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ABSTRACT

CHILD MALTREATMENT VICTIMIZATION AND ADOLESCENT WEAPON CARRYING: EXPLORING THE ROLE OF IN-HOME FIREARM ACCESS AND PARENT-CHILD RELATIONSHIPS

By

MELISSA C. OSBORNE

NOVEMBER 2018

Youth violence is a widespread public health problem affecting thousands of adolescents ages 10-24 each year. Violence-exposed youth have greater risk for negative physical and mental health outcomes. Adolescent weapon carrying is a form of delinquent behavior associated with youth violence. Child maltreatment (CM) has been identified as a risk factor for weapon carrying. This study sought to elucidate the relationship between CM and weapon carrying by exploring three potential mediators at the interpersonal level of the social-ecological model: in-home firearm access, quality of relationship with father, and quality of relationship with mother. Data were from the Longitudinal Studies of Child Abuse and Neglect, which followed 1,354 children at risk for CM from approximately age 4 to age 18. The exploratory mediational hypotheses were not supported. However, results found that a positive association between child protective services-substantiated physical abuse history and adolescent weapon carrying, after controlling for child gender, annual family income, study site, and propensity score ($B=0.12$, 95% CI: -0.006 , 0.22 , $p=.04$). No other CM types were significantly related to

adolescent weapon carriage in adjusted models. These results underscore the importance of child physical abuse prevention in preventing this type of delinquent behavior in adolescence.

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Author's Statement Page

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A handwritten signature in blue ink, appearing to read "Melissa C. Osborne", is written over a horizontal line.

Signature of Author, Melissa C. Osborne

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Chapter 1: Literature Review and Statement of Purpose

Youth Violence

Youth violence is a substantial public health problem that impacts thousands of adolescents each year. It involves the intentional perpetration of violent acts or threats committed by people ages 10-24 years (David-Ferdon et al., 2016). Examples of youth violence range from bullying to threats with weapons to homicide. This problem is especially pertinent in the U.S., as the U.S. has higher rates compared to other industrialized countries. Specifically, in the World Report on Violence and Health, the World Health Organization reported that the rate of homicide among 10-29 year-olds in the U.S. was 11 per 100,000. As a comparison, it was 0.9 per 100,000 in the United Kingdom and 1.7 per 100,000 in Canada (Mercy, Butchart, Farrington, & Cerda, 2002). Outside of injuries resulting from physical violence, youth violence is also associated with numerous short- and long-term morbidities, such as post-traumatic stress disorder, substance abuse, depression, and hypertension (Ford & Browning, 2014; Kilpatrick et al., 2003). It can also result in death. Homicide is the third leading cause of death among 10-24 year olds in the U.S., with 87% of deaths committed by a firearm. Racial disparities are evident in homicide deaths, as homicide is the leading cause of death for black youth ages 10-24 years; 93% are committed with a firearm. Even more adolescents experience non-fatal violence than fatal violence. The Centers for Disease Control and Prevention (CDC) estimate that the number of adolescents seen in emergency rooms in the U.S. is 115 times the number of adolescents killed. In addition to injury and loss of life, there is also an estimated economic burden of over \$18 billion associated with youth violence (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2017; David-Ferdon et al., 2016).

Adolescent Weapon Carrying

Scope of the problem. Weapon carrying by adolescents¹ is considered a delinquent behavior and has been associated with youth violence (DuRant, Getts, Cadenhead, & Woodes, 1995; DuRant, Kahn, Beckford, & Woods, 1997; Resnick, Ireland, & Borowsky, 2004; Stickley et al., 2015). Negative sequelae associated with adolescent weapon carrying include decreased life satisfaction as well as decreased emotional health (Valois, Zullig, Huebner, & Drane, 2001; Walsh et al., 2013). According to data from the 2017 nationally representative Youth Risk Behavior Surveillance System (YRBSS), which includes data on health risk behaviors reported by 9th through 12th graders in the U.S., approximately 16% of students reported carrying a weapon, such as a gun, knife, or club, in the last 30 days. This percentage was far greater among males (24%) compared to females (7%). For both males and females, rates of weapon carrying were highest in the 11th grade (25% and 9%, respectively). For males, the rate of weapon carrying was lowest, on average, among 9th and 12th graders (both 23%); for females, the rate was lowest among 10th graders (6%) (Kann et al., 2018).

Other studies have also estimated the rates of adolescent weapon carrying. A study of students in a low-income, predominantly African-American Baltimore school district found that 18% of 6th grade respondents reported weapon carrying in the last 30 days. This is a particularly high rate given the young age of the study participants, which may have been due to their being selected from a school considered “persistently dangerous” according to State of Maryland policy definitions (Finigan-Carr, Cheng, Gielen, Haynie, & Simons-Morton, 2015). Another

¹ There are different definitions for the time period known as adolescence. Definitions range from as low as 10 years (U.S. Department of Health and Human Services Office of Adolescent Health, 2018) to as high as 24 (Sawyer, Azzopardi, Wickremarathne, & Patton, 2018). For the purposes of this research, adolescence refers to the period between ages 10 and 24. This is consistent with the CDC’s definition of “youth” (David-Ferdon et al., 2016).

study assessed adolescents in 7th, 9th, 11th, and 12th grades in a high-risk school district in the U.S. Approximately 17% of respondents in this study reported weapon carrying in the last 30 days (Leeb, Barker, & Strine, 2007). Yet another study using data collected from five sites across the U.S. from children at-risk for CM found that 7% of 12-year olds reported carrying a weapon in the past year (Lewis et al., 2007).

Percentages of weapon carriage were greatest among white students (18%) compared to students of other races/ethnicities according to data from YRBSS. Looking at the interaction of gender and race/ethnicity category, the percentage of students having carried a weapon in the last 30 days was greatest among white males (29%), followed by Hispanic males (18%), and black males (15%; Kann et al., 2018). This is counterintuitive, as the highest homicide rates are experienced by black males, and some research has found higher weapon carriage rates among black compared to white males (Beardslee, Docherty, Mulvey, Schubert, & Pardini, 2018; Lizotte, Krohn, Howell, Tobin, & Howard, 2000). Beardslee and colleagues (2018) attributed the increased rates of weapon carriage among black adolescents to differential exposure to risk factors during childhood, specifically childhood conduct problems and peer delinquency. Of note, research by Beardslee and colleagues (2018) and by Lizotte and colleagues (2000) that found higher rates among black youth each used samples from single metropolitan areas rather than nationally representative data, such as YRBS (Kann et al., 2018). Other researchers examining racial disparities in this area have suggested that homicides among black youth may be higher than they are among white youth because white youth may have access to better and faster resources after an assault compared to black youth. They also suggest that, when black youth carry weapons, especially guns, they may be more likely to be in situations where they will

be used such as in gang activities, compared with white youth (Nielsen, Martinez, & Rosenfeld, 2005).

Trend analyses indicated that there was a statistically significant² decrease in adolescent weapon carrying from 1991 to 2017, dropping from 26% of students to 16% of students. However, there was not a statistically significant change from 2015 to 2017 (Kann et al., 2018). Other research using nationally representative data of youth in grades 6th through 10th found that from 1998 to 2010, weapon carrying increased significantly for white youth but not for adolescents from any other racial category (Perius, Brooks-Russeii, Wang, & Iannotti, 2014). The overall decrease since the early 1990s may be due, in part, to an increased use of metal detectors at schools, as research has indicated that rates of weapon carrying are significantly lower at schools with metal detectors (Centers for Disease Control and Prevention, 1993; Johnson, 2000). However, researchers suggest that a lack of continued decrease in more recent years may be due to a focus on bullying prevention programs in schools. These programs have been effective in reducing bullying but typically do not include a weapon involvement component (Perius et al., 2014).

Several studies have examined firearm carrying behaviors specifically. One study assessed firearm possession rates among adolescents ages 14 to 24 years who were presenting in the emergency department for an assault-related injury. Participants were asked about the frequency of carrying a gun outside the home in the last six months, the reason for carrying, and the source of the handgun outside the home. They were also asked if they personally owned a gun and where they obtained a handgun paid for with cash. In this sample, 23% of adolescents

² From this point forward, the term, “significant” will be used to refer to a statistically significant relationship. Other terms will be used to denote a clinically meaningful or otherwise substantive effect.

indicated that they had possessed a firearm in the last six months. Of those, 42% carried the firearm outside the home, 15% were less than 18 years of age, and 32% had children of their own. Adolescents most often reported protection as the primary purpose for carrying a firearm (37%). Only 17% reported purchasing the firearm from a legal source, with the majority of the remainder not endorsing a response to this question. Over half of the sample (52%) indicated that they could obtain a firearm with little to no trouble (Carter et al., 2013).

Another study looked specifically at juvenile offenders and firearm carrying behaviors. Data were from a longitudinal study conducted from 2000 to 2010 in Arizona and Pennsylvania of adolescents who were considered serious offenders in the juvenile justice system. Study participants were asked at baseline if they had ever carried a gun and were asked at each follow-up assessment if they had carried a gun in the last six months. Almost half (47%) of study participants indicated that they had carried a gun in their lifetime at the baseline assessment. Gun carriage at baseline was significantly associated with exposure to violence (as a victim or as a witness) in bivariate as well difference in differences analyses (Loughran, Reid, Collins, & Mulvey, 2016). Other research using Youth Risk Behavior Survey (YRBS) data from 2001-2011 looked at 55 risk factors for gun possession. Survey respondents were asked if they had carried a gun in the last 30 days. The authors conducted hierarchical clustering of individual risk factor items to compute odds ratios for gun carriage in the past 30 days. Examining odds ratios for gun carrying over time, the strongest associations were with alcohol, tobacco, and other drug use overall and at school (Ruggles & Rajan, 2014).

Risk and protective factors. Several factors have been found to be associated with an increased risk of weapon carrying. Research consistently finds that males have greater odds of weapon carrying compared to females (Carter et al., 2013; Ferguson & Meehan, 2010; Finigan-

Carr et al., 2015; Leeb et al., 2007). Research has also indicated that white youth report weapon carrying in greater numbers than youth of other races (Carter et al., 2013; Kann et al., 2018). Ferguson and Meehan (2010) looked at data from the Ohio YRBS to examine risk factors for weapon carrying. They found that, in addition to being male, youth self-reporting illegal substance use and those exhibiting antisocial personality traits had increased odds of weapon carrying. Carter and colleagues (2013) conducted a multivariate logistic regression analysis examining firearm possession among adolescents presenting in an emergency room, and results indicated that males, those not receiving public assistance, those reporting illicit drug use, those with retaliatory attitudes, and those in a serious fight within the last six months were at increased odds of reporting firearm possession. There were no significant findings with regard to race, although a lower percentage of black participants reported gun carriage compared with white participants. Recent research has examined the racial disparity in weapon carrying. Beardslee and colleagues (2018) used data on black and white boys from the Pittsburgh Youth Study, a longitudinal study of a sample of high-risk boys recruited from Pittsburgh public schools. This study found that a greater percentage of black boys carried weapons compared to white boys. Further analyses led researchers to conclude that the disparity in weapon carriage was due to black boys' early exposure to risk factors for weapon carriage such as childhood conduct problems and peer delinquency.

Various forms of interpersonal violence have also been identified as a risk factor for weapon carrying. In research using 2011 YRBS data, researchers found that in-person only bullying was a significant risk factor for weapon carrying on school property in girls; electronic-only bullying was a significant risk factor for weapon carrying in boys (Hertz et al., 2015).

Additionally, child maltreatment has been identified as a risk factor for weapon carrying (Leeb et al., 2007; Lewis et al., 2007). This will be discussed further below.

Child Maltreatment and Weapon Carrying

Background on child maltreatment. Child maltreatment (CM) is the abuse or neglect of a child under the age of 18 by a parent or other caregiver and includes acts of commission (e.g., physical abuse, sexual abuse) and acts of omission (e.g., emotional neglect, inadequate supervision) (Leeb, Paulozzi, Melanson, Simon, & Arias, 2008). In 2016, there were 3.5 million children in the U.S. who were involved as the subject of one or more reports to child protective services. Of these, 676,000 children were considered to be victims of a substantiated report, one in which there was evidence indicating that CM occurred (US Department of Health & Human Services [DHHS], Administration for Children and Families, Administration on Children Youth and Families Children's Bureau, 2018). Children are most vulnerable to CM in their earliest years. Approximately 29% of CM victims were under the age of three years, and children under age one had the highest rates of CM (24.8/1,000 children).

There are racial disparities in CM. Of CM victims in 2016, 45% were white, 22% were Hispanic, and 21% were black. Among these three groups, rates of CM were highest among black children (13.9/1,000 children). Rates of CM among Hispanic and white children were similar to one another (8.0/1,000 and 8.1/1,000, respectively). Differences exist by child gender as well, with girl victims (9.5/1,000) having higher rates than boy victims (8.7/1,000) (US DHHS, 2018).

The vast majority of CM victims experienced neglect (75%). Almost one-fifth (18%) of victims experienced physical abuse, 6% experienced emotional abuse, and 9% were sexually

abused. Parents were most often the perpetrators of CM (78%). Another 6% were a relative other than a parent. The national rate of CM in 2016 was 9.1/1,000 children in the population. However rates vary by state from a low of 1.6/1,000 in Pennsylvania to a high of 23.3/1,000 in Massachusetts (US DHHS, 2018). While no studies to-date have identified regions of the country in which CM occurs in clusters, there have been ecological studies at the state-, census tract-, or neighborhood-level that identified factors such as income inequality, child poverty rate, unemployment rate, and child care burden are correlates of CM (Eckenrode, Smith, McCarthy, & Dineen, 2014; Freisthler, Merritt, & LaScala, 2006).

CM is associated with a range of negative outcomes including those to physical and mental health as well as to the individual and society. Research indicates that CM is associated with short-term and long-term problems including internalizing and externalizing problems in later childhood, cardiovascular disease, and depression (Danese et al., 2009; Felitti et al., 1998; Leeb, Lewis, & Zolotor, 2011; F. Li, Godinet, & Thompson, 2014). The economic impact of CM was estimated to be \$124 billion in 2008, the most recent estimate. This is due to a variety of factors including healthcare costs, child welfare costs, and loss of productivity (Fang, Brown, Florence, & Mercy, 2012).

