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Risk and Protective Factors Associated with Youth Firearm Access, Possession or Carrying

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Abstract

Firearm homicide and suicide are the leading causes of violence-related injury deaths among U.S. youth. However, evaluations of the effectiveness of firearm violence prevention programs and strategies to reducing youth firearm violence are limited. To help inform and evaluate such efforts, this study aimed to identify risk and protective factors associated with youth firearm access, possession or carrying (for reasons other than hunting or target shooting) among a sample of U.S. urban youth in the Mountain West. Findings show the influence that youth violence risk (e.g., having friends engaged in delinquency; violence; drug sales; gang fights; exposure to violence; screening positive for violence risk) can have on youth firearm access, possession or carrying. Implications for prevention and intervention are discussed.

Keywords

Gun; firearm; youth; adolescents; violence; delinquency

BACKGROUND

In 2017, firearms were used in 87% of all homicides and 41% of all suicides among United States (U.S.) youth aged 10–17 (CDC, 2019). In fact, firearm homicides and suicides are the two leading causes of violence-related injury deaths among U.S. youth (CDC, 2019).

Furthermore, a recent cross-national study of high-income countries found that 92% of all firearm-related deaths of 5–14 year olds occurred in the U.S., and that the firearm homicide rate among 15–24 year olds in the U.S. was 31.1 times higher than the rate for other high-

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Conflict of Interest:

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income countries (9.4 vs. 0.3 per 100,000) (Grinshteyn and Hemenway, 2019). Beyond the loss of life, the most recently available data shows that, in 2017 alone, violence-related youth firearm homicides and suicides resulted in an estimated \$3.1 billion in combined lifetime medical and work loss costs (CDC, 2019).

Over the past 30 years, research has sought to understand the prevalence of firearm carrying among U.S. youth, including their reasons for having a firearm and how they access them (for reasons other than hunting or target practice). In 2017, 4.8% of all U.S. high school students (7.7% male v. 1.9% female) reported carrying a gun at least one day during the past 12 months for reasons other than hunting or for a sport (Kann, McManus, Harris, et al., 2018). Although males are more likely than females to carry handguns (Carter et al., 2013; Kann et al., 2018; Kemal et al 2018), a recent study showed that the prevalence of handgun carrying among girls increased from 0.9% to 1.7% from 2002 to 2015 (Vaughn et al., 2019). Several demographic differences also exist. For example, the prevalence of carrying a gun was higher among white male (7.0%), black male (9.8%), and Hispanic male (9%) than white female (1.3%), black female (3%), and Hispanic female (2.5%) students, respectively. It was also highest for 12th-grade males than 9th-grade males (9.4% v. 6.4%) (Kann et al., 2018).

Most research on the reasons for youth carrying firearms focuses on environmental or lifestyle factors that situate them in contexts of danger – particularly gang involvement, (Callahan & Rivera, 1992; Wilkinson & Fagan, 1996; Lizotte, Howell, Tobin & Howard, 2000; Decker & Curry, 2002; Tigri, Reid, Turner, & Devinney, 2016), drug dealing (Lizotte et al., 2000; Black & Hausman, 2008; Docherty, Beardslee, Grimm, & Pardini, 2019), drug use (Hemenway, Vrinotis, Johnson, Miller, & Azrael, 2011; Carter et al., 2013; Carter et al., 2015; Khubchandani & Price, 2018), violence (Carter et al., 2013; Carter et al., 2015; Khubchandani & Price, 2018; Kemal et al., 2018), exposure to violence (Bingenheimer, Brennan, & Earls, 2005; Spano, Pridemore, & Bolland, 2012; Loughran, Reid, Collins, & Mulvey, 2016), neighborhood social disorder (Molnar, Miller, Azraek, & Buka, 2004), and peer victimization (Hemenway et al., 2011). For example, Hemenway and colleagues (2011) found that firearm carrying youth in urban locations report lower levels of perceived interpersonal safety compared to those who did not carry a firearm. Other studies have shown that youth report having a firearm to protect themselves from frequent exposure to violence (Kellermann, Fuqua-Whitley, & Parramore, 2006; Copeland-Linder et al., 2007; Wilkinson, McBryde, Williams, Bloom, & Bell, 2009; Carter et al., 2013; Carter et al., 2015) and repeated aggression and bullying (Turner, Phillips, Tigri, Williams & Hartman, 2016; Black & Hausman 2018), even though firearm carrying may not decrease risk for victimization among U.S. high school students (Mocan & Tekin, 2006). The directional relationship between fear, victimization and firearm carrying among students has not been well studied, particularly using longitudinal data where temporal order can be determined (Wilcox et al., 2006). One longitudinal study of 7th graders that were followed in 8th and 9th grades showed that fear of school victimization, perceived risk of school victimization and school victimization in the last year did not increase subsequent firearm carrying among students (Wilcox et al., 2006). Alternatively, firearm carrying in the 8th grade appeared to increase subsequent fear of school victimization, perceived risk of victimization, victimization and offending (Wilcox, et al., 2006). Wilkinson and Fagan's (1996) seminal

research on youth firearm violence found that youth's sense of safety when carrying a gun was characterized by feeling free to go anywhere and do anything, suggesting invincibility and fearlessness in increasingly dangerous environments. However, while some youth may feel energized, excited or powerful while carrying a firearm (Kellermann et al., 2006), others report feeling scared or anxious when doing so (Shapiro, Dorman, Welker, & Clough, 1998; Kellermann et al., 2006; Black & Hausman, 2018). Additionally, in some contexts, carrying a firearm is associated with fulfilling male gender role expectations (Mankowski, 2013). Kinscherff (2013) concluded, "firearm possession may be due to interactions between the need for self-protection in violent communities and increased involvement in delinquent behaviors" (p. 11).

