances while carrying a weapon (gun or knife), with 16.4% reporting alcohol use and 17.6% reporting drug use at least once.

Firearm Types and Methods of Acquisition of Firearms

Youth reported firearm possession primarily for protection (37.1%), although some note they were “holding it for someone” (10.1%), or because their “friends carry guns” (8.8%). Among those carrying a gun outside the home, respondents primarily reported access to a handgun through either cash purchase (17.7%) or receiving it from

a friend (17.1%). Only 17% (*n* = 27) reported purchasing a handgun with cash from a plausibly legal source (department/sporting goods store or pawnshop/gun shop), whereas the remainder purchased the firearm illegally (either from a clearly illegal source or underage purchases from a legal source [*n* = 2]) or did not endorse a method of acquisition. More than half the sample (51.6%) reported that it would be little or no trouble to obtain a firearm.

Among the assault-injured youth in our sample (Table 2), respondents were noted to possess high levels of rapid-fire weapons with 17.6% (*n* = 28) of youth noting ownership of automatic or semiautomatic weapons (rifles

or handguns). Of these youth with automatic/semiautomatic weapons, 32.1% (*n* = 9) endorsed the view that “revenge was a good thing,” 14.3% (*n* = 4) reported that they carried a gun “to scare someone” or “to get back at someone,” and 1 of these participants had a mental health visit within the past year at the site ED. Of those with automatic or semiautomatic weapons, only 5 (17.9%) reported acquiring them from a clearly legal source.

Multivariate Logistic Regression Analysis

In the multivariate logistic regression model (Table 3), illicit drug use, past 6-month serious fight, and high levels of retaliatory attitudes were associated with firearm possession among assault-injured ED youth. Male individuals and those with higher SES status (ie, not receiving public assistance) were more likely to possess a gun. Age and race were not significant predictors of firearm possession.

DISCUSSION

This is the first study to report firearm-possession rates, associated risk behaviors, and to characterize the types of firearms and methods of firearm acquisition among a consecutive, systematically obtained sample of high-risk assault-injured youth presenting to the ED. Results have implications for firearm diversion policy as well as hospital- and community-based initiatives to prevent potentially recurrent lethal violence among assault-injured youth.

Rates of firearm possession were notably higher in our study than previous ED studies, likely reflecting our focus on a high-risk sample of youth seeking care for assault rather than general ED patient populations.^{31,41,64} The high rates of firearm possession in this population, combined with the finding that assaulted youth with firearms had

TABLE 2 Characteristics of Gun Possession Among Violently Injured Patients Presenting to ED, *n* = 159

Type of gun possession	
Rifle	24 (15.1)
Automatic or semiautomatic rifle	16 (10.1)
Shotgun	29 (18.2)
Sawed-off shotgun	9 (5.7)
Revolver (regular handgun)	18 (11.3)
Automatic or semiautomatic handgun	19 (12.0)
Did not endorse a specific type of gun	96 (60.4)
Method of handgun acquisition (cash purchases)	
Family member	15 (9.4)
Friend	37 (23.3)
Drug addict	8 (5.0)
Drug dealer	13 (8.2)
Street dealer	17 (10.7)
Pawnshop or gun shop	12 (7.6)
Someone purchased for me	4 (2.5)
Department or sporting goods store	17 (10.7)
Did not endorse paying cash for a handgun	69 (43.4)

All values are *n* (%). Participants were allowed to select all answers that applied to their gun possession. Questions excluded gun possession for hunting or target-shooting activities.

higher rates of retaliatory attitudes and substance use, highlight the importance of focusing ED and community violence prevention interventions among this subgroup. Most firearms in our study were likely obtained illegally, with almost a quarter of the sample

TABLE 3 Multivariate Logistic Regression Predicting Gun Possession Among Adolescent ED Patients (14 to 24 Years Old) Presenting for a Violent Injury

Risk Factors for Gun Possession	AOR (95% CI)
Age	1.04 (0.97–1.12)
Male gender ^a	2.76 (1.83–4.18)
Not receiving public assistance ^b	1.51 (1.01–2.26)
African American	0.84 (0.57–1.23)
Illicit drug use ^b	1.63 (1.10–2.42)
Retaliatory attitudes ^b	1.58 (1.09–2.28)
Serious fight within previous 6 mo ^b	1.73 (1.02–2.93)

AOR, adjusted odds ratio; CI, confidence interval.