The effect of child maltreatment on weapon carrying. Many studies have established a link between CM and a trajectory of violent delinquency. For instance, research using data from almost 1,500 low-income, minority children in the Chicago Longitudinal Study found that children with substantiated CM (approximately 9% of the sample) had 51% increased odds of having a violent petition as a juvenile, compared to children who were not maltreated. These researchers also found that the relation between CM and having a violent petition as a juvenile was moderated by the parent's persistent receipt of public assistance, whereby those receiving

assistance showed a stronger relationship between CM and having a violent petition compared to those not receiving assistance, on average (Mersky & Reynolds, 2007).

Yun and colleagues (2011) found a connection between CM and violent delinquency for specific types of maltreatment. The researchers used data from the National Longitudinal Study on Adolescent Health (Add Health), a nationally representative sample of over 10,000 youth, which began when the participants were in grades 7 through 12. CM data were retrospective child-reported accounts collected when the participants were young adults. Participants were asked about CM occurring before entering sixth grade; 14% reported physical abuse, 4% reported sexual abuse, and 9% reported neglect. This research found that early physical abuse was not significantly associated with delinquency in adolescence, but sexual abuse and neglect were associated with and increased odds of delinquency.

A review of studies examining CM and violent delinquency identified 12 studies dating back to the late 1980s. Researchers found consistent evidence of a link between CM and violent delinquency, especially in the case of physical abuse. They noted that CM occurring during adolescence appears to be a particularly strong predictor of violent delinquent behavior. There was no strong evidence of gender differences in the relation between CM and delinquent behavior. The researchers noted that more studies should examine this issue and more longitudinal studies should be conducted (Maas, Herrenkohl, & Sousa, 2008).

Researchers using data from the 2007 Minnesota Student Survey assessed weapon carrying specifically in addition to overall delinquent behavior (Duke, Pettingell, McMorris, & Borowsky, 2010). The survey asked the students, who were in 6th, 9th, and 12th grades, about adverse experiences in childhood including abuse and household dysfunction. Almost 30% of participants reported at least one adverse childhood experience, and 6% (3% of girls and 9% of

boys) reporting carrying a weapon on school property in the past month. For girls, experiencing physical abuse increased the odds of weapon carrying 4.22 times, on average (95% confidence interval [CI]: 3.79, 4.69). Sexual abuse victimization also increased the odds of weapon carrying in the cases of perpetration by a family member (odds ratio [OR]:4.06, 95% CI: 3.52, 4.69) and perpetration by a non-family member (OR: 4.06, 95% CI: 3.61, 4.56). For boys, experiencing physical abuse increased the odds of weapon carrying by 3.62 times (95% CI: 3.36, 3.90). Sexual abuse victimization also increased the odds of weapon carrying in the cases of perpetration by a family member (OR: 6.82, 95% CI: 5.92, 7.86) and perpetration by a non-family member (OR: 6.46, 95% CI: 5.80, 7.20).

Leeb and colleagues (2007) found similar results when examining CM and weapon carrying. Data for this cross-sectional study were from adolescents in grades 7, 9, 11, and 12 in a high-risk community in the U.S. Researchers in this study used propensity score stratification to account for participants' likelihood of having experienced CM. CM was self-reported in this study and measured using one item for physical abuse before age 10 years and sexual abuse before age 10. Participants were asked how many days in the past 30 days they carried a weapon, and a binary variable indicating any carriage or no carriage was used in the analysis. Approximately 23% of participants self-reported physical abuse; 9% reported sexual abuse. Of the total sample, 17% had carried a weapon in the past 30 days. A model predicting firearm carrying specifically did not yield significant relationships. Results of the weapon carrying model indicated that physical abuse victimization overall (AOR: 1.28, 95% CI: 1.02, 1.61) and sexual abuse victimization among females (AOR: 1.90, 95% CI: 1.25, 2.89) were associated with an increase in the odds of carrying a weapon in the past 30 days. Sexual abuse victimization

among males was not significantly related to weapon carrying. Having a firearm available in the home increased the odds of weapon carrying significantly (AOR: 3.05, 95% CI: 2.28, 4.07).

One study used data from the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN), which includes data from children at varying risk levels for CM who were recruited from five study sites around the country. Data collected when the children were approximately 12 years old were used for this study. Of the children assessed at age 12, 7% reporting carrying a weapon in the past year, 22% reported physical abuse, and 15% reported sexual abuse. Both child self-reported physical abuse (AOR: 2.85, 95% CI: 1.31, 6.21) and sexual abuse (AOR: 4.36, 95% CI: 1.69, 11.26) victimization were significantly associated with weapon carrying. This study examined perceived need for a weapon, as a mediator, and it was found to be a mediator in both the case of physical abuse and sexual abuse (Lewis et al., 2007).

Mediators in the Relation between CM History and Adolescent Weapon Carrying and Theoretical Underpinnings

Lewis and colleagues (2007) examined a mediator in the relation between CM and weapon carrying at the intrapersonal level of the social-ecological model. The social-ecological model has been used widely to better understand many public health problems. The model was initially used in CM research in the 1970s but has since been applied to other public health issues including youth violence (Farrell, Henry, & Bettencourt, 2013; Mikhail & Nemeth, 2016). The model has four levels: intrapersonal, interpersonal/relationship, community, and societal. According to the model, public health issues are affected by factors at all levels. That is, they are multifaceted problems, and interventions are most effective when they involve multipronged approaches that address issues at multiple levels. The intrapersonal level, explored by Lewis and colleagues (2007), involves factors such as biological and psychological issues that occur within

an individual that affect the health problem. For example, an individual's history of depression may impact their likelihood for substance use disorder (Bronfenbrenner, 1979; Centers for Disease Control and Prevention, 2015; Dahlberg & Krug, 2002).

While other studies have examined youth violence broadly through the lens of the social-ecological model, the study by Lewis and colleagues (2007) is the only one to-date that has specifically investigated a potential mediator in the association between CM and weapon carrying among adolescents using this theoretical framework. They examined the perceived need for a weapon, a variable at the intrapersonal level, as a possible mediator in this relation. They posited that CM victims may be more likely to view the world as threatening and feel more vulnerable, increasing their likelihood for carrying a weapon. Their analysis found this to be true in the case of physical abuse and in the case of sexual abuse among girls. Their work provides a better understanding of why CM and weapon carrying are related at the intrapersonal level. However, it is important to understand factors at multiple levels of the social-ecological model in order to better inform interventions in a holistic way, improving their effectiveness (Dahlberg & Krug, 2002). Thus, research delineating the risk factors that play a role in weapon carrying at other levels is warranted.

The current study looks to explore potential mediators at the interpersonal/relationship level, particularly those that are involved with the adolescent's relationship with their parents. At the interpersonal level, three variables stand out as possible mediators: adolescent in-home firearm access, quality of relationship with father, and quality of relationship with mother. These variables are all part of the family environment and are modifiable with knowledge and skills training. They will be discussed in further detail in the subsections below.

Adolescent in-home firearm access. Estimates from self-report data indicate that many adolescents have access to firearms in the U.S. Add Health data that included a nationally-representative sample of adolescents ages 12-18 years were analyzed to assess risk for in-home access to firearms and/or alcohol. Firearm access was assessed by asking, “Is a gun easily available to you in your home?” Almost one-quarter (24%) of adolescents reported in-home firearm access based on this question (Swahn, Hammig, & Ikeda, 2002). Other studies have found even higher estimates of adolescent access to firearms. Using data from the National Comorbidity Survey-Adolescent Supplement, a nationally representative survey of adolescents between ages 13 and 18 years, researchers obtained estimates of the proportion of adolescents in the U.S. reporting access to a firearm. Participants were predominantly non-Hispanic white (82%) and a large portion lived in the south (45%). Adolescents were asked how many firearms were in their home, and those who reported at least one were asked, “Could you get [the gun/one of the guns] and shoot it right now if you wanted to? Or is either the gun or the ammunition put where you can’t get it?” Those who responded, “Could get it,” were considered to have firearm access. Almost half (41%) of those indicating the presence of at least one firearm in the home responded that they had easy access to it and could shoot it (Simonetti, Mackelprang, Rowhani-Rahbar, Zatzick, & Rivara, 2015). In another study of violent offending and victimization using Add Health data, Ruback and colleagues (2011) found that being male, white, living in a two-parent home, being of high socioeconomic status, and living in a rural area were associated with firearm access. They also found that adolescent involvement with weapons was associated with the presence of a gun in the home, even if the involvement was with a weapon outside the home.

Many of the firearm owners in the U.S. are parents, meaning their children could potentially access their firearms. A study using data from parents (93% women) of fifth-grade

children across the U.S. examined the presence of a firearm in the home. Approximately 20% of parents reported that a firearm was kept in or around the home. Consistent with previous research on regional variability in gun ownership, the greatest percentage of those keeping a firearm in the home was in the southeastern U.S. (the Birmingham, Alabama study site) (Ladapo et al., 2016). Another study using these data looked at other factors associated with parents reporting a firearm in the home. This study found that, compared to non-Hispanic white parents, non-Hispanic black parents (AOR: 0.56, 95% CI: 0.42, 0.76) and Hispanic parents (AOR: 0.44, 95% CI: 0.30, 0.65) had lower odds of keeping a firearm in the home (Schwebel et al., 2014). It is important to note that because the parents in this study were almost all women, the number of homes with a firearm may have been underreported, as research has found that in homes with one male and one female living together, overall agreement between pairs is low, with women reporting fewer guns than men (Coyne-Beasley, Johnson, Johnson, Webster, & Wiebe, 2001).

No known research has been conducted on the association between CM and in-home firearm access. There are several reasons why firearms may be less likely to be in the home in a population at risk for CM. Specifically, factors associated with greater risk for CM, such as low socioeconomic status and living in a two-parent home, are associated with a lower risk for in-home firearm access (Ruback et al., 2011; Simonetti et al., 2015; Swahn et al., 2002). Despite this, there are factors associated with CM that would indicate an increased risk for in-home firearms in homes where CM is occurring. Specifically, research has indicated that parents with a diagnosis of depression (AOR: 1.36, 95% CI: 1.04, 1.77); parents reporting binge drinking (AOR: 1.75, 95% CI: 1.14, 2.68); and parents reporting illicit drug use (AOR: 1.75, 95% CI: 1.12, 2.76) had an increased odds of keeping a firearm in the home (Ladapo et al., 2016), and these are all factors associated with CM (Semidei, Radel, & Noal, 2001; Smith, Johnson, Pears,

Fisher, & DeGarmo, 2007; Windham et al., 2004; Zuravin, 1989). However, the effect of CM on in-home firearm access has not been specifically investigated.

There is a paucity of research on the association between in-home firearm access and adolescent weapon carrying. However, one study found evidence that the relationship is significant and positive. In their study of CM and weapon carrying, Leeb and colleagues (2007) found that, on average, adolescents were at 3 times greater odds of weapon carrying if they reported firearms were available in the home (95% CI: 2.28, 4.07). While there is very limited research on firearm access and adolescent weapon carrying, the relationship between adolescent in-home access to firearms and involvement in violent delinquent behavior, which is associated with weapon involvement, has been established in the literature (Hardy, 2006; Ruback et al., 2011). A study using data from Add Health looked at the association between adolescent in-home firearm access and self-reported violent offending and violent victimization in the past 12 months. Results indicated that in-home firearm access increased the odds of both violent offending and violent victimization at Wave 2. With regard to violent offending, they found that firearm access was significantly associated with being in a serious fight, pulling a weapon on someone, and hurting someone badly enough to require medical attention. The authors suggest that the adolescents do not use a firearm from home when committing these offenses. They note that, although the firearm itself may have not been directly related to the violent offending or victimization, access alone may contribute to a “factor or process” that increases risk (Ruback et al., 2011).

Parent-child relationship quality. A child’s relationship with his or her parents may also help explain the effect of CM on weapon carrying. Research has found that CM victimization has an impact on the parent-child relationship. A meta-analysis identified eight

studies meeting the predefined inclusion criteria that investigated the effect of multiple types of CM on attachment. Results of the meta-analysis found that CM victimization was associated with a 7% increase, on average, of having an insecure attachment. Researchers suggested a closer look at the effects by type of CM (Baer & Martinez, 2006).

The parent-child relationship has also been found to have an effect on youth delinquent behaviors in general. One study examined these effects using Add Health data. Mother-child and father-child attachment scores were combined if the child completed a father-child attachment scale (i.e., if he or she had a father figure on whom to report). If no father figure was identified, the score for mother-child attachment was used. Results indicated a significant negative effect of parental attachment on overall number of delinquent acts, as well as on indicators for property delinquency and violent delinquency (Gault-Sherman, 2012).

Another study examined this relationship in a sample of 7th, 9th, and 11th grade youth in one U.S. county. Youth in the study self-reported delinquent behaviors as well as positivity and negativity toward parents. Their parents reported on time spent together on a range of activities. Positivity toward parents was found to have a significant negative effect on delinquency. Negativity toward parents and time spent with parents was not significantly related to delinquency (Worthen, 2012).

Other work has looked more specifically at weapon carrying as an outcome. Orpinas and colleagues (1999) conducted such a study using cross-sectional data from 6th, 7th, and 8th graders in multiple Texas schools. Students in the study were predominantly Hispanic (66%). Weapon carrying was assessed by asking how many times in the past 30 days the respondent carried a weapon, consistent with questions from YRBS. Child-reported parent-child relationship quality was measured with a single item rated on a five-point Likert scale. Over one-quarter (27%) of

participants reported weapon carriage in the past 30 days; 11% reported carrying a handgun. Students who reported that they got along “very badly” with their parents had greater odds of handgun carrying compared to those who reported that they got along “very well” with their parents (OR: 1.37, 95% CI: 1.3, 1.5). In the study by Leeb and colleagues (2007) examining the relationship between CM and weapon carrying, child-reported parental support in the past 30 days and child-reported parental monitoring were both included in the adjusted model. There was not a significant relationship between parental support and weapon carrying, but parental monitoring was associated with significantly decreased odds of weapon carrying, on average.

Statement of Purpose and Hypotheses

The purpose of this research is to conduct an exploratory study that will examine potential mediators in the relation between CM and adolescent weapon carrying, two factors that have an established relationship in the literature (Duke et al., 2010; Leeb et al., 2007; Lewis et al., 2007). The proposed mediators are: in-home firearm access, quality of relationship with father, and quality of relationship with mother.

Gaps in knowledge. This study will address several gaps in knowledge in this area of research. First, longitudinal data will be used. Many of the studies on CM and weapon carrying or overall delinquency examined only cross-sectional data, which does not allow for causal inferences to be made. A review of the literature in this area recommended that future research focus on prospective studies (Maas et al., 2008). Second, this work will have separate models for quality of relationship with father and quality of relationship with mother. Research related to CM or parenting in general often uses the term “parent” to mean mothers, but fathers play an important and unique role in the lives of their children, and more research that examines father-child relationships is warranted (Kohl & Seay, 2015).