Recent research has focused on community, school, and family risk factors for youth gun violence and carrying. Higher levels of socioeconomic community distress (proportion of adults without a high school diploma, poverty rate, median income ratio, and housing vacancy) (Carter et al., 2017; Tracy et al., 2019), and lower levels of socioeconomic status (Carter et al., 2013; Carter et al., 2017) were found to be strong predictors of youth gun violence. Analysis of data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) examined the relationship between school attachment, depressive symptoms and youth gun carrying and found that the relationship between depression symptoms and gun carrying was no longer significant when accounting for school attachment (Watts, Province, & Toohy, 2019). Similarly, Juan and Hemenway (2017) found that the mediating effect of social connectedness accounts for 7% of depression's overall impact on youth gun carrying at school. Beardslee, Docherty, Vevette, Yang, and Pardini (2019) found a relationship between childhood parental disengagement and adolescent gun carrying, the association was partially mediated through peer delinquency and externalizing problems during adolescence.

Youth violence – including but not limited to youth firearm violence – has been associated with multiple risk factors across the socio-ecological spectrum (Dahlberg & Simon, 2006; David-Ferdon, et al., 2016), which may co-occur and predict other types of negative outcomes (Wilkins, Tsao, Hertz, Davis, & Klevens, 2014; Bushman et al., 2016). These risk factors include youth's individual characteristics (e.g., neurological factors, mental illness, early on-set aggression, abuse of alcohol and drugs, and poor academic achievement), relational experiences (e.g., violence victimization, high-stress or neglectful family contexts, negative parenting practices, deviant peer associations), community context (e.g., social rejection, poor school experience and environment, high-crime communities), and socio-cultural characteristics (e.g., poverty, social distrust, exposure to violent media) (Dahlberg & Krug, 2002; Muschert, 2007; Kinscherff, Guerra, & Williamson, 2013; David-Ferdon, et al., 2016; Bushman et al., 2016).

The impact of these risk factors on youth violence can be serious and lethal (Kinscherff et al., 2013). Furthermore, risk factors for firearm violence are similar to the risk factors for violence in general. Although there is no meaningful or reliable profile of those who will eventually engage in firearm violence, research suggests that developmental, social, and environmental risk factors that increase the risk of aggressive behavior may also lead to firearm violence (Kinscherff et al., 2013).

Firearm access is a key risk factor for youth firearm violence, which has also been associated with other forms of violence among youth – such as: dating violence (Yan, Howard, Beck, Shattuck, & Hallmark-Kerr, 2010), alcohol abuse (Simonetti, Mackelprang, Rowhani-Rahbar, Zatzick, & Rivara, 2015), suicide attempts (Watkins & Lizotte, 2013), depression (Kim, 2018) street shootings (Bushman et al., 2016), school shootings (Bushman et al., 2016; Muschert, 2007; Vossekuil, Fein, Reddy, Borum, & Modzeleski, 2002), and gang violence (Wilkinson & Fagan, 1996). However, the level of risk posed by firearm access could be affected by a variety of complex modifiable and un-modifiable factors (Institute of Medicine, 2013). Youth commonly report accessing firearms through family or friends (Callahan & Rivara, 1992; Smith, 1996), by stealing them (Kleck, 2009; Wright & Rossi, 1986), or purchasing them illegally (Braga & Kennedy, 2001; Carter et al., 2013). A longitudinal study of 7th grade youth showed that owning a gun was positively associated with 8th graded weapon carrying (Wilcox et al., 2006). Similarly, a recent analysis of 1990s data from the National Longitudinal Study of Adolescent Health found that access to a firearm at home increased the risk of weapon involvement (gun, knife, or club) among African American youth (Shetgiri, Boots, Lin, & Cheng, 2016). The study also found that high educational aspirations serve as a protective factor for African American and Hispanic youth, and high family connectedness also protects Hispanic youth from weapon involvement (Shetgiri et al., 2016). These findings suggest that factors at different levels of the social ecology can mediate the impact that firearm access may have on youth's violence involvement. Furthermore, the Institute of Medicine (2013) notes the importance of this and recommends informing prevention initiatives with research to identify factors at different levels of the social ecology that affect youth access to firearms.

Beyond addressing illegal sources of firearms and intervention (e.g., reducing recidivism of youth who committed firearm-related offenses), prevention strategies are essential for reducing youth firearm violence (Sheppard, Grant, Rowe, & Jacobs, 2000). Prevention strategies to decrease youth firearm violence and access to firearms include, for example: community programs (e.g., community policing, grassroots' mobilization, rallies), gun safety and educational programs for parents and children, physician counseling around safe storage practices, as well as local policies and legislation (e.g., child access prevention laws; laws prohibiting firearm sales to children under the age of 21 for a handgun and age 18 for a long-gun) (National Research Council, 2013; APA, 2013; David-Ferdon, et al., 2016). Unfortunately, few programs or strategies have been rigorously evaluated for impact in reducing youth firearm homicides and assaults (David-Ferdon, et al., 2016; see also <http://www.colorado.edu/cspv/blueprints/>). There is some evidence for abandoned building/vacant lot remediation (Branas et al., 2011, 2016) and street outreach approaches such as Cure Violence (Butts, Roman, Bostwick, & Porter, 2015) and Safe Streets (Webster, Whitehill, Vernick, & Curriero, 2012). These approaches are associated with reductions in gun assaults and homicide (Branas et al., 2011; Webster et al., 2012; Butts et al., 2015; Branas et al., 2016). Safe-storage interventions have shown impacts on youth suicide attempts and unintentional firearm injuries but weaker effects on reducing firearm assaults and homicides among youth (Hepburn, Azrael, Miller, & Hemenway, 2006; Webster, Vernick, Zeoli, & Manganello, 2004; Xuan & Hemenway, 2015). Many school-based programs and technological interventions have also not been adequately evaluated to determine their