^a *P* < .001.

^b *P* < 0.05.

endorsing ownership of automatic/semiautomatic weapons that are large-clip, high rate-of-fire weapons, or may be modified to these highly lethal weapon types (ownership of guns for target shooting or hunting was excluded). This, along with high carriage rates (41.5%), suggests opportunities for improved law enforcement around firearm diversion and improved policies around weapon access among high-risk youth.

Participants in our study, consistent with school-based studies,⁶⁵ endorsed protection as a primary reason for ownership. These school-based studies found an association between carrying firearms and exposure to community violence.⁶⁵ The perceived need to own and carry firearms for protection among respondents with assault injury suggests a need to address youth's perceived and real feeling of safety through individual and community intervention.

Although causality cannot be determined because of the cross-sectional nature of the study, among an already high-risk group of assault-injured patients, those with firearms were more likely engaged in violent and aggressive firearm-related activities over the previous 6 months. They were also more likely to have pulled a firearm in a fight, shot or stabbed another person, used a gun in a fight with an intimate partner, or caused injury requiring treatment than their peers without firearms. It is important to note that few youth were involved in a gang. Taken together, these findings demonstrate that even if the main reason youth reported that they obtained a gun was for protection, they are often both carrying and using the weapon. In combination with high rates of substance use reported before the altercation, and higher rates of substance use seen in youth with firearms, this is particularly concerning for inadvertently increasing

the risk of a firearm moving from a protective device to impulsive use and lethal outcomes.

As in previous studies, male youth were more likely to have firearm possession.^{39,41,64,66} It is important to note, however, that 30% of youth with firearms were female, highlighting the need to include both genders in injury-prevention efforts. Of note, and contrary to previous ED studies, youth with higher SES status were more likely to own a gun.^{41,64} As would be hypothesized, race was not predictive of firearm possession. Overall, white males, not on public aid seeking care for assault were more likely to possess a gun than their African American male counterparts receiving public assistance.

Participants with firearms were noted to have more aggressive attitudes compared with those without firearms, suggesting aggressive attitudes and subsequent retaliation are major contributors to violent firearm-related injury. ED studies have shown that assault-related injuries among youth are often the result of long-standing disagreements²⁸ and that retaliation may be an underlying cause for violence.^{67,68} These findings are important because health behavior models,⁶⁹ which are key to many violence-prevention efforts, suggest the first step to decreasing future aggression would be to modify aggressive attitudes.

Although peer violence was the source of the altercation prompting medical care in most cases, we found dating/intimate partner violence was also highly associated with firearm possession. This finding is concerning for escalation of future partner violence to lethal means with the firearm they note that they possess. Also, many of these youth are parents themselves, raising concern for the safe gun storage and the need to restrict firearm access from their young children.

Our study finds higher rates of binge drinking and other illicit drug use among assault-injured patients with firearms. In this regard, youth with firearms, who are more likely to also be binge drinking and/or using illicit drugs, including drinking before a fight, increases concerns about potential firearm discharge. Interventions addressing firearms among youth should also assess and intervene for alcohol and other drug use to decrease the risk of harm with impulsive behavior that may occur with youth and substance use.

Several study limitations are noted. Although our sample reflected the racial composition of the city in which it was located, future studies are needed with samples containing other racial/ethnic groups. Causal attributions are not possible with a cross-sectional study design and the single urban site limits generalizability to other settings. Exclusion of patients presenting for suicidal

ideation and acute sexual assault may underestimate true firearm-possession rates. Although a potential limitation, the use of a self-report survey has been shown to have high reliability and validity among adolescents for self-reported risk behaviors, including alcohol and drug use.^{70–77}

These findings have implications for injury-prevention efforts at the community and law-enforcement levels in terms of the high numbers of firearms obtained illegally, the ease of obtaining illegal and highly lethal firearms, including automatic/semiautomatic weapons, diversion of legally obtained firearms, as well as hospital ED-based initiatives among assaulted youth seeking care. Previous research has demonstrated the immediate post-injury time is an ideal time to capitalize on a teachable moment with preventive interventions.^{28,78} Previous ED screening, brief intervention, and referral to treatment approaches have focused on

substance use,^{79–81} with a recent study showing positive findings for intervening for both substance use and youth violence among younger less violence-involved youth.^{45,82} Interventions for hospitalized assault-injured youth have shown promise linking hospitalized youth with community-level resources.^{17,30,83–86} Future ED-based injury-prevention interventions or case management approaches for youth with assault-related injuries may have the potential to decrease the likelihood that a youth who is seeking care today with an assault-related injury will use a firearm lethally or be a victim of firearm violence.