Finally, this study will, in part, include firearm-related research by examining in-home firearm access and weapon carrying. Firearm research overall is an area that has been understudied and has been sensitive to the policies that limit funding for certain areas of research. Most recently, the trend in publications on this topic has shown a decrease. Publications on firearm violence increased substantially between the mid-1980s and late 1990s. However, by 2012, firearm violence publications decreased 64%. Additionally, the number of researchers in this topic area is limited, without a steady increase since the late 1990s (Alcorn, 2016). In the late 1990s there was a change in policy that prohibited federal funding from being used to “advocate or promote gun control” (Ladapo, Rodwin, Ryan, Trasande, & Blustein, 2013, p. 532). Research has found that, as one would expect, this had an effect on the number of publications related to firearms. Although firearms accounted for approximately 13% of deaths between 1991 and 2010, firearm research accounted for less than 1% (0.3%) of publications during that time period. However, trends in publications on other health outcomes with similar impacts increased during that time period. In 2013, Present Obama clarified the language of the policy from the 1990s, stating that the law allowed for firearm research as long as it did not support work encouraging or promoting gun control directly. This led to the release of more funding announcements for firearm research. It is yet to be seen if this directive has resulted in a substantial increase in publications in this field (Ladapo et al., 2013). The proposed study will address a gap in the literature by adding to this area of research that is in need of more published evidence.

Public health contribution. Findings from this research will build on and add to the existing body of knowledge regarding weapon carrying among adolescents. This new-found knowledge will contribute to programs, policies, and future research. If the proposed mediators

show evidence of mediation, this information could be used to inform parenting programs and child welfare policies. Specifically, modifiable factors have been identified as potential mediators. These factors can be improved upon through skills training and knowledge provided to parents. Millions of families in which CM is occurring or who are at risk for CM become involved in parenting programs (US DHHS, 2018). Parenting programs are recommended as part of the Centers for Disease Control and Prevention's strategies to address youth violence. These evidence-based programs, such as Nurse Family Partnership and The Incredible Years, already have existing curricula into which these new concepts could be incorporated (David-Ferdon et al., 2016). For instance, if in-home firearm access helps in explaining the relation between CM and weapon carrying, parenting programs can include information on gun safety throughout the lifespan. Similarly, parenting programs could provide parents with skills that improve the parent-child relationship and could help parents understand developmental changes in their child during adolescence and ways to maintain a positive relationship during this time. Early intervention in this area could help in improving later outcomes. Additionally, identification of other risk factors could aid in program and policy decisions, particularly those related to firearms, a topic area for which research is lacking. Ultimately, the information gleaned from this study can be used to guide policy and practice decisions that will have a wide public health impact and hopefully reduce the burden of adolescent weapon involvement.

Research questions and hypotheses. The proposed mediators are modifiable factors at the interpersonal level of the social-ecological model and are a part of the family environment. Thus, this work will build on the work of Lewis and colleagues (2007), who identified a mediator at the intrapersonal level. CM will be separated by reporting source and type. The research questions are:

- (1) Does in-home firearm access act as a potential mediator in the relation between early CM and later weapon carrying in adolescence?
- (2) Does quality of relationship with father act as a potential mediator in the relation between early CM and later weapon carrying?
- (3) Does quality of relationship with mother act as a potential mediator in the relation between early CM and later weapon carrying?

These questions will be assessed separately for the following reporting sources and types of CM: parent-reported emotional abuse and physical abuse; child-reported emotional abuse, physical abuse, and sexual abuse; and CPS-substantiated emotional abuse, physical abuse, and sexual abuse. Based on the prior research examining the relationships between these variables as well as the theoretical framework for this study, it is hypothesized that:

- (1) In-home firearm access at age 14 will partially mediate the relation between CM through age 12 and weapon carrying at age 18.
- (2) Quality of relationship with father at age 14 will partially mediate the relation between CM through age 12 and weapon carrying at age 18.
- (3) Quality of relationship with mother at age 14 will partially mediate the relation between CM through age 12 and weapon carrying at age 18.

Chapter 2: Methods

Subjects and Settings

Study design. Data for this study are from the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) (Runyan et al., 1998, 2014). LONGSCAN is a consortium of research studies spanning five different sites across the U.S. The purpose of the research is to better understand the etiology and effects of CM by following children and their families from early childhood through adolescence. Families in the studies were at varying degrees of risk for CM in order to compare outcomes. The five study sites are named for their region of the U.S.: East, Midwest, Northwest, Southwest, and South. The East, Midwest, and Northwest sites are located in urban areas, while the Southwest site is suburban. The South site includes urban, suburban, and rural areas of one southern state. Thus, a variety of areas of the country are represented, as are varying levels of urbanicity. The studies began enrolling participants in 1991 and continued collecting data through 2012. Participants were enrolled in the study when the child was four years old or younger. Data collection from parents, children, and teachers (beginning at the age-6 assessment) occurred when the children were ages 4, 6, 8, 12, 14, 16, and 18. Parents and children were interviewed separately. Additionally, Child Protective Services (CPS) records were reviewed periodically throughout the study. Participants were contacted in between research assessments with the goal of achieving high levels of retention.

Although measures were the same across the five study sites, samples were recruited differently. In the East site ($n=282$), participants were identified from three pediatric clinics serving low-income, inner city children. Eligible participants met criteria for being at-risk in the child's first year of life. Two at-risk groups were defined as having either a child risk factor or a parent risk factor. A comparison group was only considered at-risk due to low income and no

other factors. In the Midwest site ($n=245$), approximately two-thirds of the sample were CPS-involved families. The remainder of the sample were non-CPS involved neighborhood control families. In the Northwest site ($n=254$), children were identified after being considered at moderate risk of CM based on a referral to CPS. Over half (about 60%) of the referrals were later substantiated. In the Southwest site ($n=330$), all children were in out-of-home placement due to CM before age 4. No comparison group was recruited for this site, but 112 of the children were returned to their parents by the age 4 assessment. In the South site ($n=243$), children were identified as being at-risk based on public health tracking. Two controls were matched for each at-risk child.

As stated earlier, data collection occurred when the children were ages 4, 6, 8, 12, 14, 16, and 18 years. Participants were given face-to-face interviews (with the exception of teachers) at ages 4, 6, and 8, with computer-assisted face-to-face interviews utilized at the age 8 assessment. Beginning with the age 12 assessment the audio computer assisted self-interview (ACASI) system was employed to conduct assessments. Teachers were sent pencil-and-paper forms in the mail throughout the studies (Larrabee & Lewis, 2015).

Characteristics of study participants. LONGSCAN participants ($N=1,354$ parent-child dyads across all sites) were predominantly black (53% of children). Approximately one-quarter (26%) were white, 12% were mixed race, and 7% were Latino/a. The remaining 2% of the sample were of other races/ethnicities. Approximately half of the children in the sample were male (49%). The sample was low income, with over two-thirds (69%) of caregiver incomes reported as less than \$20,000 annually at the age 4 assessment. Almost half (44%) of caregivers reported an education of 11 years or less. The distribution of the sample among the five sites was relatively even with 21% in the East site, 19% from the Midwest site, 19% from the

Northwest site, 23% from the Southwest site, and 18% from the South site (Larrabee & Lewis, 2015).

Analytic sample. Due to attrition and non-response over the course of this longitudinal study, data are missing on several study variables. Parent- and child-reported CM variables were collected at the age 12 assessment. Data were missing from 469 and 470 caregivers on the parent-reported psychological aggression and physical assault variables, respectively. Data were also missing on the child-reported psychological abuse ($n=471$), physical abuse ($n=473$), and sexual abuse ($n=480$) measures. There was no missing data on the cps-reported data, as research staff examined records for all participants. Proposed mediators (i.e., firearm access, relationship with father, and relationship with mother) were assessed at age 14. Data were missing from 501 participants on the firearm access variable; from 693 participants on the relationship with father variable; and from 505 participants on the relationship with mother variable. The dependent variable, weapon carrying, was assessed at age 18. Data were missing from 450 participants on this variable.

Measures

Demographics. Information on child gender and race was collected at baseline. Study site was also recorded and included in the dataset. Parent participants completed demographic information such as gender, race, age, and household income. Annual household income at baseline (age 4) was a categorical variable with 11 categories ranging from <\$5,000 to \$50,000 or more. For this study, a binary variable was created to reflect income of <\$20,000 or \$20,000 or more, given the distribution of the data. Child gender and annual family income at baseline were included as control variables.

Dependent variable. Adolescent weapon carrying was captured using a single item from a self-report measure on adolescent delinquency and violent behavior that was created for the Denver Youth Study (Huizinga, Esbensen, & Weiher, 1991). It was assessed at the age 18 assessment. The item used in analyses asked, “How many times in the last year have you carried a hidden weapon?” Responses included, “Never,” “One or two times,” “Between three and nine times,” and “10 or more times.” For this study, a binary variable was created to indicate any weapon carrying in the last year.

Proposed mediators. Data for the three proposed mediators (in-home firearm access, quality of relationship with father, and quality of relationship with mother) were all collected at the age 14 assessment. Further information on each variable follows.

In-home firearm access. Firearm access was assessed with six questions developed by the research team that were included in the age 14 assessment. The items reflect the adolescent’s knowledge of firearms in the home, handling of loaded firearms in general, access to firearms in the home, and access to loaded or unlocked firearms in the home. The assessment item utilized for this study was, “Are there any guns now kept in or around your home?” Response options were, “No,” “Yes, one gun,” “Yes, more than one gun,” or “Don’t know.” A binary variable was created based on this question to reflect if the adolescent indicated that there were no guns in the home (0) or if the adolescent indicated that there were one or more guns in the home (1). “Don’t know” responses were coded as missing.

Quality of Relationship with Father and with Mother. Participants rated the quality of the relationship with their fathers and with their mothers separately with the same six items, adapted from the National Longitudinal Study on Adolescent Health (Resnick et al., 1997). Participants were asked to rate items on a scale of one (“Never” or “Not at all,” depending on the

item) to five (“Always” or “Very much”). Example items include, “How close do you feel to your father/mother?” and, “Do you make decisions together?” Mean scores were calculated based on the average of the six items. Before responding to the items, participants were first asked if they live with their father/mother or someone who acts as a father/mother figure. If participants indicated that they did not live with a birth father/birth mother they were asked to respond to the items with the father/mother figure in mind. Quality of relationship with the father/mother was assessed at age 12 and at age 14. The data from the age 14 assessment were used in this analysis. Internal consistency for the mean scores of the quality of the relationship with the father and with the mother was excellent ($\alpha=.88$ and $\alpha=.85$, respectively). Because the scores for quality of relationship with the father and for quality of relationship with the mother were not normally distributed, the scores were cubed, and the transformed variables were used in the analyses.

Independent variable. Child maltreatment (CM) was measured using data from three sources: parent self-report, child self-report, and official records. Parent self-reported CM was measured using the Parent-Child Conflict Tactics Scale (CTS-PC) (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). The CTS-PC includes 22 items assessing the frequency of various parenting behaviors over the past year. Behaviors include appropriate, harsh, or abusive disciplinary techniques such as, “Explained why something was wrong,” or “Slapped him/her on the hand, arm, or leg.” Parents respond with their frequency of each behavior on a scale from 0 (“Has never happened”) to 6 (“More than 20 times”). They can also indicate if the behavior has happened before but not in the past year. There are three main scales: non-violent discipline, psychological aggression, and physical assault. Binary variables were created for psychological aggression and for physical assault to indicate if that type of abuse had ever occurred. To

maintain consistency with the data collection time points for the child-reported variables used in this study, parent-reported data from the assessment at 12 years were used.

Child self-reported lifetime experience of CM was assessed at age 12 and included experiences of psychological abuse, physical abuse, and sexual abuse. Questions were developed by the LONGSCAN research team and were based on definitions established in the literature and recognized by experts in the field (Barnett, Manly, & Cicchetti, 1993; Knight, Smith, Martin, Lewis, & The LONGSCAN Investigator Group, 2008). Physical abuse items included 18 items that led to more questions, if applicable, about the age of occurrence, frequency, and perpetrator. Sexual abuse items included 11 stem questions and psychological abuse items included 26 stem questions that followed a similar pattern to the physical abuse questions whereby participants were asked about age of occurrence, frequency, and perpetrator, if applicable, for each item. Children were asked about lifetime occurrence and occurrence in the past year. Regarding frequency of abusive behaviors, response options for the physical and sexual abuse questions were ordinal (“never,” “1 time,” “2 or 3 times,” “4 or more times”). Response options for psychological abuse were also ordinal but were, “never,” “sometimes,” or “often.” Binary variables for emotional, physical, and sexual abuse were created to indicate if that type of abuse ever occurred (i.e., the participant responded “Yes” to any of the stem questions). Example items include: “Have any of your parents ever blamed you for other people’s problems when they were not your fault?” “Has any adult ever tried to choke, drown, or smother you?” and “Has anyone tried to put some part of their body or anything else inside your private parts or bottom?”

CM was also assessed using official records from CPS, which were reviewed every two years. The research team included trained abstractors who reviewed narratives from CPS

records. Abstractors achieved 90% inter-rater reliability in coding the narratives for information such as what was being reported and conclusions drawn. While there are similar outcomes between those with substantiated (i.e., confirmed) and unsubstantiated (i.e., unconfirmed) CM cases (Hussey et al., 2005; Kohl, Jonson-Reid, & Drake, 2009), only substantiated cases will be regarded as CM in this study because of the sample being selected due to their risk for CM. The additional distinction of substantiation is important in this instance. Binary variables were created to indicate any substantiated emotional, physical, and sexual abuse cases on the child through age 12.

Propensity score variables. For the calculation of the propensity score, used as a covariate in the final models, parental history of victimization and parenting attitudes at baseline were used as predictors.

Parental history of physical assault victimization. The parent's history of CM was assessed through a single question: "When you were a child or teenage were you ever physically hurt by a parent or someone else (like hit slapped, beaten, shaken, burned, or anything like that)?" This question was asked of all caregivers at baseline. The variable was modeled as a binary variable indicating the presence (1) or absence (0) of abuse as a child or teenager.