impact in reducing youth firearm violence (David-Ferdon & Simon, 2014; Price & Khubchandani, 2019). Additionally, behavioral or cognitive based programs that are not implemented as part of a comprehensive strategy show “limited promise for reducing youth gun violence ” (Hardy, 2002, p. 101).

Our ability to develop and implement evidence-based programs and strategies to reduce the prevalence of youth accessing firearms – a key risk factor for youth firearm violence – is limited by the gaps that remain in our understanding of which factors increase the risk or protect youth from accessing or carrying firearms (for reasons other than hunting or target practice). Increasing our understanding of differences among subpopulations where youth have access to firearms can help target interventions for the most public health benefit (Institute of Medicine, 2013). The purpose of this study is to identify risk and protective factors associated with youth firearm access, possession or carrying among a sample of U.S. urban youth in a large mountain west city.

METHOD

This cross-sectional study is a secondary analysis of 2012–2013 data from a project conducted by the University of Colorado Boulder’s Youth Violence Prevention Center. Data were collected via a community-wide survey that measured youth violence and its risk and protective factors, and originally served as baseline data for a 5-year evaluation of the Communities that Care system (Hawkins et al., 2012; Oesterle et al., 2015) implemented in Colorado. The survey was administered to parents and youth ages 10–17 years in two communities, each of which ranked in the top one-third of all city neighborhoods on violence and other crime among 11–24 year olds, according to local law enforcement data. We used the FBI’s Uniform Crime Reporting definition of violent crime, which consists of offenses that involve force or threat of force, including murder and non-negligent manslaughter, rape, robbery, and aggravated assault. This study is based on youth data only to maximize the sample size for low base rate behaviors, such as youth firearm possession and carrying; adding the matched parent data would have reduced the sample size considerably.

Community-based study personnel went door-to-door to screen and recruit participants from a random systematic sample of households identified using fractional zone sites. After talking with at least one adult residing in each household and assessing their household eligibility (i.e., youth ages 10–17 residing in the home), the family was invited to participate in the study. Interviewers obtained adult consent and youth assent prior to conducting confidential face-to-face highly structured interviews using a script and recording answers on study personnel’s laptop computers. The interviewers entered the participants’ answers into the Computer-assisted Survey Execution Software (CASES) on the interviewer’s laptop. The interviews comprised mostly of close-ended questions, with a few open-ended questions. Interviewers provided each youth and parent a \$20 incentive for their participation in the study, along with a list of community resources and services for a variety of supports such as family resource centers, an anonymous tip line for concerning behaviors, mental health services, food banks, crisis line, health centers, and community centers. The University of Colorado Boulder’s Institutional Review board approved this study.

Study Instruments and Measures

The community-wide survey consisted of a combination of validated self-report instruments for measuring youth violence, mental health, and other risk and protective factors contained within the Denver Youth Study (Huizinga, 2016) and the Communities That Care survey (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Glaser, van Horn, Arthur, Hawkins, & Catalano, 2005), as well as validated violence and mental health screening questions from the Violence, Injury, Protection and Risk Screen (VIPRS) (Sigel, Hart, Hofeenberg, & Dodge, 2011) and the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997; Goodman, Lamping, & Ploubidis, 2010). We categorized our measures into the following four domains – one focused on the dependent variables, while the other 3 consisted of the independent variables: 1) youth firearm access, possession or carrying (dependent variables), 2) violence and mental health screening, 3) violence and delinquency, and 4) risk and protective factors for youth violence.

Youth Firearm Access, Possession or Carrying.—For this study, there are two main outcomes or dependent variables: a) potential youth firearm access, and b) youth possessing or carrying a firearm. The *potential youth firearm access* scale assesses youth’s knowledge of how and where to access firearms. It aggregates four questions: a) knows where to get a handgun (0=no; 1=yes), b) ease of getting a firearm (0=very hard or sort of hard, 1=sort of easy or very easy), and c) friends with a firearm, measured by two items (i.e., number of friends that have handguns, pistols, or revolvers; and number of friends that have rifles or shotguns (0=no friends with firearms, 1= 1 friends with firearms)). Scoring one or more on the scale implied the youth had potential firearm access. Two items measured the second outcome or dependent variable – *youth possessing or carrying a firearm*: “During the past year have you owned or had a gun in your possession?” (0=no, 1=yes), and “During the past year, other than to go hunting, target shooting, or to a gun show, have you carried a gun” (0=no, 1=yes). Scoring 1 for either item meant the youth has possessed or carried a gun in the past year.

Violence and Mental Health Screening.—The *Violence Injury, Protection and Risk Screen (VIPRS)* (Sigel et al., 2011) tool consists of 14 items measuring risk and protective factors related to future violence perpetration (VIPRS Risk) ($\alpha=.74$). Risk factors were assigned a positive score (0=absent, 1=present). Conversely, the presence of a protective factor was scored as 0, whereas its absence was scored as 1. Thus, the potential range on VIPRS is from 0 (no risk) to 14 (highest risk). Example items include: “Have you been suspended from school in the past year?” (0=no, 1=yes), “How many fights have you been in during the past year?” (0=0, 1=1 or more), and “Do your parents expect you to do well at school? (0=most of the time, 1= sometimes, rarely, never).