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REFERENCES

- Centers for Disease Control and Prevention. Ten leading causes of death: Web-based Injury Statistics Query and Reporting System (WISQARS). 2007. Available at: <http://webappa.cdc.gov/sasweb/ncipc/leadcaus10.html>. Accessed February 5, 2012
- Krug E, Powell K, Dahlberg L. Firearm-related deaths in the United States and 35 other high- and upper-middle- income countries. *Int J Epidemiol*. 1998;27(2):214–221
- Mercy JA, Krug EG, Dahlberg LL, Zwi AB. Violence and health: the United States in a global perspective. *Am J Public Health*. 2003;93(2):256–261
- Richardson EG, Hemenway D. Homicide, suicide, and unintentional firearm fatality: comparing the United States with other high-income countries, 2003. *J Trauma*. 2011;70(1):238–243
- Centers for Disease Control and Prevention. WISQARS, NVDRS. Available at: <http://wisqars.cdc.gov:8080/nvdrs/nvdrsDisplay.jsp>. Accessed March 12, 2013
- American Medical Association. AMA violence related reports and policies. Council on Science and Public Health Reports. "Update on Youth and School Violence" 2007. Available at: www.ama-assn.org/ama/pub/physician-resources/public-health/promoting-healthy-lifestyles/violence-prevention/ama-reports-policies.page?. Accessed March 12, 2013
- American Academy of Family Physicians. Violence [position paper]. 2000. Available at: www.aafp.org/online/en/home/policy/policies/v/violencepositionpaper.html. Accessed April 8, 2008
- American College of Emergency Physicians. Practice resources - Violence. 2007. Available at: www.acep.org/practres.aspx?id=29848. Accessed April 8, 2008
- Smith GA, Baum CR, Dowd MD, et al; Committee on Injury, Violence, and Poison Prevention. Policy statement—Role of the pediatrician in youth violence prevention. *Pediatrics*. 2009;124(1):393–402
- Muelleman RL, Reuwer J, Sanson TG, et al; SAEM Public Health and Education Committee. An emergency medicine approach to violence throughout the life cycle. *Acad Emerg Med*. 1996;3(7):708–715
- Fein JA, Ginsburg KR, McGrath ME, Shofer FS, Flamma JC Jr, Datner EM. Violence prevention in the emergency department: clinician attitudes and limitations. *Arch Pediatr Adolesc Med*. 2000;154(5):495–498
- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). 2005. Available at: www.cdc.gov/injury/wisqars/index.html. Accessed April 8, 2008
- Cooper C, Eslinger D, Nash D, al-Zawahri J, Stolley P. Repeat victims of violence: report of a large concurrent case-control study. *Arch Surg*. 2000;135(7):837–843
- Luna G, Adye B, Haun-Hood M, Berry M, Taylor L, Thorn R. Intentional injury treated in community hospitals. *Am J Surg*. 2001;181(5):463–465
- Madan AK, Yu K, Beech DJ. Alcohol and drug use in victims of life-threatening trauma. *J Trauma*. 1999;47(3):568–571
- De Vos E, Stone DA, Goetz MA, Dahlberg LL. Evaluation of a hospital-based youth violence intervention. *Am J Prev Med*. 1996;12(suppl 5):101–108