Parenting attitudes. Parenting attitudes were assessed using the Adult-Adolescent Parenting Inventory (Bavolek, 1984). The AAPI has 32 items and 4 scales: appropriate expectations (expanded version), appropriate empathy, rejection of physical punishment, and appropriate family roles. Items are rated on a scale from one ("strongly agree") to five ("strongly disagree"). For this study, raw scale scores from the age four (baseline) assessment were used. Items include: "Children should always be spanked when they misbehave." and "A good child will comfort both of his/her parents after the parents have argued."

Analytic Plan

Descriptive statistics and bivariate relationships were analyzed in SAS 9.4 (SAS Institute Inc., Cary, NC). Mediation analyses were conducted in *Mplus* version 8 (Muthen & Muthen, 1999-2017). Bias-corrected 95% confidence intervals were bootstrap-generated (draws=5,000). Parameter estimates in the mediation models were calculated using a mean- and variance-adjusted weighted least squares (WLSMV) estimator and a probit link function. WLSMV is an estimation method used with nonnormally distributed data that has been found to perform better than maximum likelihood under such conditions. It is also a good alternative when sample sizes are not large enough for weighted least squares (Beauducel & Herzberg, 2006; C.-H. Li, 2016). Probit regression results are similar to those of logistic regression results. However, probit regression uses the inverse of the cumulative distribution function of the normal distribution. Unlike logit results, probit estimates cannot be interpreted in terms of change in log odds, but they provide information on the direction and magnitude of the change in the probit (Muthen, Muthen, & Asparouhov, 2016, pp. 222–224). The level of significance for all tests was set at $\alpha=.05$. This dissertation research was approved by the Georgia State University Institutional Review Board and deemed not human subjects research.

Analyses were run separately for each CM reporting source and type. That is, the following types of CM were considered as independent variables: Parent-reported emotional abuse and physical abuse; child-reported emotional abuse, physical abuse, and sexual abuse; and CPS-substantiated emotional abuse, physical abuse, and sexual abuse. To determine if a mediation model should be tested, bivariate relationships were first assessed between each of the independent variables and each of the proposed mediators. These relationships are referred to as the a path in a mediation model (Baron & Kenny, 1986). For firearm access these relationships

were tested in logistic regression models; for quality of relationship the associations were tested in linear regression models using the transformed variables. Next, the bivariate relationship between each of the proposed mediators and the dependent variable was tested in logistic regression models. These relationships are referred to as the b path in a mediation model (Baron & Kenny, 1986). If the a path *and* the b path were both statistically significant, a mediation model was tested. While a statistically significant relationship between the independent and dependent variables (the c path of the mediation model) was initially considered a prerequisite for testing mediation (Baron & Kenny, 1986), this is no longer the case. This is because there could be inconsistent mediation, in which the direct and indirect effects have opposite signs (Hayes, 2017; Valeri & Vanderweele, 2013), and this type of relationship would only be uncovered by testing the mediation model.

Covariate selection and propensity score calculation. Covariates included in the final mediation models included annual family income at baseline, child gender, and study site. Family income and child gender were selected based on prior research. Study site was included to address the potential for lack of independence of observations due to the overall sample consisting of samples from five different sites in which different sampling methods were used. A propensity score was also included as a covariate in the final models for psychological and physical abuse. Propensity score analysis provides a method of approximating randomization when randomization is not an option. That is, because it is not possible or ethical to randomize children to CM or non-CM groups, a propensity score strategy (in this case, propensity score adjustment) approximates randomization and minimizes bias due to possible systematic differences at baseline between those experiencing CM and those not experiencing CM (Austin, 2011; Heinze & Jüni, 2011; Pan & Bai, 2015). Propensity scores were calculated to estimate the

likelihood of group membership given a set of baseline variables, and the final mediation models were adjusted to account for these scores. Propensity scores were calculated separately for each CM reporting source and type. Variables in the propensity score models were parental history of CM and each of the four scale scores on the AAPI, as parental history of abuse and parenting attitudes are risk factors for CM (Centers for Disease Control and Prevention, 2018; Sidebotham & Heron, 2006). Although other risk factors for CM such as child gender and family income were assessed at baseline, these were not included in the propensity score calculation so that they could be included in the final mediation models without the risk of multicollinearity.

A propensity score was not calculated for sexual abuse. The risk factors associated with sexual abuse are different from those associated with other types of abuse (i.e., emotional and physical). Thus, calculating a score for the propensity for child sexual abuse based on parental history of physical abuse and parenting attitudes would not be meaningful. Family income and child gender are associated with child sexual abuse, but these variables were slated to be included in the mediation models; using them to calculate a propensity score would have led to issues of multicollinearity in the final models. Other risk factors for child sexual abuse, such as living with a step parent or in a single parent home (Sedlak et al., 2010), were not available from the baseline data.

Chapter 3: Results

Descriptive Statistics

Dependent variable. Data on the dependent variable, adolescent weapon carrying, were collected at the age 18 assessment.

Adolescent weapon carrying. Approximately 18% of adolescent participants ($n=165$) reported having carried a hidden weapon at least once in the last 12 months. This was relatively evenly distributed among the five study sites, ranging from 17% at the Southwest site ($n=38$) to 20% at the Northwest site ($n=35$). A significantly larger proportion of boys compared to girls reported weapon carrying (28% and 11%, respectively; $\chi^2[1]=43.38, p<.001$). Chi-square tests did not reveal any statistically significant differences in weapon carriage by race/ethnicity or by income level. See Table 2 for more details.

Independent variable. Child maltreatment (CM) was assessed at the age 12 assessment and was broken down by reporting source and type of maltreatment.

Child maltreatment. Parent-reported psychological aggression was widely reported, with 90% of the sample at the age 12 assessment ($n=794$) reporting that this type of abuse had occurred. Over half (65%, $n=576$) reported that physical assault had occurred. CM was less prevalent when examining reports by children. Less than half (41%, $n=359$) indicated that psychological abuse had occurred, and 23% ($n=202$) indicated that physical abuse had occurred. Sixteen percent ($n=139$) reported that they had been sexually abused. CPS records indicated that 16% of participants ($n=221$) had a substantiated emotional abuse case by age 12; 13% ($n=182$) had a substantiated physical abuse case; and 6% ($n=78$) had a sexual abuse case by age 12.

Proposed mediator variables. Adolescents' reported in-home firearm access, their reported quality of the relationship with their mothers, and the relationship with their fathers were assessed at the age 14 assessment.

In-home firearm access. Approximately 12% of adolescents ($n=99$) indicated that at least one gun was present in or around the home. The percentage of adolescents reporting the presence of a gun in the home was greatest at the South study site (26%, $n=38$) followed by the Northwest site (19%, $n=30$). The percentage was lowest at the Midwest site (3%, $n=4$) and at the East site (3%, $n=6$). The presence of a gun in the home was reported among a greater percentage boys (14%) than girls (11%), but this difference was not statistically significant. A significantly greater percentage of white adolescents (32%, $n=66$) reported a gun in the home compared to minority (i.e., non-white) adolescents (6%, $n=33$; $\chi^2[1]=98.06, p<.001$). A greater percentage of adolescents in families reporting an annual income of \$20,000 or more indicated the presence of a gun in the home compared to those in families reporting an annual income of less than \$20,000 (18% vs. 11%, respectively; $\chi^2[1]=5.98, p=.01$). See Table 3 for more details.

Quality of relationship with father. The mean score for adolescent quality of relationship with father was 4.01 ($SD=0.84; n=661$). Scores ranged from one to five, with higher scores indicating a better quality relationship. The average score was lowest at the South study site (3.87, $SD=0.94$) and highest at the Midwest site (4.19, $SD=0.74$). The mean score for boys (4.13, $SD=0.76$) was significantly different from the mean score for girls (3.88, $SD=0.89$; $t[640.21]=-3.83, p<.001$). Additionally, the mean score for non-white adolescents (4.07, $SD=0.81$) was significantly different from the mean score for white adolescents (3.86, $SD=0.88$; $t[659]=-2.88, p=.004$). There was no statistically significant difference in mean scores between high and low income categories ($t[561]=0.93, p=.35$).

Quality of relationship with mother. The mean score for adolescent quality of relationship with mother was 4.20 ($SD=0.69$; $n=849$). Scores ranged from one to five. The average score was lowest at the Northwest study site (4.05, $SD=0.65$) and highest at the Midwest site (4.37, $SD=0.60$). There was no statistically significant difference between the mean score for boys (4.23, $SD=0.66$) and the mean score for girls (4.17, $SD=0.73$; $t[845.11]=-1.31$, $p=.19$). The mean score for non-white adolescents (4.24, $SD=0.70$) was significantly different than the mean score for white adolescents (4.07, $SD=0.67$; $t[847]=-3.11$, $p=.002$). The mean score for those from families reporting an annual income of less than \$20,000 at baseline (4.24, $SD=0.68$) was significantly different from the mean score for those from families reporting an annual income of \$20,000 or more (4.04, $SD=0.72$; $t[723]=3.67$, $p<.001$).

Propensity score variables. Parental history of physical abuse victimization, as measured by a single assessment item, and parenting attitudes, measured by the four scales of the Adult-Adolescent Parenting Inventory (AAPI), were assessed at baseline. These variables were used to create propensity scores. Almost one-third (32%, $n=294$) of parents indicated a history of physical abuse victimization at the age four assessment (baseline). The mean score for the Appropriate Expectations scale (expanded version) of the AAPI was 47.75 ($SD=6.36$); the possible range of scores is 0-60. Higher scores on this and all AAPI scales indicate more appropriate behavior. The mean score for the Appropriate Empathy scale was 30.03 ($SD=5.51$); the possible range of scores is 0-40). The mean score for the Non-Corporal Discipline scale was 37.19 ($SD=6.29$); the possible range of scores is 0-50. The mean score for the Appropriate Family Roles scale was 29.23 ($SD=6.63$); the possible range of scores is 0-40.

Preliminary Testing of Proposed Mediators

In-home firearm access. To determine if firearm access should be tested as a mediator in the relation between CM by age 12 and adolescent weapon carrying at age 18, a bivariate logistic regression model was first tested between CM (all reporting sources and types separately) and firearm access (the a path). There was statistically significant relationship between parent-reported physical abuse up to age 12 and adolescent-reported firearm access at age 14 ($\beta=0.63$, 95% confidence interval [CI]: 0.09, 1.17; $B=0.16$). Additionally, the relationship between child-reported physical abuse and firearm access was statistically significant ($\beta=0.63$, 95% CI: 0.13, 1.12, $B=0.14$). No other categories of CM were significantly associated with firearm access. Because there were statistically significant results for the a path, the relationship between firearm access at age 14 and weapon carrying at age 18 was tested (the b path). This relationship was not statistically significant ($\beta=0.04$, 95% CI: -0.56, 0.64, $B=0.01$). Thus, firearm access at age 14 was not tested as a mediator.

Quality of relationship with father. To determine if the quality of relationship with father should be tested as a mediator, a bivariate linear regression model was first tested between CM and the transformed relationship variable (the a path). All types of child-reported CM were significantly related to quality of relationship with father. CPS-reported emotional and physical abuse were significantly related to quality of relationship with father. However, the quality of relationship with father was not significantly related to weapon carrying at age 18 (the b path). Thus, quality of relationship with father at age 14 was not tested as a mediator.

Quality of relationship with mother. As with the corresponding father relationship variable, a bivariate linear regression model was first tested between CM and the transformed relationship variable (the a path) to determine if the quality of relationship with mother should be tested as a mediator. As with the father relationship variables, all types of child-reported CM

were significantly related to the quality of relationship with mother as were CPS-reported emotional and physical abuse. Additionally, quality of relationship with mother was significantly associated with weapon carrying at age 18 ($\beta=-0.009$, 95% CI: -0.01, -0.003, $B=-0.15$). Thus, mediation models were pursued testing quality of relationship with mother at age 14 as a mediator in the relation between all types of child-reported CM and CPS-substantiated emotional and physical abuse through age 12 and weapon carrying at age 18.

Mediation Models

Child-reported CM. Separate mediation models were tested examining quality of the relationship with mother at age 14 as a mediator between child-reported emotional, physical and sexual abuse up to age 12 and weapon carrying at age 18. All models included the following covariates: child gender, family income at baseline, and study site. Additionally, the models for emotional abuse and physical abuse included model-specific propensity scores. Chi-square model difference testing was used to compare models with and without covariates. In all cases, the null hypothesis that including the additional covariates did not improve the model fit was rejected. See Table 4 for model results.

Child-reported emotional abuse. In the model that included the independent variable, proposed mediator, and dependent variable, the standardized estimate for the effect of emotional abuse on weapon carrying was -0.04 (95% CI: -0.15, 0.08). In the final mediation model for child-reported emotional abuse, which included the covariates, emotional abuse was significantly associated with quality of relationship with mother ($B=-0.31$, 95% CI: -0.40, -0.23), as was income ($B=-0.11$, 95% CI: -0.20, -0.03) and study site ($B=-0.16$, 95% CI: -0.26, -0.07). No other variables were significantly associated with quality of relationship with mother. In looking at weapon carrying as the outcome, child gender was the only variable with which there was a

significant association ($B=0.29$, 95% CI: 0.15, 0.41). Results also indicated that the indirect effects were not significant (0.02, 95% CI: -0.03, 0.07). See Figure 1a and Table 6 for more details.

Child-reported physical abuse. In the model that included the independent variable, proposed mediator, and dependent variable, the standardized estimate for the effect of physical abuse on weapon carrying was 0.07 (95% CI: -0.05, 0.17). In the final mediation model for child-reported physical abuse, child physical abuse was significantly related to the quality of relationship with mother ($B=-0.15$, 95% CI: -0.24, -0.06), as was income ($B=-0.14$, 95% CI: -0.23, -0.05), and study site ($B=-0.17$, 95% CI: -0.26, -0.07). No other variables were significantly associated with quality of relationship with mother. In looking at weapon carrying as the outcome, child gender was the only variable with which there was a significant association ($B=0.27$, 95% CI: 0.14, 0.40). The indirect effects were not significant (0.01, 95% CI: -0.01, 0.04). See Figure 1b and Table 6 for more details.