Mental health screening measures originated from the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997; Goodman et al., 2010). The SDQ consists of 34 items asking youth to respond to attitudes and behaviors about their mental health ($\alpha=.73$). Example items include: “I try to be nice to other people. I care about their feelings.”, “I am restless, I cannot stay still for long.”, and “I get very angry and often lose my temper.” (0=not true; 1=somewhat true; 2=certainly true).

Suicidal ideation was assessed using one item used in the Youth Risk Behavior Surveillance System (YRBSS) (CDC, 2017): “During the past 12 months, did you ever seriously consider attempting suicide?” (0=no, 1=yes).

Violence and Delinquency.—The survey also included valid and reliable measures of violence and delinquency from the Denver Youth Survey (Huizinga, 2016) measuring youth’s perpetration and victimization of violence, exposure to violence, and engagement in other delinquent behaviors. These measures are described below.

Serious assault (Huizinga, 2016) was measured using two items assessing the frequency of involvement in aggravated assault and robbery among youth in the study. The questions were: “In the past year, how many times have you attacked someone with a weapon or with the idea of seriously hurting or killing them?” and “In the past year, how many times have you used a weapon, force, or strong-arm methods to get money or things from people?” The two items were combined to create a binary score indicating the past year occurrence of serious assault for each respondent (0=no, 1=yes). Scores were used to calculate the past year prevalence for serious assault.

Minor assault (Huizinga, 2016) was measured by two items indicating the frequency of minor assault perpetration among youth in this study: “How many times in the last year have you thrown objects such as rocks or bottles at people?”, and “How many times in the last year, have you hit someone with the idea of hurting them (other than the events you just mentioned)?” Items were summed to create a binary score representing past year occurrence of minor assault for each respondent (0=no, 1=yes) and then calculated to determine its past year prevalence.

Gang fights (Huizinga, 2016) was measured at the individual level by asking youth how many times in the last year they had been involved in gang fights (0=no, 1=yes). The original study’s database also included measures for individual, peer and family gang membership. However, the inclusion of gang fights and membership measures in the firearms possession and carrying logistic regression model led to unstable odds; therefore, they were excluded from those analyses.

Non-violent delinquency (Huizinga, 2016) was measured by 26 items reflecting a wide range of behaviors, including nonviolent status offenses, public disorder, property damage, minor and serious theft, and drug sales. Example items included: “How many times in the last year have you run away from home?”, and “How many times in the last year have you purposely damaged or destroyed property that did not belong to you (for example, breaking, cutting or marking up something)?” (recoded from number of times into 0=no, 1=yes). Items were combined to create a binary score indicating past year engagement in non-violent delinquency for each respondent. The binary scores were then used to calculate the past year prevalence of non-violent delinquency.

Violence victimization (Huizinga, 2016) included five items allowing the youth to self-report violence victimization within the past year. Example items included: “During the past year, has someone used a weapon, force, or strong-arm methods to get money or things from

you?”, and “During the past year, have you been attacked by someone with a weapon or by someone trying to seriously hurt or kill you?” (0=no, 1=yes). The five items were combined to create a binary score for each respondent indicating the occurrence of violent victimization in the past year. Scores were used to calculate the past year prevalence of violence victimization.

Exposure to violence (Huizinga, 2016) was measured using six items reflecting exposure to violence that may have occurred in the family, school or community contexts during the past year. Example items included: “Did you see a parent or adult get pushed, slapped, hit, or beat up by another parent or adult or boyfriend or girlfriend?”, and “Did you see anyone get attacked on purpose with a stick, rock, gun knife, or other thing that would hurt?” (0=no, 1=yes). Items were summed to generate a binary score for each respondent reflecting exposure to violence in the past year. These scores were used to calculate past year prevalence of exposure to violence.

Cyberbullying perpetration was measured with two items adapted from the Olweus Bullying Questionnaire (Olweus, 2007): “In the last year, have you made rude or nasty comments to someone online or on a cell phone?”, and “In the last year, have you used the Internet to harass or embarrass someone whom you were mad at?” (0=no, 1=yes). Items were summed to create a binary score for each respondent indicating occurrence of cyberbullying perpetration in the past year. The binary scores were used to calculate the past year prevalence of cyberbullying perpetration.

Cyberbullying victimization was measured with three items adapted from the Olweus Bullying Questionnaire (Olweus, 2007): “In the last year, have you received rude or nasty comments from someone through email, instant messaging, chat room exchanges, website posts, or digital messages or images sent to a cellular phone, PDA, or smart phone?”, and “In the last year, have you received threatening or aggressive comments while online or on a cell phone?” (0=no, 1=yes). Items were summed to create a binary score indicating the occurrence of cyberbullying victimization in the past year. The scores were then calculated to produce the past year prevalence of cyberbullying victimization.

Teen dating violence (Huizinga, 2016) consisted of the following two items asking youth about their experiences with dating violence: “During the past 12 months, did anyone you were in a romantic relationship with ever hit, slap, or physically hurt you on purpose?”, and “During the past 12 months, did you ever hit, slap, or physically hurt someone you were in a romantic or dating relationship with on purpose?” (0=no, 1=yes). These items were only available for respondents ages 12 and older. The two items were summed to create a binary score indicating the occurrence of teen dating violence in the past year. The scores were then used to calculate the past year prevalence of teen dating violence.