17. Datner E, Fein J, McGrath M. Violence intervention project: linking healthcare facilities with community-based resources. *Acad Emerg Med.* 1999;6:511
18. Becker MG, Hall JS, Ursic CM, Jain S, Calhoun D. Caught in the crossfire: the effects of a peer-based intervention program for violently injured youth. *J Adolesc Health.* 2004;34(3):177–183
19. Sims DW, Bivins BA, Obeid FN, Horst HM, Sorensen VJ, Fath JJ. Urban trauma: a chronic recurrent disease. *J Trauma.* 1989;29(7):940–946, discussion 946–947
20. Claassen CA, Larkin GL, Hodges G, Field C. Criminal correlates of injury-related emergency department recidivism. *J Emerg Med.* 2007;32(2):141–147
21. Goins WA, Thompson J, Simpkins C. Recurrent intentional injury. *J Natl Med Assoc.* 1992;84(5):431–435
22. Morrissey TB, Byrd CR, Deitch EA. The incidence of recurrent penetrating trauma in an urban trauma center. *J Trauma.* 1991;31(11):1536–1538
23. Poole GV, Griswold JA, Thaggard VK, Rhodes RS. Trauma is a recurrent disease. *Surgery.* 1993;113(6):608–611
24. Reiner DS, Pastena JA, Swan KG, Lindenthal JJ, Tischler CD. Trauma recidivism. *Am Surg.* 1990;56(9):556–560
25. Mollen CJ, Fein JA, Vu TN, Shofer FS, Datner EM. Characterization of nonfatal events and injuries resulting from youth violence in patients presenting to an emergency department. *Pediatr Emerg Care.* 2003;19(6):379–384
26. American Academy of Pediatrics Task Force on Adolescent Assault Victim Needs. Adolescent assault victim needs: a review of issues and a model protocol. *Pediatrics.* 1996;98(5):991–1001
27. Pelucio M, Roe G, Fiechtl J, et al. Assessing survey methods and firearm exposure among adolescent emergency department patients. *Pediatr Emerg Care.* 2011;27(6):500–506
28. Cheng TL, Johnson S, Wright JL, et al. Assault-injured adolescents presenting to the emergency department: causes and circumstances. *Acad Emerg Med.* 2006;13(6):610–616
29. Wilson KM, Klein JD. Adolescents who use the emergency department as their usual source of care. *Arch Pediatr Adolesc Med.* 2000;154(4):361–365
30. Cunningham RM, Vaidya RS, Walton M, Maio RF. Training emergency medicine nurses and physicians in youth violence prevention. *Am J Prev Med.* 2005;29(5 suppl 2):220–225
31. Cheng TL, Schwarz D, Brenner RA, et al. Adolescent assault injury: risk and protective factors and locations of contact for intervention. *Pediatrics.* 2003;112(4):931–938
32. Cheng TL, Wright JL, Markakis D, Copeland-Linder N, Menvielle E. Randomized trial of a case management program for assault-injured youth: impact on service utilization and risk for reinjury. *Pediatr Emerg Care.* 2008;24(3):130–136
33. Walton MA, Goldstein AL, Chermack ST, et al. Brief alcohol intervention in the emergency department: moderators of effectiveness. *J Stud Alcohol Drugs.* 2008;69(4):550–560
34. Borowsky IW, Ireland M. Predictors of future fight-related injury among adolescents. *Pediatrics.* 2004;113(3 pt 1):530–536
35. Swahn MH, Hammig BJ, Ikeda RM. Prevalence of youth access to alcohol or a gun in the home. *Inj Prev.* 2002;8(3):227–230
36. Sheley JF, Wright JD. *Gun Acquisition and Possession in Selected Juvenile Samples.* Washington, DC: US Department of Justice, Office of Juvenile Justice and Delinquent Prevention; 1993
37. Bergstein JM, Hemenway D, Kennedy B, Quaday S, Ander R. Guns in young hands: a survey of urban teenagers' attitudes and behaviors related to handgun violence. *J Trauma.* 1996;41(5):794–798