Child-reported sexual abuse. In the model that included the independent variable, proposed mediator, and dependent variable, the standardized estimate for the effect of sexual abuse on weapon carrying was 0.09 (95% CI: -0.03, 0.19). In the final mediation model for child-reported sexual abuse, child sexual abuse was significantly related to quality of relationship with mother ($B=-0.10$, 95% CI: -0.18, -0.01), as was income ($B=-0.15$, 95% CI: -0.23, -0.07), and study site ($B=-0.17$, 95% CI: -0.24, -0.08). No other variables were significantly associated with quality of relationship with mother. In looking at weapon carrying as the outcome, child gender was the only variable with which there was a significant association ($B=0.31$, 95% CI: 0.20, 0.41). The indirect effects were not significant in this model either (0.01, 95% CI: -0.001, 0.04). See Figure 1c and Table 6 for more details.

CPS-substantiated CM. Separate mediation models were tested examining quality of the relationship with mother as a mediator between CPS-substantiated emotional and physical abuse and weapon carrying. Both models included the following covariates: child gender, family income at baseline, study site, and model-specific propensity scores. Chi-square model difference testing was used to compare models with and without covariates. In both cases, the null hypothesis that including the additional covariates did not improve the model fit was rejected. In instances in which p -values indicated statistical significance, but 95% CIs included 0, p -values are provided. See Table 5 for model results.

CPS-substantiated emotional abuse. In the model that included the independent variable, proposed mediator, and dependent variable, the standardized estimate for the effect of emotional abuse on weapon carrying was -0.03 (95% CI: -0.11, 0.08). In the final mediation model for CPS-substantiated emotional abuse, which included covariates in addition to the mediator, emotional abuse was significantly associated with quality of relationship with mother ($B=-0.12$, 95% CI: -0.21, -0.03), as was income ($B=-0.09$, 95% CI: -0.17, -0.004), study site ($B=-0.15$, 95% CI: -0.24, -0.06), and propensity score ($B=-0.10$, 95% CI: -0.19, -0.02). No other variables were significantly associated with quality of relationship with mother. In looking at weapon carrying as the outcome, child gender was the only variable with which there was a significant association ($B=0.29$, 95% CI: 0.17, 0.40). The indirect effects were not significant in this model (0.01, 95% CI: -0.001, 0.04). See Figure 2a and Table 6 for more details.

CPS-substantiated physical abuse. In the model that included the independent variable, proposed mediator, and dependent variable, the standardized estimate for the effect of physical abuse on weapon carrying was 0.08 (95% CI: -0.02, 0.16). In the final mediation model for CPS-reported physical abuse, physical abuse was significantly associated with quality of

relationship with mother ($B=-0.14$, 95% CI: -0.22, -0.05), as was study site ($B=-0.15$, 95% CI: -0.24, -0.06), and propensity score ($B=-0.09$, 95% CI: -0.18, 0.003, $p=.048$). No other variables were significantly associated with quality of relationship with mother. In looking at weapon carrying as the outcome, there was a significant association with physical abuse ($B=0.12$, 95% CI: -0.006, 0.22, $p=.04$), as well as with child gender ($B=0.30$, 95% CI: 0.18, 0.41). The indirect effects were not significant (0.01, 95% CI: -0.003, 0.04). See Figure 2b and Table 6 for more details.

Ad Hoc Analyses

In order to better understand the role of quality of relationship with mother, it was also tested as a moderator in the relation between the CM variables (specifically, the five types included in the mediation models) and weapon carrying at age 18. Additional testing was justified because theoretically, it could be the case that mother-child relationship quality is the reason why CM and weapon carrying are connected (i.e., a mediation model), given that CM affects relationship quality and relationship quality has an impact on delinquent behaviors. However, it could also be the case that the effect of CM on weapon carrying is different at different levels of relationship quality (i.e., a moderation model), with CM having a lesser effect on weapon carrying for relationships of high quality. Results showed that quality of relationship with mother served as a moderator in the relation between child-reported sexual abuse and adolescent weapon carrying, as the interaction term was significant ($B=0.40$, 95% CI: 0.10, 0.69). That is, at higher (i.e., better quality) levels of mother-child relationship quality, the effect of child-reported sexual abuse on adolescent weapon carrying is greater, controlling for child gender, family income, and study site. See Table 7 for more details.

Chapter 4: Discussion, Future Directions, and Conclusion

This research sought to elucidate the relation between CM and weapon carrying, for which a significant relationship has been established in previous research (Leeb et al., 2007; Lewis et al., 2007), by examining potential mediators using longitudinal data. Prior research has examined a variable at the intrapersonal level, perceived need for a weapon, and found it to act as a mediator in the cases of child-reported physical abuse and sexual abuse (Lewis et al., 2007). The current study looked to extend this work by examining potential mediators at the interpersonal/environmental level: in-home firearm access, quality of relationship with father, and quality of relationship with mother. These variables are modifiable, and, if evidence of mediation was established, could be targeted by evidence-based parenting programs that work with families experiencing CM. Surprisingly, none of the proposed variables served as mediators.

Main Research Questions

In-home firearm access as mediator. It seems plausible that the presence of a firearm in the home could facilitate an adolescent's access to such a weapon. It could also indicate a normalization of weapons at home in general, making adolescents more apt to carry one, as was discussed by Ruback and colleagues (2011). However, results from this study do not support either of these scenarios, given that mediation was not found. Two types of CM (parent-reported and child-reported physical abuse) were significantly associated with in-home firearm access, but it was determined not to act as a mediator due to its lack of relationship with the dependent variable, weapon carriage at age 18.

While in-home firearm access was not related to weapon carrying, parent-reported and child-reported physical abuse were associated with an increase in the odds of reporting a firearm in the home. This is an interesting finding, considering that the population at-risk for CM does not typically have the factors associated with the presence of a gun in the home, such as high income. This was not a main research question, and, as such, a rigorous analysis of these variables was not conducted, which would have included control variables. Future research should examine this relationship more closely to determine if it continues to hold true when confounding variables are held constant.

Quality of relationship with father as mediator. Results were similar for quality of relationship with father at age 14. All types of child-reported CM were significantly associated with quality of relationship with father as well as CPS-substantiated emotional abuse and physical abuse, consistent with previous research (L. Li et al., 2016), but it was determined not to act as a mediator due to the lack of a significant association with later weapon carriage. Other research encountered a similar pattern. A study in Norway looked at potential mediators in the relation between living in a single-parent (mother or father) divorced home and adolescent antisocial and risky behavior. They found that mother-child conflict mediated this relation in single-mother homes, but father-child conflict was not a mediator in single-father homes (Breivik, Olweus, & Endresen, 2009). While information on whom the child lived with (e.g., both biological parents, biological mother only, etc.) was not available in the current study, it could be the case that many of the children were living primarily with their mothers, making the relationship more impactful on their behaviors. Future work should examine the interaction of child gender and quality of father-child relationship on weapon carrying. Additionally, relationship quality at age 14 was included in the model. Future research should include

relationship quality at age 18 as well, as it may be the case that current relationship status is as important, or more important, in its effects on delinquent behavior as opposed to previous relationship quality.

Quality of relationship with mother as mediator. All types of child-reported CM and CPS-substantiated emotional abuse and physical abuse were significantly negatively associated with the quality of relationship with mother, consistent with previous research (Baer & Martinez, 2006; Sousa et al., 2011). It, in turn, was significantly negatively associated with the dependent variable in bivariate analyses and was tested as a mediator. In mediation models, these five types of CM tested were all significantly negatively associated, on average, with quality of relationship with mother, controlling for child gender family income, study site, and propensity score. These final models also found that all types of CM tested were not significantly associated with weapon carrying, with the exception of CPS-substantiated physical abuse. Children with a CPS-substantiated physical abuse case by age 12 had, on average, higher odds of weapon carrying at age 18, controlling for confounders. It should be noted that the 95% CI for this estimate included 0. However, significant results in this study were identified as those with a *p*-value less than .05. Thus, the estimate was considered significant. Results of mediation models indicated that quality of relationship with mother did not serve as a mediator in the relation between CM and weapon carriage in any of the models, as indirect effects were not significant in any case. This is contrary to what was expected. Thus, none of these exploratory main study hypotheses proposing firearm access, quality of relationship with father, and with mother as mediators, were supported.

Ad Hoc Analyses

The ad hoc moderation analyses showed that quality of relationship with mother at age 14 served as a moderator in the relation between early child-reported sexual abuse and later weapon carrying. Specifically, results indicated that, on average, the effect of child-reported sexual abuse on weapon carrying was higher at higher levels of relationship quality and lower at lower levels of relationship quality, controlling for confounders. This finding is contrary to what would have been expected, especially given the negative association between relationship quality and weapon carrying in previous analyses and prior research indicating that parent-child relationship is negatively correlated with delinquent behavior (Haegerich, Oman, Vesely, Aspy, & Tolma, 2013; Orpinas et al., 1999; Thurnherr, Michaud, Berchtold, Akre, & Suris, 2009). While this is unexpected, given that better mother-child relationship quality is typically a protective factor against delinquent behavior (Breivik et al., 2009; Klahr, Rueter, McGue, Iacono, & Burt, 2011), mothers of sexual abuse victims who have a high quality or close relationship with their children may have trouble setting boundaries. This could allow adolescents the latitude to engage in delinquent behavior. Numerous studies have shown that nonoffending mothers of child sexual abuse victims, on average, have inconsistent parenting behaviors, exhibit poor parental monitoring, and report a low sense of parental competence. Researchers report this is likely due to an increased risk of distress and depression after a child is sexually abused (Jobe-Shields, Swiecicki, Fritz, Stinnette, & Hanson, 2016; Mannarino, Cohen, Deblinger, & Steer, 2007; Pazdera, McWey, Mullis, & Carbonell, 2013; Santa-Sosa, Steer, Deblinger, & Runyon, 2013). It should be noted that the perpetrator of the CM was not taken into account in the current analyses. In child sexual abuse cases, however, the vast majority of perpetrators are not biological parents and only a small minority are women (Sedlak et al., 2010). The mother's nonoffending role in this particular type of abuse may have contributed to the difference in the

role of mother-child relationship in the sexual abuse model compared to the other types of CM. This is preliminary work on this topic, and further research should be conducted to help explain these findings.

Additional Findings of Interest

In addition to the findings on the proposed mediators and moderator, this study adds to the literature by providing descriptive information on firearm access and weapon carrying, two areas of research that have historically been understudied (Alcorn, 2016; Ladapo et al., 2013).

In-home firearm access. Approximately 12% of study participants reported a firearm in the home. This is lower than other research assessing adolescent firearm access at home, which found over 22-24% of adolescents reporting in-home firearm access (Swahn et al., 2002; Watkins & Lizotte, 2011). However, these studies used nationally representative samples with over 10,000 participants in non-child welfare populations. The current study is smaller and targeted families at risk for CM. These families reported very low annual income levels at baseline (less than \$20,000 for 69% of families at baseline) and were predominantly non-white (74% of children). Adolescent reports of a firearm in the home are associated with higher family income and with being white (Carter et al., 2013; Swahn et al., 2002). This may have led to the lower rate of in-home firearms in this study. Additionally, because this study involved a sample of families at risk for CM, there were participants living with an adoptive (11%) or foster (2%) parent at the age 14 assessment. Other participants may have lived in homes where an investigation was in progress. Involvement with child welfare in these ways could have impacted the availability of firearms in the home.

Of the five different study sites in the U.S., in-home firearms were reported in greatest numbers in the South and Northwest sites, which is consistent with geographical gun ownership patterns (Kalesan, Villarreal, Keyes, & Galea, 2016). Also consistent with previous research, in-home firearms were reported by a significantly greater percentage of white adolescents compared to non-white adolescents and by those from homes in the higher income category (Ruback et al., 2011; Simckes et al., 2017; Simonetti et al., 2015; Swahn et al., 2002). The difference was especially substantial by race, with 32% of white adolescents reporting access compared to 6% of non-white adolescents. In bivariate logistic regression analyses, parent-reported physical abuse and child-reported physical abuse were significantly associated with in-home firearm access. Specifically, children whose parents reported or who self-reported physical abuse had, on average, increased odds of in-home firearm access at age 14 compared to those who had not experienced physical abuse per parent- and self-report.

Weapon carrying. As was the case in a study by Carter and colleagues (2013) and in line with recent nationally representative data (Kann et al., 2018), weapon carrying did not differ descriptively by race in this study. Also consistent with prior research, a significantly greater percentage of boys reported weapon carrying compared to girls (Carter et al., 2013; Leeb et al., 2007; Lewis et al., 2007). Of note, child gender was a consistent predictor of weapon carrying, controlling for quality of mother-child relationship and confounding variables, with boys at greater odds of weapon carrying than girls in all mediation models. This is not surprising given that prior research has found that adolescent boys engage in more delinquent behavior such as weapon carrying compared to girls (Carter et al., 2013; Pickett et al., 2005). Research by Leeb and colleagues (2007) found that the relationship between child sexual abuse and weapon carrying was different for boys than for girls. In their study, the relationship between child

sexual abuse and weapon carrying was not significant for boys but it was for girls. Future research should further explore the role of gender in weapon carrying, as the reasons for this behavior may differ between boys and girls. Identifying these differences could aid in creating targeted prevention messages and other public health efforts.

Study participants who indicated that they carried a hidden weapon in the past year were asked a follow-up question about the type of weapon carried. The six weapon options were not mutually exclusive. The three most commonly endorsed weapons were pocket knives (67% of weapon carriers), “other knives” (23%), and guns (22%). Participants in the current study were not asked how the weapon carried was obtained, so it is unknown if the weapons were taken from the home environment or other sources. Given that at age 18, participants would not have been able to legally purchase a handgun, and it would be difficult to carry a hidden long gun, it is likely that the guns referenced by the participants were either taken or obtained in another illegal manner. One study assessing the source of firearms in particular found that the majority of respondents would not reveal where they obtained the gun; only 17% indicated they had obtained it legally (Carter et al., 2013). Future research should investigate where adolescents obtain weapons when they carry them. A mixed methods approach would be useful in this context, whereby qualitative data could help explain the reasons behind quantitative findings.

In the initial mediation analyses, with no added covariates, no types of CM tested were significantly associated with weapon carrying. In the final mediation models, all but CPS-reported physical abuse were not significantly associated with weapon carrying. Children with CPS-substantiated physical abuse had, on average, increased odds of weapon carrying at age 18 compared to those without a substantiated physical abuse case, controlling for quality of relationship with mother, child gender, family income, study site, and propensity score. This is

not surprising, given that a review of the literature in this area has found physical abuse to be a consistent predictor of youth violent delinquent behavior across studies (Maas et al., 2008). Interestingly, CM and weapon carrying became significantly related in the final CPS-substantiated physical abuse model, when they were not significantly associated in the initial mediation model that did not include the control variables. In returning to the model and adding the control variables individually, it was discovered that it was at the introduction of propensity score to the model that the effect of physical abuse on weapon carrying became significant. That is, when the baseline likelihood for physical abuse was held constant along with mother-child relationship quality, the effect of CPS-substantiated physical abuse on weapon carrying emerged as significant. This is important to note for future research using observational data. Other methods of propensity score analysis, such as matching and stratification, provide even more protection against bias (Pan & Bai, 2015), but they were not appropriate for this study, given the rare outcome.