Risk and Protective Factors.—This study included risk and protective factors for youth firearm access, and possession or carrying that were measured in the community survey. Valid risk and protective factor measures from the Denver Youth Study (Huizinga, 2016) that have been previously shown in the literature to be associated with youth firearm access or

carrying outcomes – such as drug and alcohol use, delinquent peers, parental attachment and school bonding – were included.

Risk Factors.—At the individual level, *substance use* (Huizinga, 2016) was measured by 9 items asking youth about their consumption of tobacco, e-cigarettes, alcohol (beer, wine, hard liquor), and illicit drugs in the past year. Example items included: “During the past year, how often did you drink hard liquor?”, and “During the past year, how often did you use narcotics other than heroin, such as methadone, opium, morphine, codeine, Demerol, Vicodin, OxyContin, and Percocet?” (0=never, 1=less than once a month, 2=at least once a month, 3=once a week, 4=more than once a week, 5=every day) (recoded from how often into 0=no reported use, 1=any reported use). Items were combined to create a binary score indicating past year substance use for each respondent. The binary scores were then used to calculate the past year prevalence of substance use.

Drug sales (Huizinga, 2016) was measured at the individual level using two items: “How many times in the last year have you sold marijuana or hashish (pot, grass, hash)?”, and “How many times in the last year have you sold hard drugs such as heroin, cocaine, and LSD?” (0–1000; recoded into 0=never, 1=1 or more times). Items were combined to create a binary score indicating past year drug sales for each respondent.

Delinquent peers (Huizinga, 2016) was measured at the peer level using 18 items asking youth about their friend’s involvement in delinquency. Example items include: “During the past year, how many of your friends have skipped school without an excuse?”, and “During the past year, how many of your friends have been in trouble with the law?” (1=none of them, 2=very few of them, 3=half of them, 4=most of them, 5=all of them, 6=don’t know). The variables were dichotomized for analyses from how many friends into 0=1–2, none to very few friends, and 1=3–5, half or more friends. Items were combined into a single measure of having delinquent peers in the past year ($\alpha=.89$).

Attitudes favorable toward antisocial behavior (Huizinga, 2016) was measured at the individual level using 16 items; for example: “How wrong is it to lie, disobey, or talk back to adults such as parents, teachers, or others?”, and “How wrong is it to purposely damage or destroy property that did not belong to them?” (1=not wrong, 2=a little bit wrong, 3=wrong, 4=very wrong). These variables were dichotomized into 0=1–2 not wrong to a little wrong, and 1=3–4 wrong to very wrong ($\alpha=.92$).

Protective Factors.—At the family level, *parental attachment* (Huizinga, 2016) was measured with seven items assessing the strength of family relationships. Example items include: “You enjoy talking over your plans with your parents.” and “You can talk with your parents about anything.” (1=strongly disagree; 2=disagree; 3=neither disagree nor agree; 4=agree; 5=strongly agree). Items were combined into an average scale score ($\alpha=.81$).

Parental monitoring was measured using ten items assessing the extent to which youth report that their parents know what they are doing and whom they are with. Example items included: “Do your parents talk to you about what you actually did during the day?”, and

“Do your parents know who you are with when you are away from home?” (1=almost never, 2=sometimes, 3=Often). Items were combined into an average scale score ($\alpha=.69$).

At the school-level, *school attachment* (Huizinga, 2016) was measured by six items asking youth if they agree or disagree with different statements about school. Example items included: “Homework is a waste of time.”, “I try hard in school”, and “In general, I like school” (1=strongly disagree; 2=disagree; 3=neither disagree nor agree; 4=agree; 5=strongly agree). Items were combined into an average scale score ($\alpha=.76$).

At the neighborhood level, *neighborhood attachment* was measured using three items asking youth how they felt about their neighborhood. Example questions included: “I like living in my neighborhood.”, and “If I had to move, I would miss the neighborhood I now live in.” (1=strongly disagree; 2=disagree; 3=neither disagree nor agree; 4=agree; 5=strongly agree). Items were combined into an average scale score ($\alpha=.84$).

Covariates.—Three demographic covariates were included: age (in years), sex (0=female, 1=male), and race/ethnicity. Race and ethnicity included dummy-coded variables for non-Hispanic white, black, mixed race, and other. Hispanic/Latino was included as the reference group due to the small number of non-Hispanic white youth in the sample.

Data Analyses

Pearson correlation 2-tailed analyses examined the associations between risk and protective factors, and the two outcome/dependent variables for youth – *potential youth firearm access*, and *youth possessing or carrying a firearm*. Logistic regression analyses only included those variables that were significantly related to these outcome variables, and excluded variables that were related almost perfectly as indicated by unstable odds. Given that the outcome measures were highly skewed, they were dichotomized for analyses and missing values were omitted from the computations. Backwards stepwise logistic regression was used for the predictive variables, after the covariates were first entered. Odds ratios and confidence intervals are presented for each of the risk and protective measures, by each of the outcomes.

RESULTS

Participants

The response rate for identified eligible youth was 78.2% ($n=1,100$ out of 1,407), comprising 60.3% ($n=1,100$ out of 1,825) of the estimated total number of youth aged 10–17 living in the two communities. The median age of participating youth was 13.3 years ($SD=2.2$; range=10–17 years), and close to half (47.1%) of the sample was male. More than half of participants self-identified as Hispanic/Latino (58.3%), followed by non-Hispanic black (24.8%), mixed race (10.6%), other (3.9%), and non-Hispanic white (2.5%).