38. Callahan CM, Rivara FP. Urban high school youth and handguns. A school-based survey. *JAMA.* 1992;267(22):3038–3042
39. Sheley JF, Brewer VE. Possession and carrying of firearms among suburban youth. *Public Health Rep.* 1995;110(1):18–26
40. Wright MA, Wintemute GJ, Claire BE. Gun suicide by young people in California: descriptive epidemiology and gun ownership. *J Adolesc Health.* 2008;43(6):619–622
41. Loh K, Walton MA, Harrison SR, et al. Prevalence and correlates of handgun access among adolescents seeking care in an urban emergency department. *Accid Anal Prev.* 2010;42(2):347–353
42. Federal Bureau of Investigation. Crime in the United States 2006: Uniform Crime Report 2006. 2006. Available at: www.fbi.gov/ucr/cius2006/index.html. Accessed April 8, 2008
43. US Census Bureau Health. Department of Commerce. 2010 Demographic Profile Data. Available at: http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1. Accessed May 29, 2013
44. Cunningham RM, Murray R, Walton MA, et al. Prevalence of past year assault among inner-city emergency department patients. *Ann Emerg Med.* 2009;53(6):814–823.e15
45. Walton MA, Chermack ST, Shope JT, et al. Effects of a brief intervention for reducing violence and alcohol misuse among adolescents: a randomized controlled trial. *JAMA.* 2010;304(5):527–535
46. Sheley JF, Wright JD. *In the Line of Fire: Youth, Guns, and Violence in Urban America.* New York, NY: National Institute of Justice; 1995
47. Sheley JF, Wright JD. High School Youth, Weapons, and Violence: A National Survey of Weapon Related Experiences, Behaviors, and Concerns. Final Report for the National Institute of Justice. May 1998
48. Harris K, Florey F, Tabor J, Bearman P, Jones J, Udry J. The national longitudinal study of adolescent health: research design. 2003. Available at: www.cpc.unc.edu/projects/addhealth/design. Accessed 2008, May 21
49. Bearman PS, Jones J, Udry J (1997). The National Longitudinal Study of Adolescent Health: Research Design. Accessed at: [HYPERLINK www.cpc.unc.edu/projects/addhealth/codebooks/wave1](http://www.cpc.unc.edu/projects/addhealth/codebooks/wave1). Accessed March 23, 2005.
50. Sieving RE, Beuhring T, Resnick MD, et al. Development of adolescent self-report measures from the National Longitudinal Study of Adolescent Health. *J Adolesc Health.* 2001;28(1):73–81
51. Handelsman L, Stein JA, Grella CE. Contrasting predictors of readiness for substance abuse treatment in adults and adolescents: a latent variable analysis of DATOS and DATOS-A participants. *Drug Alcohol Depend.* 2005;80(1):63–81
52. Straus MA. Measuring intrafamily conflict and violence: the conflict tactics (CT) scales. *J Marriage Fam.* 1979;41:633–644
53. Chermack ST, Wryobeck JM, Walton MA, Blow FC. Distal and proximal factors related to aggression severity among patients in substance abuse treatment: family history, alcohol use and expectancies. *Addict Behav.* 2006;31(5):845–858
54. Chermack ST, Blow FC. Violence among individuals in substance abuse treatment: the role of alcohol and cocaine consumption. *Drug Alcohol Depend.* 2002;66(1):29–37
55. Gilbert EH, Lowenstein SR, Koziol-McLain J, Barta DC, Steiner J. Chart reviews in emergency medicine research: where are the methods? *Ann Emerg Med.* 1996;27(3):305–308
56. Baker SP, O'Neill B, Haddon W Jr, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. *J Trauma.* 1974;14(3):187–196
57. Copeland-Linder N, Jones VC, Haynie DL, Simons-Morton BG, Wright JL, Cheng TL. Factors associated with retaliatory attitudes among African American adolescents