CM reporting sources. This study provided a unique contribution to the literature by conducting analyses using three reporting sources for CM: parent, child, and CPS records. Research has found that CM rates are underestimated using parent-reported measures compared to child-reported measures (Chan, 2012). However, the current study found that parent-reported estimates of abuse were far greater than child-reported estimates. For instance, according to parent-report measures 90% of children in this study experienced emotional abuse by age 12. However, using the child-report measure only 41% indicated emotional abuse for the same time period. According to parent-report measures 65% of children experienced physical abuse, but using the child-report measure only 23% experienced physical abuse by age 12. While parents typically underreport maltreatment, the large discrepancies in this study are likely due to the

difference in the content of the measures. The parent-report measure in this study was the Parent-Child Conflict Tactics Scale (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). This is a widely used, standardized and validated measure of CM. However, in a sample of parents at risk for CM it may not have captured enough variability to be used as a measure of CM in this analysis. For instance, the Psychological Aggression scale includes five items, one of which is “shouted, yelled, or screamed at.” In comparison, the child-report measure used in this study, developed by the LONGSCAN research team, included 18 items of less common behavior. For instance, one item is, “Have any of your parents ever threatened to hurt someone very important to you?” In the context of this study of families at risk for CM, the measure created specifically with this population in mind may have captured only behavior serious enough to rise to the level of maltreatment rather than poor parenting behavior, making an indicator variable for maltreatment more reflective of the presence of abuse. Using the frequency of the behaviors on the CTS-PC, as is common in research, may have resulted in greater variability, but an indicator variable was used in order to be consistent across the three reporting types.

As has been found in previous research, the lowest rates of CM were observed using the CPS records. CM that comes to the attention of CPS officials is commonly regarded as the “tip of the iceberg,” capturing only a portion of abuse (Everson et al., 2008; Fallon et al., 2010; Finkelhor, Turner, Ormrod, & Hamby, 2009; Swahn et al., 2006). The use of multiple reporting sources in studies of CM is important to understanding the true scope of those affected.

Limitations

Despite the strengths and contributions of this study, there are several notable limitations. First, the sample is from an at-risk population, meaning findings cannot be generalized to the

overall population. However, the main research questions for this study applied to a population at risk for CM. Other work on firearm access and weapon carrying has been done in a similar population with little variability in characteristics such as family income (Carter et al., 2013; Lewis et al., 2007). The study sample was not selected randomly from the U.S. but from five specific study sites using a purposive convenience sample. This may have led to a lack of independence of observations, as each study site had its own inclusion criteria. Participants at each of these sites are subject to cultural norms from that specific region of the country. A multilevel model would have accounted for correlated data by study site, but, given there were only five study sites, this was not a possibility. To address this issue, study site was entered into each model as a control variable. Results should be interpreted with this information on the sample in mind.

Additionally, this study uses secondary data from LONGSCAN and, as such, was not formulated with the current research questions in mind. For instance, while the analyses for the mediation models were conducted in *Mplus* (Muthen & Muthen, 1999-2017), which uses all available data to estimate the parameters, the study was not powered for the current research questions. Also, variables may not have been included in the research assessments that would have been considered had these mediation models been the focus of the larger study. This could lead to omitted variable bias. Future work should be conducted focusing specifically on these potential mediators and outcome. Results of this study are also subject to the multiple comparisons problem and an increase in the Type I error rate, due to the great number of analyses conducted. Ordinarily, a correction would have been implemented to account for this and protect against false positives. However, given the exploratory nature of this work, this was not done so as not to increase the rate of false negatives. Results should be considered with the

potential for false positives in mind. More research should be conducted to replicate the significant findings in this study.

Finally, it is important to note that abuse categories were not mutually exclusive. Thus, children coded as not having experienced child-reported emotional abuse, for example, may have experienced physical abuse. This could have affected results in this study. However, separate analyses by type are also a strength of the study, as different types of abuse have different characteristics and sequelae (Manly, Kim, Rogosch, & Cicchetti, 2001; Sedlak et al., 2010). Similarly, child participants could have experienced the first instance of abuse after the age 12 assessment. Future research with a broader sample should also include analysis of CM victims compared to non-victims and explore more complex models that include both early and later abuse experiences.

Implications and Conclusion

This study serves to provide a better understanding of the relationship between early CM and later weapon carrying in order to inform CM interventions such as evidence-based parenting programs. These programs could target specific modifiable parenting behaviors early on that improve later outcomes for children as adolescents. Given that mother-child relationship quality acted as a moderator in the child-reported sexual abuse model, nonoffending mothers of child sexual abuse victims should be provided especially with parenting strategies that will allow them to be emotionally supportive of their children while still providing structure, consistent parenting behaviors, and adequate monitoring. In addition to supporting them in their parenting skills, nonoffending mothers of sexual abuse victims should also be referred to mental health services that prevent or treat depression (Jobe-Shields et al., 2016; Mannarino et al., 2007). These early

intervention services could ultimately help prevent later adolescent delinquent behavior such as weapon carrying.

The study also provides more descriptive information about firearm and weapon-related factors in families. While in-home firearm access did not emerge as a significant mediator in this study, it is still an important factor to address in homes in which CM is an issue, as initial models indicated a significant relationship between physical abuse and in-home firearm access. Child welfare policy makers should consider making it routine for CPS workers to formally address gun safety in the home in a way that focuses on child and adolescent safety. Messages related to firearms are often politicized and conjure arguments regarding government infringement on rights. However, these discussions should become more routine and seen as a regular part of child health and safety, especially in home where extreme physical violence has occurred, and caregivers may react impulsively when angry or frustrated. Approaches could model the routine discussions that pediatricians have about guns in the home (Betz & Wintemute, 2015; Council on Injury Violence and Poison Prevention Executive Committee, 2012). Parents should also be counseled on the restriction of firearm access in the home throughout their child's life, not just in early childhood, as there are safety concerns with firearms in the home outside of just accidental shootings by young children. This is important for all parents to understand but especially parents of boys, given that boys are at greater risk for weapon involvement in adolescence, including violent perpetration and especially victimization through suicide. Suicide is the second leading cause of death among 15-24 year olds and almost half are completed using a firearm (CDC, National Center for Injury Prevention and Control, 2017). This is an especially poignant issue in a population experiencing CM, as CM victimization may increase the risk for suicide (Logan, Leeb, & Barker, 2009; Martin, Bergen,

Richardson, Roeger, & Allison, 2004; Thompson et al., 2005). Public health communication campaigns should also be developed with this message of firearm safety through the life course, as it was not CPS-reported abuse that was significantly associated with firearm access. Thus, there may be homes in which abuse is occurring that does not come to the attention of authorities.

This research has also sparked more research questions to be explored. Future work should examine other mediators at all levels of the social-ecological model that may help to elucidate the relationship between early CM and later weapon carrying. Youth violence is a substantial public health problem and greater understanding of its etiology will aid in prevention efforts. Given that millions of families involved in the child welfare system receive prevention or intervention services each year (US DHHS, ACF, 2018), addressing modifiable risk factors for adolescent risk behaviors early on could have a strong public health impact.

References

- Alcorn, T. (2016). Trends in Research Publications About Gun Violence in the United States, 1960 to 2014. *JAMA Internal Medicine*, 1998–2000.
<https://doi.org/10.1001/jamainternmed.2016.7076>
- Austin, P. C. (2011). An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research*, 46(3), 399–424.
<https://doi.org/10.1080/00273171.2011.568786>
- Baer, J. C., & Martinez, C. D. (2006). Child maltreatment and insecure attachment: A meta-analysis. *Journal of Reproductive and Infant Psychology*, 24(3), 187–197.
<https://doi.org/10.1080/02646830600821231>
- Barnett, D., Manly, J., & Cicchetti, D. (1993). Defining child maltreatment: The interface between policy and research. In D. Cicchetti & S. L. Toth (Eds.), *Advances in Applied Developmental Psychology: Child Abuse, Child Development, and Social Policy*. Norwood, NJ: Ablex Publishing Corp.
- Baron, R., & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.
<https://doi.org/10.1037/0022-3514.51.6.1173>
- Bavolek, S. (1984). *Handbook for the AAPI (Adult-Adolescent Parenting Inventory)*. Park City, UT: Family Development Resources, Inc.
- Beardslee, J., Docherty, M., Mulvey, E., Schubert, C., & Pardini, D. (2018). Childhood risk factors associated with adolescent gun carrying among Black and White males: An

examination of self-protection, social influence, and antisocial propensity explanations. *Law and Human Behavior*, 42(2), 110–118. <https://doi.org/10.1037/lhb0000270.supp>

Beauducel, A., & Herzberg, P. Y. (2006). On the performance of maximum likelihood versus means and variance adjusted weighted least squares estimation in CFA. *Structural Equation Modeling: A Multidisciplinary Journal*, 13(2), 186–203.

https://doi.org/10.1207/s15328007sem1302_2

Betz, M. E., & Wintemute, G. J. (2015). Physician counseling on firearm safety a new kind of cultural competence. *JAMA*, 314(5), 449–450. <https://doi.org/10.1001/jama.2015.7055>

Breivik, K., Olweus, D., & Endresen, I. (2009). Does the quality of parent-child relationships mediate the increased risk for antisocial behavior and substance use among adolescents in single-mother and single-father families? *Journal of Divorce & Remarriage*, 50(6), 400–426. <https://doi.org/10.1080/10502550902766282>

Bronfenbrenner, U. (1979). *The Ecology of Human Development—Experiments by Nature and Design*. Cambridge, MA: Harvard University Press. Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/00131728109336000>

Carter, P. M., Walton, M. A., Newton, M. F., Clery, M., Whiteside, L. K., Zimmerman, M. A., & Cunningham, R. M. (2013). Firearm possession among adolescents presenting to an urban emergency department for assault. *Pediatrics*, 132(2), 213–21. <https://doi.org/10.1542/peds.2013-0163>

Centers for Disease Control and Prevention. (1993). Violence-related attitudes and behaviors of high school students--New York City, 1992. *MMWR*, 42(40), 773–7. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8413162>

Centers for Disease Control and Prevention. (2015). The Social-Ecological Model: A Framework for Prevention. Retrieved from <https://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html>

Centers for Disease Control and Prevention. (2018). Child Abuse and Neglect: Risk and Protective Factors. Retrieved from <https://www.cdc.gov/violenceprevention/childabuseandneglect/riskprotectivefactors.html>

Centers for Disease Control and Prevention National Center for Injury Prevention and Control. (2017). WISQARS (Web-based Injury Statistics Query and Reporting System). Retrieved February 17, 2018, from <https://www.cdc.gov/injury/wisqars/index.html>

Chan, K. L. (2012). Comparison of parent and child reports on child maltreatment in a representative household sample in Hong Kong. *Journal of Family Violence*, 27(1), 11–21. <https://doi.org/10.1007/s10896-011-9405-1>

Council on Injury Violence and Poison Prevention Executive Committee. (2012). Firearm-related injuries affecting the pediatric population. *Pediatrics*, 130(5), e1416–e1423. <https://doi.org/10.1542/peds.2012-2481>

Coyne-Beasley, T., Johnson, R. M., Johnson, R. M., Webster, B., & Wiebe, D. J. (2001). Gun storage--Who's the right target? *Pediatrics*, 108(3), 823. <https://doi.org/10.1542/peds.108.3.823b>

Dahlberg, L., & Krug, E. (2002). *World Report on Violence*. Geneva. Retrieved from http://www.who.int/violence_injury_prevention/violence/world_report/en/summary_en.pdf

Danese, A., Moffitt, T. E., Harrington, H., Milne, B. J., Polanczyk, G., Pariante, C. M., ... Caspi,

- A. (2009). Adverse childhood experiences and adult risk factors for age-related disease: depression, inflammation, and clustering of metabolic risk markers. *Archives of Pediatrics & Adolescent Medicine*, *163*(12), 1135–1143.
<https://doi.org/10.1001/archpediatrics.2009.214>
- David-Ferdon, C., Vivolo-Kantor, A. M., Dahlberg, L. L., Marshall, K. J., Rainford, N., & Hall, J. E. (2016). *A Comprehensive Technical Package for the Prevention of Youth Violence and Associated Risk Behaviors*. Atlanta, GA. Retrieved from
<https://www.cdc.gov/violenceprevention/pdf/yv-technicalpackage.pdf>
- Duke, N. N., Pettingell, S. L., McMorris, B. J., & Borowsky, I. W. (2010). Adolescent violence perpetration: Associations with multiple types of adverse childhood experiences. *Pediatrics*, *125*(4). <https://doi.org/10.1542/peds.2009-0597>
- DuRant, R. H., Getts, A. G., Cadenhead, C., & Woodes, E. (1995). The association between weapon-carrying and the use of violence among adolescents living in or around public housing. *Journal of Adolescence*, *18*, 579–592. Retrieved from https://ac.els-cdn.com/S0140197185710408/1-s2.0-S0140197185710408-main.pdf?_tid=a7022260-9ab3-421e-b4fc-5c805c746e0f&acdnat=1522161360_878995896836152ff68ded2b506aae77
- DuRant, R. H., Kahn, J., Beckford, P. H., & Woods, E. R. (1997). The association of weapon carrying and fighting on school property and other health risk and problem behaviors among high school students. *Archives of Pediatrics & Adolescent Medicine*, *151*(4), 360–366. <https://doi.org/10.1001/archpedi.1997.02170410034004>
- Eckenrode, J., Smith, E. G., McCarthy, M., & Dineen, M. (2014). Income inequality and child maltreatment in the United States. *Pediatrics*, *133*(3), 454–461.

<https://doi.org/10.1542/peds.2013-1707>

Everson, M. D., Smith, J. B., Hussey, J. M., English, D., Litrownik, A. J., Dubowitz, H., ...

Runyan, D. K. (2008). Concordance between adolescent reports of childhood abuse and Child Protective Service determinations in an at-risk sample of young adolescents. *Child Maltreatment, 13*(1), 14–26. <https://doi.org/10.1177/1077559507307837>

Fallon, B., Trocmé, N., Fluke, J., MacLaurin, B., Tonmyr, L., & Yuan, Y.-Y. (2010).