Potential Youth Firearm Access, Possession or Carrying.—Nearly a tenth (9.4%) of youth reported that they “know where to get a handgun”, 6.5% reported that it would be “easy” to get a gun, 13.5% have friends with a handgun, pistol or revolver, and 8% have a friend with a rifle or shotgun. Answering “yes” to any of these items resulted in identifying 19.9% of participating youth as having potential firearm access, for reasons other than

hunting or target shooting. Only 1.9% of youth reported possessing or carrying a gun in the last year. These outcome variables were analyzed separately in the bivariate analysis and logistic regression.

Violence and Mental Health Screening.—One-fifth (20%) of youth screened positive for violence risk on the VIPRS tool. Additionally, 17.3% of youth scored positive on the SDQ, indicating high risk for a mental health disorder, and 9.2% self-reported suicidal ideation during their life.

Violence and Delinquency.—Most participating youth (84.4%) reported violence victimization, 63.6% reported exposure to violence, 49.1% engaged in non-violent delinquency, and about a quarter of youth said they experienced cyberbullying victimization (25.2%). Additionally, 45.8% reported perpetrating minor assault and 13.9% perpetrated cyberbullying. Less than 5% of youth reported participating in gang fights (3.8%), engagement in teen dating violence (2.7%), or having perpetrated serious assault (3.6%).

Risk Factors.—Over a quarter (25.3%) of youth reported using substances (cigarettes, alcohol, marijuana, and hard drugs) at least once in the past year, and 4.5% said they have friends who engage in delinquency. Additionally, 3% engaged in drug sales.

Protective Factors.—Most youth self-reported the presence of protective factors. A majority of youth reported agreement with attachment and monitoring scales: 85% (mean=4.2) school attachment, 82% (mean=4.0) parental attachment, 77% (mean 2.96) neighborhood attachment, and 67% (2.36) parental monitoring.

Bivariate Relationship between Risk and Protective Factors, and Firearms Access and Own/Carrying

Table 1 shows the relationships between youth's risk and protective factors and potential firearm access, and possessing or carrying a firearm in the past year. Males and older youth were more likely to possess or carry a firearm during the past year; older youth were more likely to have potential firearm access; there was no association between race/ethnicity and youth potential firearm access, or youth possessing or carrying a firearm. All risk and protective factors were significantly associated with potential firearm access, and youth possessing or carrying a firearm, with the exception of having a high score on the SDQ, self-reported suicidal ideation, and parental monitoring, which were not associated with possessing or carrying a firearm (Table 1).

The data show that youth with potential firearm access and possessing or carrying a firearm in the past year were more likely to engage in non-violent delinquency and violence (data not shown). For example, among those who reported having potential firearm access, 73.7% had engaged in nonviolent delinquency compared to 42.5% who did not have potential firearm access ($p<.001$). Additionally, 70% of youth with potential firearm access reported perpetrating minor assault, compared to 39.1% who did not have potential firearm access ($p<.001$). Similarly, 8% of youth who reported potential firearm access also reported engaging in serious assault, compared to 1.3% who did not have potential firearm access ($p<.001$). Finally, youth who reported possessing or carrying a firearm in the past year were

more likely to engage in non-violent delinquency (90.5% vs. 47.7%; $p < .001$), minor assault (81% vs. 44.5%; $p < .001$) and serious violence (33.3% vs. 2%; $p < .001$) than those who did not report possessing or carrying a firearm.

Logistic regression

Table 2 includes the risk and protective factors remaining in the final step of the backwards stepwise logistic regression model predicting potential firearm access with controls for age, sex and race/ethnicity. The results show that the odds of having potential access to firearms are higher for youth who: were older, had friends who engaged in delinquency, engaged in minor assault, were involved in gang fights; were exposed to violence, reported less parental monitoring, and who screened at risk for violence using the VIPRS.

The odds ratios are particularly large for measures related to delinquent peers and gang fights. Youth who reported having delinquent peers were 6 times more likely to report having potential access to firearms than youth who were not involved with delinquent peers (AOR = 6.05; 95% CI = 2.59, 14.11; $p = .000$). Similarly, youth who reported engaging in gang fights were 5 times more likely to report having potential access to firearms than those who did not engage in gang fights (AOR = 5.19; 95% CI = 1.93, 13.97; $p = .001$). Youth who reported exposure to violence (AOR = 2.58; 95% CI = 1.52, 4.39; $p = .000$), scored at risk for violence (VIPRS Risk) (AOR = 2.07; 95% CI = 1.30, 3.30; $p = .002$), and reported perpetrating minor assault (AOR = 1.96; 95% CI = 1.26, 3.05; $p = .003$) were about 2 times more likely to report having potential access to firearms than those who were not exposed to violence, did not score at risk for violence, and did not report perpetrating minor assault. Youth who reported parental monitoring of who they were with and what they were doing were less likely to report having potential access to firearms than those who did not report parental monitoring (AOR = .410; 95% CI = .22, .77; $p = .006$). While sex, race/ethnicity remained in the model, they were not statistically significant.