- who have been assaulted. *J Pediatr Psychol*. 2007;32(7):760–770
58. Hill HM, Noblin V. *Children's Perceptions of Environmental Violence*. Howard University; Washington, DC: 1991
 59. Straus MA, Hamby SL, Boney-McCoy S, Sugarman DB. The revised Conflict Tactics Scales (CTS2) - Development and preliminary psychometric data. *J Fam Issues*. 1996;17(3):283–316
 60. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption—II. *Addiction*. 1993;88(6):791–804
 61. Chung T, Colby SM, Barnett NP, Rohsenow DJ, Spirito A, Monti PM. Screening adolescents for problem drinking: performance of brief screens against DSM-IV alcohol diagnoses. *J Stud Alcohol*. 2000;61(4):579–587
 62. WHO ASSIST Working Group. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): development, reliability and feasibility. *Addiction*. 2002;97(9):1183–1194
 63. Humeniuk R, Ali R, Babor TF, et al. Validation of the Alcohol, Smoking And Substance Involvement Screening Test (ASSIST). *Addiction*. 2008;103(6):1039–1047
 64. Cunningham RM, Resko SM, Harrison SR, et al. Screening adolescents in the emergency department for weapon carriage. *Acad Emerg Med*. 2010;17(2):168–176
 65. Sheley JF, Wright JD, Educational Resources Information Center: US Office of Juvenile Justice and Delinquent Prevention (Department of Justice). Washington, DC. Gun Acquisition and Possession in Selected Juvenile Samples. Research in Brief. December 1993. [S.I.]: Distributed by ERIC Clearinghouse; 1993. Available at: www.ncjrs.gov/pdffiles1/Digitization/145326NCJRS.pdf. Accessed February 5, 2012
 66. Brown B. Juveniles and weapons: recent research, conceptual considerations, and programmatic interventions. *Youth Violence Juv Justice*. 2004;2(2):161–184
 67. Johnson SB, Frattaroli S, Wright JL, Pearson-Fields CB, Cheng TL. Urban youths' perspectives on violence and the necessity of fighting. *Inj Prev*. 2004;10(5):287–291
 68. Rich JA, Stone DA. The experience of violent injury for young African-American men: the meaning of being a "sucker." *J Gen Intern Med*. 1996;11(2):77–82
 69. Gielen AC, Sleet D. Application of behavior-change theories and methods to injury prevention. *Epidemiol Rev*. 2003;25:65–76
 70. Gray TA, Wish ED. *Substance Abuse Need for Treatment among Arrestees (SANTA) in Maryland*. College Park, MD: Center for Substance Abuse Research; 1998
 71. Thornberry TP, Krohn MD. The self-report method of measuring delinquency and crime. In: Duffee D, ed. *Measurement and Analysis of Crime and Justice: Criminal Justice 2000*. Washington, DC: US Department of Justice, Office of Justice Programs; 2000:33–83
 72. Buchan BJ, L Dennis M, Tims FM, Diamond GS. Cannabis use: consistency and validity of self-report, on-site urine testing and laboratory testing. *Addiction*. 2002;97(suppl 1):98–108
 73. Brener ND, Billy JO, Grady WR. Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: evidence from the scientific literature. *J Adolesc Health*. 2003;33(6):436–457
 74. Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. *Science*. 1998;280(5365):867–873
 75. Wright DL, Aquilino WS, Supple AJ. A comparison of computer-assisted and paper-and-pencil self-administered questionnaires in a survey on smoking, alcohol, and drug use. *Public Opin Quarterly*. 1998;62(3):331–353
 76. Webb PM, Zimet GD, Fortenberry JD, Blythe MJ. Comparability of a computer-assisted versus written method for collecting health behavior information from adolescent patients. *J Adolesc Health*. 1999;24(6):383–388
 77. Harrison LD, Martin SS, Enev T, Harrington D. *Comparing Drug Testing and Self-report of Drug Use Among Youths and Young Adults in the General Population*. Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies; 2007. Department of Health and Human Services Publication No. SMA 07-4249, Methodology Series M-7.
 78. Johnston BD, Rivara FP, Drosch RM, Dunn C, Copass MK. Behavior change counseling in the emergency department to reduce injury risk: a randomized, controlled trial. *Pediatrics*. 2002;110(2 pt 1):267–274
 79. Monti PM, Barnett NP, Colby SM, O'Leary TA. Motivational enhancement of alcohol-involved adolescents. In: Monti PM, Colby SM, O'Leary TA, eds. *Adolescents, Alcohol and Substance Abuse: Reaching Teens Through Brief Interventions*. New York, NY: The Guilford Press; 2001:145–182
 80. Cunningham RM, Harrison SR, McKay MP, et al. National survey of emergency department alcohol screening and intervention practices. *Ann Emerg Med*. 2010;55(6):556–562
 81. Yuma-Guerrero PJ, Lawson KA, Velasquez MM, von Sternberg K, Maxson T, Garcia N. Screening, brief intervention, and referral for alcohol use in adolescents: a systematic review. *Pediatrics*. 2012;130(1):115–122
 82. Cunningham RM, Chermack ST, Zimmerman MA, et al. Brief motivational interviewing intervention for peer violence and alcohol use in teens: one-year follow-up. *Pediatrics*. 2012;129(6):1083–1090
 83. Cooper C, Eslinger DM, Stolley PD. Hospital-based violence intervention programs work. *J Trauma*. 2006;61(3):534–537, discussion 537–540
 84. Dicker R. Violence prevention for trauma centers: a feasible start. Paper presented at: Injury and Violence In America; May 11, 2005; Denver, CO. Poster 2901
 85. Zun LS, Downey LV, Rosen J. Violence prevention in the ED: linkage of the ED to a social service agency. *Am J Emerg Med*. 2003;21(6):454–457
 86. Cheng TL, Haynie D, Brenner R, Wright JL, Chung SE, Simons-Morton B. Effectiveness of a mentor-implemented, violence prevention intervention for assault-injured youths presenting to the emergency department: results of a randomized trial. *Pediatrics*. 2008;122(5):938–946

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Firearm Possession Among Adolescents Presenting to an Urban Emergency Department for Assault

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