Methodological challenges in measuring child maltreatment. *Child Abuse & Neglect, 34*(1), 70–79. <https://doi.org/10.1016/J.CHIABU.2009.08.008>

Fang, X., Brown, D. S., Florence, C., & Mercy, J. A. (2012). The economic burden of child maltreatment in the United States and implications for prevention. *Child Abuse & Neglect, 36*(2), 156–165. <https://doi.org/10.1016/j.chiabu.2011.10.006>.The

Farrell, A. D., Henry, D. B., & Bettencourt, A. (2013). Methodological challenges examining subgroup differences: Examples from universal school-based youth violence prevention trials. *Prevention Science, 14*(2), 121–133. <https://doi.org/10.1007/s11121-011-0200-2>

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., ...

Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine, 14*(4), 245–258. [https://doi.org/10.1016/S0749-3797\(98\)00017-8](https://doi.org/10.1016/S0749-3797(98)00017-8)

Ferguson, C. J., & Meehan, D. C. (2010). Saturday night's alright for fighting: Antisocial traits, fighting, and weapons carrying in a large sample of youth. *Psychiatr Q, 81*, 293–302.

<https://doi.org/10.1007/s11126-010-9138-y>

- Finigan-Carr, N., Cheng, T., Gielen, A., Haynie, D. L., & Simons-Morton, B. (2015). Using the theory of planned behavior to predict aggression and weapons carrying in urban African American early adolescent youth. *Health Education and Behavior, 42*(2), 220–230. <https://doi.org/10.1177/1090198114548479>
- Finkelhor, D., Turner, H., Ormrod, R., & Hamby, S. L. (2009). Violence, abuse, and crime exposure in a national sample of children and youth. *Pediatrics, 124*(5), 1411–23. <https://doi.org/10.1542/peds.2009-0467>
- Ford, J. L., & Browning, C. R. (2014). Effects of exposure to violence with a weapon during adolescence on adult hypertension. *Annals of Epidemiology, 24*(3), 193–198. <https://doi.org/10.1016/J.ANNEPIDEM.2013.12.004>
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: A review of the literature and directions for future research. *Child Maltreatment, 11*(3), 263–280. <https://doi.org/10.1177/1077559506289524>
- Gault-Sherman, M. (2012). It's a two-way street: The bidirectional relationship between parenting and delinquency. *J Youth Adolescence, 41*(121–145). <https://doi.org/10.1007/s10964-011-9656-4>
- Haegerich, T. M., Oman, R. F., Vesely, S. K., Aspy, C. B., & Tolma, E. L. (2013). The predictive influence of family and neighborhood assets on fighting and weapon carrying from mid-to late adolescence. *Prevention Science, 15*, 473–484. <https://doi.org/10.1007/s11121-013-0400-z>
- Hardy, M. S. (2006). Keeping children safe around guns: Pitfalls and promises. *Aggression and Violent Behavior, 11*(4), 352–366. <https://doi.org/10.1016/j.avb.2006.01.003>

- Hayes, A. F. (2017). *Introduction to Mediation, Moderation, and Conditional Process Analysis* (Second). Guilford.
- Heinze, G., & Jüni, P. (2011). An overview of the objectives of and the approaches to propensity score analyses. *European Heart Journal*, *32*(14), 1704–1708.
<https://doi.org/10.1093/eurheartj/ehr031>
- Hertz, M., Jones, S. E., Barrios, L., David-Ferdon, C., Behavioral, [, Holt, M., ... Jones, E. (2015). Association between bullying victimization and health risk behaviors among high school students in the United States. *J Sch Health*, *85*(12), 833–842.
<https://doi.org/10.1111/josh.12339>
- Huizinga, D., Esbensen, F.-A., & Weiher, A. W. (1991). Are there multiple paths to delinquency. *Journal of Criminal Law and Criminology*, *82*(1), 83–118. Retrieved from
<https://scholarlycommons.law.northwestern.edu/jclc>
- Hussey, J. M., Marshall, J. M., English, D. J., Knight, E. D., Lau, A. S., Dubowitz, H., & Kotch, J. B. (2005). Defining maltreatment according to substantiation: Distinction without a difference? *Child Abuse and Neglect*, *29*(5), 479–492.
<https://doi.org/10.1016/j.chiabu.2003.12.005>
- Jobe-Shields, L., Swiecicki, C. C., Fritz, D. R., Stinnette, J. S., & Hanson, R. F. (2016). Posttraumatic stress and depression in the nonoffending caregivers of sexually abused children: Associations With parenting practices. *Journal of Child Sexual Abuse*, *25*(1), 110–125. <https://doi.org/10.1080/10538712.2015.1078867>
- Johnson, R. S. (2000). Metal detector searches: An effective means to help keep weapons out of schools. *Journal of Law & Education*, *29*(2), 197–203. Retrieved from

<https://heinonline.org/HOL/Page?handle=hein.journals/jle29&id=207&div=27&collection=journals>

- Kalesan, B., Villarreal, M. D., Keyes, K. M., & Galea, S. (2016). Gun ownership and social gun culture. *Injury Prevention, 22*, 216–220. <https://doi.org/10.1136/injuryprev-2015-041586>
- Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Queen, B., ... Ethier, K. A. (2018). Youth Risk Behavior Surveillance — United States, 2017. *MMWR. Surveillance Summaries, 67*(8), 1–114. <https://doi.org/10.15585/mmwr.ss6708a1>
- Kilpatrick, D. G., Ruggiero, K. J., Acierno, R., Saunders, B. E., Resnick, H. S., & Best, C. L. (2003). Violence and risk of PTSD, major depression, substance abuse/dependence, and comorbidity: Results from the National Survey of Adolescents. *Journal of Consulting and Clinical Psychology, 71*(4), 692–700. <https://doi.org/10.1037/0022-006X.71.4.692>
- Klahr, A. M., Rueter, M. A., McGue, M., Iacono, W. G., & Burt, S. A. (2011). The relationship between parent-child conflict and adolescent antisocial behavior: Confirming shared environmental mediation. *Journal of Abnormal Psychology, 39*, 683–694. <https://doi.org/10.1007/s10802-011-9505-7>
- Knight, E. D., Smith, J. S., Martin, L. M., Lewis, T., & The LONGSCAN Investigator Group. (2008). Measures for Assessment of Functioning and Outcomes in Longitudinal Research on Child Abuse-Volume 3: Early Adolescence (Ages 12-14). Retrieved from <http://www.unc.edu/depts/sph/longscan/>
- Kohl, P. L., Jonson-Reid, M., & Drake, B. (2009). Time to leave substantiation behind: Findings from a national probability study. *Child Maltreatment, 14*(1), 17–26.

- Kohl, P. L., & Seay, K. D. (2015). Engaging African American fathers in behavioral parent training: To adapt or not adapt. *Best Practices in Mental Health, 11*(1), 54–68. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/26190952>
- Ladapo, J. A., Elliott, M. N., Kanouse, D. E., Schwebel, D. C., Toomey, S. L., Mrug, S., ... Schuster, M. A. (2016). Firearm ownership and acquisition among parents with risk factors for self-harm or other violence. *Academic Pediatrics, 16*(8), 742–749. <https://doi.org/10.1016/J.ACAP.2016.05.145>
- Ladapo, J. A., Rodwin, B. A., Ryan, A. M., Trasande, L., & Blustein, J. (2013). Scientific publications on firearms in youth before and after congressional action prohibiting federal research funding. *JAMA, 310*(5), 532. <https://doi.org/10.1001/jama.2013.119355>
- Larrabee, H. M., & Lewis, T. (2015). Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) Assessments 0-18 User's Guide. Ithaca, NY: National Data Archive on Child Abuse and Neglect. Retrieved from <http://www.ndacan.cornell.edu>
- Leeb, R. T., Barker, L. E., & Strine, T. W. (2007). The effect of childhood physical and sexual abuse on adolescent weapon carrying. *Journal of Adolescent Health, 40*, 551–558. <https://doi.org/10.1016/j.jadohealth.2007.01.006>
- Leeb, R. T., Lewis, T., & Zolotor, A. J. (2011). A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine, 5*(5), 454–468. <https://doi.org/10.1177/1559827611410266>
- Leeb, R. T., Paulozzi, L. J., Melanson, C., Simon, T., & Arias, I. (2008). *Uniform Definitions for Public Health and Recommended Data Elements*. Atlanta, GA. Retrieved from http://www.cdc.gov/violenceprevention/pdf/cm_surveillance-a.pdf

- Lewis, T., Leeb, R., Kotch, J., Smith, J., Thompson, R., Black, M. M., ... Coyne-Beasley, T. (2007). Maltreatment history and weapon carrying among early adolescents. *Child Maltreatment, 12*(3), 259–268. <https://doi.org/10.1177/1077559507303402>
- Li, C.-H. (2016). Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares. *Behavior Research Methods, 48*(3), 936–949. <https://doi.org/10.3758/s13428-015-0619-7>
- Li, F., Godinet, M. T., & Thompson, M. B. (2014). The impact of repeated maltreatment on behavioral trajectories from early childhood to early adolescence. *Children and Youth Services Review, 36*, 22–29. <https://doi.org/10.1016/j.childyouth.2013.10.014>
- Li, L., Lin, X., Chi, P., Heath, M. A., Fang, X., Du, H., & Wang, Z. (2016). Maltreatment and emotional and behavioral problems in Chinese children with and without oppositional defiant disorder: The mediating role of the parent-child relationship. *Journal of Interpersonal Violence, 31*(18), 2915–2939. <https://doi.org/10.1177/0886260515624234>
- Lizotte, A. J., Krohn, M. D., Howell, J. C., Tobin, K., & Howard, G. J. (2000). Factors influencing gun carrying among young urban males over the adolescent-young adult life course. *Criminology, 38*(3), 811–834. Retrieved from <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1745-9125.2000.tb00907.x>
- Logan, J. E., Leeb, R. T., & Barker, L. E. (2009). Gender-specific mental and behavioral outcomes among physically abused high-risk seventh-grade youths. *Public Health Reports, 124*, 234–245. Retrieved from <http://journals.sagepub.com/doi/pdf/10.1177/003335490912400211>
- Loughran, T. A., Reid, J. A., Collins, M. E., & Mulvey, E. P. (2016). Effect of gun carrying on

- perceptions of risk among adolescent offenders. *American Journal of Public Health*, 106(2), 350–2. <https://doi.org/10.2105/AJPH.2015.302971>
- Maas, C., Herrenkohl, T. I., & Sousa, C. (2008). Review of research on child maltreatment and violence in youth. *Trauma, Violence, and Abuse*, 9(1), 56–67. <https://doi.org/10.1177/1524838007311105>
- Manly, J. T., Kim, J. E., Rogosch, F. A., & Cicchetti, D. (2001). Dimensions of child maltreatment and children's adjustment: Contributions of developmental timing and subtype. *Development and Psychopathology*, 13(4), 759–782. Retrieved from <https://www.cambridge.org/core/journals/development-and-psychopathology/article/dimensions-of-child-maltreatment-and-childrens-adjustment-contributions-of-developmental-timing-and-subtype/2FBEA046C5975B908DE0F0E0C5EE06DB>
- Mannarino, A. P., Cohen, J. A., Deblinger, E., & Steer, R. (2007). Self-reported depression in mothers of children who have experienced sexual abuse. *J Psychopathol Behav Assess*, 29, 203–210. <https://doi.org/10.1007/s10862-006-9036-7>
- Martin, G., Bergen, H. A., Richardson, A. S., Roeger, L., & Allison, S. (2004). Sexual abuse and suicidality: Gender differences in a large community sample of adolescents. *Child Abuse & Neglect*, 28(28), 491–503. <https://doi.org/10.1016/j.chiabu.2003.08.006>
- Mercy, J. A., Butchart, A., Farrington, D., & Cerda, M. (2002). *Youth violence*. Retrieved from http://www.who.int/violence_injury_prevention/violence/global_campaign/en/chap2.pdf
- Mersky, J., & Reynolds, A. (2007). Child maltreatment and violent delinquency: Disentangling main effects and subgroup effects. *Child Maltreatment*, 12(3), 246–258.

<https://doi.org/10.1177/1077559507301842>

Mikhail, J. N., & Nemeth, L. S. (2016). Trauma center based youth violence prevention programs: An integrative review. *Trauma, Violence & Abuse, 17*(5), 500–519.

<https://doi.org/10.1177/1524838015584373>

Muthen, B. O., & Muthen, L. (2017). Mplus. Los Angeles, CA. Retrieved from

<https://www.statmodel.com/>

Muthen, B. O., Muthen, L., & Asparouhov, T. (2016). *Regression and Mediation Analysis Using Mplus*. Los Angeles, CA: Muthen & Muthen.

Nielsen, A. L., Martinez, R., & Rosenfeld, R. (2005). Firearm use, injury, and lethality in assaultive violence: An examination of ethnic differences. *Homicide Studies, 9*(2), 83–108.

<https://doi.org/10.1177/1088767904274160>

Orpinas, P., Murray, N., & Kelder, S. (1999). Parental influences on students' aggressive behaviors and weapon carrying. *Health Education & Behavior, 26*(6), 774–787. Retrieved from <http://journals.sagepub.com.ezproxy.gsu.edu/doi/pdf/10.1177/109019819902600603>

Pan, W., & Bai, H. (2015). *Propensity Score Analysis: Fundamentals and Developments*. New York, NY: Guilford.

Pazdera, A. L., McWey, L. M., Mullis, A., & Carbonell, J. (2013). Child sexual abuse and the superfluous association with negative parenting outcomes: The role of symptoms as predictors. *Journal of Marital and Family Therapy, 39*(1), 98–111.