Table 3 shows the effects of selected risk factors on youth who reported possessing or carrying a firearm in the past year, controlling for age, sex, and race/ethnicity. Note that 95.2% of youth who owned or carried a firearm had also been exposed to violence. When including exposure to violence as a predictor, quasi-complete separation led to unstable odds ratios. Two other variables, gang fights and serious assault, were also related almost perfectly to possessing or carrying a firearm and produced unstable odds ratios. While recognizing the very strong influence of these risk factors, we examined the influences of the other risk and protective factors separately; the results were similar when the model was re-specified to exclude the three variables. Of the variables remaining in the model, delinquent peers, drug sales, and youth at risk of violence perpetration (VIPRS Risk) were statistically significant. The findings show that youth who reported having delinquent peers were almost 4 times more likely to report possessing or carrying a firearm in the past year than youth who did not report having delinquent peers (AOR = 3.72; 95% CI = 1.11, 12.40; $p = .033$). Youth who reported selling drugs were nearly 5 times more likely to report possessing or carrying a firearm in the past year than youth who did not report selling drugs (AOR = 4.90; 95% CI = 1.51, 15.88; $p = .008$). Youth who scored at risk for violence (VIPRS Risk) were 7 times more likely to report possessing or carrying a firearm in the past

year than youth who did not score at risk for violence (AOR = 7.15; 95% CI = 1.80, 28.52; $p = .005$). Although age, sex, and race/ethnicity remained in the model, they were not statistically significant.

DISCUSSION

Consistent with previous literature on youth firearm access and carrying (Kinscherff et al., 2013), this study's findings show how having delinquent peers and engaging in violence (i.e., VIPRS Risk, and minor assaults) are related to having potential firearm access for reasons beyond hunting and target shooting; the findings are similar for youth possessing or carrying a firearm. The strong and consistent influence of having delinquent peers (Lusher & Min Oh 2001; Dahlberg & Simon, 2006; Muschert, 2007; Wilkinson et al., 2009; Kinscherff et al., 2013, David-Ferdon et al., 2016; Bushman et al., 2016) continues to highlight the importance of exploring relational- and community-level interventions to prevent youth's firearm access beyond the family or household, even though appropriately storing and locking firearms in the home remains a recommended and important practice (AAP, 2012; Asking Saves Kids, 2015).

These cross-sectional findings are also consistent with the longitudinal study conducted by Wilcox et al., 2006, which found no relationship between fear of victimization or victimization on subsequent gun carrying. More longitudinal research is needed to examine the temporal order of these variables, when controlling for other important risk and protective factors.

Surprisingly, few risk and protective factors were associated with both potential firearm access and possession/carrying of a firearm (for reasons other than hunting and target shooting). More research is needed on both of these outcome variables where the prevalence of these variables is higher, and a longitudinal design is used.

Additionally, this study supports the notion that the risk factors for more lethal youth violence such as youth firearm violence are similar to risk factors for less lethal youth violence (e.g., associating with delinquent peers, engaging in violent behavior, substance use, exposure to violence). Our study's findings show that youth who were involved with delinquent peers and engaged in minor assault and gang fights – which are documented risk factors for youth violence (Kinscherff et al., 2013) – were at increased odds of having firearm access and possessing and carrying a firearm. While there is scarce evidence on the effectiveness of prevention strategies and approaches specifically targeting youth access to firearms (Institute of Medicine, 2013), there is solid evidence for primary prevention strategies and approaches designed to prevent youth's risk for violence, increasing protective factors, and decreasing violence-related behaviors and outcomes (e.g., perpetration, victimization, felony and non-felony arrests, etc.) (David-Ferdon et al., 2016; see also <http://www.colorado.edu/cspv/blueprints>; see also <https://vetoviolence.cdc.gov/apps/stryve/detail/selection>). Therefore, preventing youth violence by targeting these key risk and protective factors, including youth possession and use of firearms has great potential to reduce the most lethal and severe outcomes of youth violence. This approach may be particularly fruitful given that “gun violence is associated with a confluence of individual, family, school, peer,

community and sociocultural risk factors that interact over time during childhood and adolescence” (Cornell & Guerra, 2013, p. 1).

Interestingly, protective factors – such as attachment to parents, school and the neighborhood – were not significant predictors of potential youth firearm access nor youth possessing or carrying a firearm in the past year, when controlling for risk factors. Although their bivariate associations were statistically significant, their weak effects in the logistic regression model suggest these are more distal influences relative to the more proximal influence of the risk factors. These notable findings suggest that youth violence prevention interventions – many of which focus on individual, family, school, and community level factors – may serve to indirectly affect youth firearm access and carrying, by preventing youth’s involvement in violence and non-violent delinquency. Additional research that explores the interrelationships of risk and protective factors may help target interventions to reduce the risk for firearm violence among youth already involved in violence. Furthermore, these findings support ongoing evaluation of youth violence prevention programs and strategies for impacts on youth access, carrying and/or possession of firearms (for reasons other than hunting or target practice).

Given that this study’s data are based on an urban sample, it is not surprising that findings are consistent with prior youth firearm research focusing on the lifestyle factors that situate male youth in contexts of danger, such as gang involvement, high exposure to violence, and carrying a firearm to protect them from violence (Wilkinson & Fagan, 1996; Lizotte et al., 2000; Decker & Curry, 2002). Additionally, as with other forms of violence, being part of a delinquent peer group during adolescence (Dodge, Greenberg, & Malone, 2008; Dishion, Véronneau, & Myers, 2010) puts youth at risk for potential firearm access and possessing or carrying a firearm.

The implications of these findings are important for parents, educators, and health care providers, particularly for those working with youth engaging in high-risk problem behaviors, where it may be important to be aware of their increased risk for potential firearm access and possessing or carrying a firearm. For parents, it is important to make sure their children are engaging in prosocial behaviors and have prosocial friends starting at a young age (APA, 2013). Once youth engage with delinquent friends, particularly during adolescence, it may be difficult to change their peer group, which increases their risk for other problem behaviors such as violence (Dodge et al., 2008; Dishion et al., 2010). Additionally, it may be prudent for parents of youth engaged in high-risk problem behaviors to monitor their youth’s behavior, increase their awareness of their youth’s friends, and their potential firearm access outside the home. For educators, it may be important to know that youth engaged in violence and gang fights are at higher risk of having potential firearm access and possessing or carrying a firearm; this information may be informative particularly for students of concern. In the health care setting, given that screening positive for violence risk was also predictive of youth having potential firearm access and possessing or carrying a firearm, clinicians could use the VIPRS to identify youth who are at an increased risk for potential firearm access and possessing or carrying a firearm. The healthcare setting could serve as another context for firearm violence prevention for children and youth (Carter et al., 2015; Carter et al., 2017).

Study Limitations

These findings have several limitations. First, they are based on cross-sectional data and causality cannot be determined. Second, findings may not be generalizable, as they are specific to participating youth from two urban communities in the mountain west. Third, the data are based on self-reported attitudes and behaviors that maybe influenced by social desirability bias, memory, and question interpretation. For example, it is possible that reports of firearm possession and carrying are underestimated; youth self-reported lower than expected possession and carrying of firearms despite assurances of confidentiality. Fourth, several important variables, such as gang membership, gang fights, exposure to violence and serious assault, were excluded from the final possession and carrying logistic regression model because they were related almost perfectly to the outcome variable and produced excessive odds ratios. While recognizing the very strong influence of these four risk factors, we examined the influences of other risk and protective factors on our outcome measures without controlling for them. Finally, we used secondary data collected in 2012–2013 which limited the variables we would have included in our analysis had we designed our own study.

Summary

This research is consistent with previous literature on youth firearm access and carrying showing its relationship to having delinquent peers and engaging in other problem behaviors (e.g., gang fights, other forms of violence). It is important for parents, educators and health care providers to be aware of the increased risk of firearm access and carrying for youth with these risk factors, as well as the prevention and intervention efforts that may be available to help reduce them. Preventing youth from associating with delinquent peers and engaging in violence may reduce youth firearm access and carrying, which may subsequently reduce youth firearm violence.

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Table 1

Pearson correlations between risk and protective factors, potential firearm access, and possession or carrying among youth (*N* = 1,100)

		Potential Firearm Access (Yes=19.9%)	Possessing or Carrying a Firearm in the Past Year (Yes=1.9%)
Socio-demographic Characteristics	Race/Ethnicity	.043	.017
	Sex	.059	.082 **
	Age	.232 **	.097 **
Violence and Mental Health Screening	VIPRS Risk	.329 **	.212 **
	SDQ Total Difficulties	.146 **	.042
	Suicide Ideation	.085 *	.005
Violence and Nonviolent Delinquency	Serious Assault	.168 **	.272 **
	Minor Assault	.201 **	.210 **
	Gang Fights	.303 **	.393 **
	Nonviolent Delinquency	.250 **	.118 **
	Violence Victimization	.250 **	.118 **
	Exposure to Violence	.225 **	.093 **
	Cyberbullying Perpetration	.202 **	.138 **
	Cyberbullying Victimization	.259 **	.150 **
	Teen Dating Violence	.095 **	.074 *
Risk and Protective Factors	Substance Use	.294 **	.180 **
	Drug Sales	.250 **	.326 **
	Delinquent Peers	.298 **	.238 **
	Attitudes Favorable Toward Antisocial Behavior	.274 **	.145 **
	Parental Attachment	-.159 **	-.083 **
	Parental Monitoring	-.197 **	-.031
	School Attachment	-.204 **	-.106 **
	Neighborhood Attachment	-.108 **	-.065 *

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

VIPRS Violence Injury, Protection and Risk Screen

SDQ Strengths and Difficulties Questionnaire

Table 2

Logistic regression results for youth having potential firearm access (*N* = 732)

	Potential Firearm Access (Yes)				
	B	Sig.	AOR Exp(B)	95% C.I. for EXP(B)	
				Lower	Upper
Age	.26	.000	1.30	1.146	1.478
Sex	.05	.809	1.05	.70	1.59
Race/Ethnicity	.05	.482	1.05	.91	1.22
VIPRS Risk	.73	.002	2.07	1.30	3.30
Minor Assault	.67	.003	1.96	1.26	3.05
Gang Fights	1.65	.001	5.19	1.93	13.97
Youth Exposed to Violence	.95	.000	2.58	1.52	4.39
Delinquent Peers	1.80	.000	6.05	2.59	14.11
Parental Monitoring	-.89	.006	.41	.22	.77
Constant	-4.36	.001	.01		

AOR Adjusted Odds Ratio

CI Confidence Interval

VIPRS Violence Injury, Protection and Risk Screen

Note: Table shows the risk and protective factors remaining in the final step of this backwards stepwise logistic regression model

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Table 3

Logistic regression results for youth possessing or carrying a firearm in the past year (*N*= 745)

	Possessing or Carrying a Firearm in the Past Year				
	B	Sig.	AOR Exp(B)	95% C.I.for EXP(B)	
				Lower	Upper
Age	.22	.223	1.25	.88	1.78
Sex	.84	.150	2.32	.74	7.31
Race/Ethnicity	.10	.548	1.11	.79	1.56
VIPRS Risk	1.97	.005	7.15	1.80	28.52
Drug Sales	1.59	.008	4.90	1.51	15.88
Delinquent Peers	1.31	.033	3.72	1.11	12.40
Constant	-9.06	.001	.000		

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