<https://doi.org/10.1111/j.1752-0606.2011.00272.x>

Perius, J. G., Brooks-Russeii, A., Wang, J., & Iannotti, R. J. (2014). Trends in bullying, physical

- fighting, and weapon carrying among 6th-through 10th-grade students from 1998 to 2010: Findings from a national study. *American Journal of Public Health*, 104(6), 1100–1106.
<https://doi.org/10.2105/AJPH.2013.301761>
- Pickett, W., Craig, W., Harel, Y., Cunningham, J., Simpson, K., Molcho, M., ... Currie, C. E. (2005). Cross-national study of fighting and weapon carrying as determinants of adolescent injury. *Pediatrics*, 116(6). <https://doi.org/10.1542/peds.2005-0607>
- Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., ... Udry, J. R. (1997). Protecting adolescents from harm. *JAMA*, 278(10), 823.
<https://doi.org/10.1001/jama.1997.03550100049038>
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: What protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *Journal of Adolescent Health*, 35(5), 424.e1-424.e10.
<https://doi.org/10.1016/J.JADOHEALTH.2004.01.011>
- Ruback, R. B., Shaffer, J. N., & Clark, V. A. (2011). Easy access to firearms: Juveniles' risks for violent offending and violent victimization. *Journal of Interpersonal Violence*, 26(10), 2111–2138. <https://doi.org/10.1177/0886260510372948>
- Ruggles, K. V., & Rajan, S. (2014). Gun possession among American youth: A discovery-based approach to understand gun violence. *PLoS ONE*, 9(11), e111893.
<https://doi.org/10.1371/journal.pone.0111893>
- Runyan, D. K., Curtis, P. A., Hunter, W. M., Black, M. M., Kotch, J. B., Bangdiwala, S., & Dubowitz, H. (1998). LONGSCAN: A consortium for longitudinal studies of maltreatment and the life course of children. *Aggression and Violent Behavior*, 3(3), 275–285.

[https://doi.org/10.1016/S1359-1789\(96\)00027-4](https://doi.org/10.1016/S1359-1789(96)00027-4)

Runyan, D. K., Dubowitz, H., English, D. J., Kotch, J. B., Litrownik, A. J., Thompson, R., & The LONGSCAN Investigator Group. (2014). Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) Assessments 0-18 [Dataset]. Retrieved from <http://www.ndacan.cornell.edu>

Santa-Sosa, E. J., Steer, R. A., Deblinger, E., & Runyon, M. K. (2013). Depression and parenting by nonoffending mothers of children who experienced sexual abuse. *Journal of Child Sexual Abuse, 22*, 915–930. <https://doi.org/10.1080/10538712.2013.841309>

SAS Institute Inc. (n.d.). SAS. Cary, NC.

Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., & Patton, G. C. (2018). The age of adolescence. *The Lancet Child & Adolescent Health, 2*(3), 223–228. [https://doi.org/10.1016/S2352-4642\(18\)30022-1](https://doi.org/10.1016/S2352-4642(18)30022-1)

Schwebel, D. C., Lewis, T., Simon, T. R., Elliott, M. N., Toomey, S. L., Tortolero, S. R., ... Schuster, M. A. (2014). Prevalence and correlates of firearm ownership in the homes of fifth graders: Birmingham, AL, Houston, TX, and Los Angeles, CA. *Health Education & Behavior, 41*(3), 299–306. <https://doi.org/10.1177/1090198113512126>

Sedlak, A. J., Mettenburg, J., Basena, M., Petta, I., Mcpherson, K., Green, A., & Li, S. (2010). Fourth National Incidence Study of Child Abuse and Neglect (NIS-4): Report to Congress, 1–147. <https://doi.org/10.1037/e659872010-001>

Semidei, J., Radel, L. F., & Noal, C. (2001). Substance abuse and child welfare: Clear linkages and promising responses. *Child Welfare, 80*(2), 109–128. Retrieved from

<https://search.proquest.com/docview/213810817?pq-origsite=gscholar>

Sidebotham, P., & Heron, J. (2006). Child maltreatment in the “children of the nineties”: A cohort study of risk factors. *Child Abuse & Neglect, 30*(5), 497–522.

<https://doi.org/10.1016/J.CHIABU.2005.11.005>

Simckes, M. S., Simonetti, J. A., Moreno, M. A., Rivara, F. P., Oudekerk, B. A., & Rowhani-Rahbar, A. (2017). Access to a loaded gun without adult permission and school-based bullying. *Journal of Adolescent Health, 61*(3), 329–334.

<https://doi.org/10.1016/j.jadohealth.2017.03.022>

Simonetti, J. A., Mackelprang, J. L., Rowhani-Rahbar, A., Zatzick, D., & Rivara, F. P. (2015). Psychiatric comorbidity, suicidality, and in-home firearm access among a nationally representative sample of adolescents. *JAMA Psychiatry, 72*(2), 152.

<https://doi.org/10.1001/jamapsychiatry.2014.1760>

Smith, D. K., Johnson, A. B., Pears, K. C., Fisher, P. A., & DeGarmo, D. S. (2007). Child maltreatment and foster care: Unpacking the effects of prenatal and postnatal parental substance use. *Child Maltreatment, 12*(2), 150–160.

<https://doi.org/10.1177/1077559507300129>

Sousa, C., Herrenkohl, T. I., Moylan, C. A., Tajima, E. A., Klika, J. B., Herrenkohl, R. C., & Russo, M. J. (2011). Longitudinal study on the effects of child abuse and children’s exposure to domestic violence, parent-child attachments, and antisocial behavior in adolescence. *Journal of Interpersonal Violence, 26*(1), 111–136.

<https://doi.org/10.1177/0886260510362883>

Stickley, A., Koyanagi, A., Kuposov, R., Blatny, M., Hrdlicka, M., Schwab-Stone, M., &

- Ruchkin, V. (2015). Correlates of weapon carrying in school among adolescents in three countries. *Am J Health Behav*, *39*(1), 99–108. <https://doi.org/10.5993/AJHB.39.1.11>
- Straus, M. A., Hamby, S. L., Finkelhor, D., Moore, D., & Runyan, D. (1998). Identification of child maltreatment with the Parent-Child Conflict Tactics Scales: Development and psychometric data for a national sample of American parents. *Child Abuse & Neglect*, *22*(4), 249–270.
- Swahn, M. H., Hammig, B., & Ikeda, R. (2002). Prevalence of youth access to alcohol or a gun in the home. *Injury Prevention*, *8*, 227–230.
- Swahn, M. H., Whitaker, D. J., Phippen, C. B., Leeb, R. T., Teplin, L. A., Abram, K. M., & McClelland, G. M. (2006). Concordance between self-reported maltreatment and court records of abuse or neglect among high-risk youths. *American Journal of Public Health*, *96*(10), 1849–1853. <https://doi.org/10.2105/AJPH.2004.058230>
- Thompson, R., Briggs, E., English, D. J., Dubowitz, H., Lee, L.-C., Brody, K., ... Hunter, W. M. (2005). Suicidal ideation among 8-year-olds who are maltreated and at risk: Findings from the LONGSCAN studies. *Child Maltreatment*, *10*(1), 26–36. <https://doi.org/10.1177/1077559504271271>
- Thurnherr, J., Michaud, P.-A., Berchtold, A., Akre, C., & Suris, J.-C. (2009). Youths carrying a weapon or using a weapon in a fight: What makes the difference? *Health Education Research*, *24*(2), 270–279. <https://doi.org/10.1093/her/cyn017>
- U.S. Department of Health and Human Services Office of Adolescent Health. (2018). *Adolescent Health: Think, Act, Grow 2018 Playbook*. Washington, D.C. Retrieved from <https://www.hhs.gov/ash/oah/sites/default/files/playbook.pdf>

- US Department of Health & Human Services Administration for Children and Families Administration on Children Youth and Families Children's Bureau. (2018). *Child Maltreatment 2016*. Retrieved from <https://www.acf.hhs.gov/sites/default/files/cb/cm2016.pdf>
- Valeri, L., & Vanderweele, T. J. (2013). Mediation analysis allowing for exposure-mediator interactions and causal interpretation: Theoretical assumptions and implementation with SAS and SPSS macros. *Psychol Methods, 18*(2), 137–150. <https://doi.org/10.1037/a0031034>
- Valois, R. F., Zullig, K. J., Huebner, E. S., & Drane, J. W. (2001). Relationship between life satisfaction and violent behaviors among adolescents. *American Journal of Health Behavior, 25*(4), 353–366. <https://doi.org/10.5993/AJHB.25.4.1>
- Walsh, S. D., Molcho, M., Craig, W., Harel-Fisch, Y., Huynh, Q., Kukaswadia, A., ... Pickett, W. (2013). Physical and emotional health problems experienced by youth engaged in physical fighting and weapon carrying. *PLoS ONE, 8*(2). <https://doi.org/10.1371/journal.pone.0056403>
- Watkins, A. M., & Lizotte, A. J. (2011). Does household gun access increase the risk of attempted suicide? Evidence from a national sample of adolescents. *Youth & Society, 45*(3), 324–346. <https://doi.org/10.1177/0044118X11417735>
- Windham, A. M., Rosenberg, L., Fuddy, L., McFarlane, E., Sia, C., & Duggan, A. K. (2004). Risk of mother-reported child abuse in the first 3 years of life. *Child Abuse & Neglect, 28*(6), 645–667. <https://doi.org/10.1016/J.CHIABU.2004.01.003>
- Worthen, M. G. F. (2012). Gender differences in delinquency in early, middle, and late

adolescence: An exploration of parent and friend relationships. *Deviant Behavior*, 33(4), 282–307. <https://doi.org/10.1080/01639625.2011.573421>

Yun, I., Ball, J. D., & Lim, H. (2011). Disentangling the relationship between child maltreatment and violent delinquency: Using a nationally representative sample. *Journal of Interpersonal Violence*, 26(1), 88–110. <https://doi.org/10.1177/0886260510362886>

Zuravin, S. J. (1989). Severity of maternal depression and three types of mother-to-child aggression. *American Journal of Orthopsychiatry*, 59(3), 377–389. <https://doi.org/10.1111/j.1939-0025.1989.tb01673.x>

Appendix A

Tables

Table 1

Study Participant Demographics (N=1,354)

Characteristic	<i>n</i> (%)
Child Race	
<i>White</i>	354 (26.16)
<i>Black</i>	721 (53.29)
<i>Hispanic</i>	97 (7.17)
<i>Native American</i>	8 (0.59)
<i>Asian</i>	4 (0.30)
<i>Mixed Race</i>	161 (11.90)
<i>Other</i>	8 (0.59)
Child Gender	
<i>Male</i>	657 (48.52)
<i>Female</i>	697 (51.48)
Caregiver Race	
<i>White</i>	391 (33.48)
<i>Black</i>	609 (52.14)
<i>Hispanic</i>	89 (7.62)
<i>Native American</i>	16 (1.37)
<i>Asian</i>	9 (0.77)
<i>Mixed Race</i>	36 (3.08)
<i>Other</i>	18 (1.54)
Caregiver Marital Status at Baseline	
<i>Married</i>	385 (32.93)
<i>Single</i>	526 (45.00)
<i>Separated</i>	88 (7.53)
<i>Divorced</i>	151 (12.92)
<i>Widowed</i>	19 (1.63)
Annual Family Income at Baseline	
<i><\$20,000</i>	788 (68.94)
<i>≥\$20,000</i>	355 (31.06)

Table 2

Descriptive Statistics by Weapon Carriage Status

Characteristic	Weapon Carrying <i>n</i> (%)	No Weapon Carrying <i>n</i> (%)
Child Gender*		
<i>Male</i>	111 (27.8)	289 (72.3)
<i>Female</i>	54 (10.7)	450 (89.3)
Child Race		
<i>Minority</i>	124 (18.3)	183 (81.7)
<i>Non-minority (white)</i>	41 (18.3)	555 (81.7)
Annual Family Income		
<\$20,000	104 (19.7)	424 (80.3)
≥\$20,000	40 (16.5)	203 (83.5)
Study Site		
<i>East</i>	36 (18.1)	163 (81.9)
<i>Midwest</i>	26 (17.8)	120 (82.2)
<i>Northwest</i>	35 (20.1)	139 (79.9)
<i>South</i>	30 (18.6)	131 (81.4)
<i>Southwest</i>	38 (17.0)	186 (83.04)
In-Home Firearm Access		
<i>Yes</i>	15 (17.9)	69 (82.1)
<i>No</i>	95 (17.2)	457 (82.8)

Note. Characteristics in bold and marked with an asterisk indicate statistically significant chi-square test results ($p < .05$).

Table 3

Descriptive Statistics by In-Home Firearm Access Status

Characteristic	In-Home Firearm Access <i>n</i> (%)	No In-Home Firearm Access <i>n</i> (%)
Child Gender		
<i>Male</i>	53 (13.7)	335 (86.3)
<i>Female</i>	46 (11.3)	362 (88.7)
Child Race*		
<i>Minority</i>	33 (5.6)	557 (94.4)
<i>Non-minority (white)</i>	66 (32.0)	140 (68.0)
Annual Family Income*		
<\$20,000	51 (10.7)	424 (89.3)
≥\$20,000	36 (17.6)	169 (82.4)
Study Site*		
<i>East</i>	6 (3.3)	175 (96.7)
<i>Midwest</i>	4 (2.8)	137 (97.2)
<i>Northwest</i>	30 (19.4)	125 (80.7)
<i>South</i>	38 (25.9)	109 (74.2)
<i>Southwest</i>	21 (12.2)	151 (87.8)

Note. Characteristics in bold and marked with an asterisk indicate statistically significant chi-square test results ($p < .05$).

Table 4

Child-Reported CM Mediation Model Results Examining Weapon Carriage at Age 18 as the Outcome

Variable	β	<i>B</i>	95% CI	<i>p</i> -value
Child-Reported Emotional Abuse (<i>n</i> =471)				
Emotional Abuse	0.18	0.08	-0.06, 0.23	.26
Mother-Child Relationship Quality	-0.002	-0.06	-0.23, 0.11	.48
Child Gender^a	0.60	0.29	0.15, 0.41	<.001
Annual Family Income ^b	-0.09	-0.04	-0.19, 0.10	.60
Study Site	0.02	0.02	-0.12, 0.16	.82
Propensity Score	3.39	0.07	-0.08, 0.20	.36
Child-Reported Physical Abuse (<i>n</i> =470)				
Physical Abuse	0.29	0.11	-0.03, 0.24	.11
Mother-Child Relationship Quality	-0.002	-0.05	-0.21, 0.11	.50
Child Gender^a	0.58	0.27	0.14, 0.40	<.001
Annual Family Income ^b	-0.06	-0.02	-0.17, 0.11	.74
Study Site	0.02	0.02	-0.12, 0.17	.79
Propensity Score	3.71	0.13	-0.03, 0.26	.08
Child-Reported Sexual Abuse (<i>n</i> =693)				
Sexual Abuse	0.32	0.11	-0.01, 0.22	.06
Mother-Child Relationship Quality	-0.003	-0.10	-0.23, 0.03	.13
Child Gender^a	0.66	0.31	0.20, 0.41	<.001
Annual Family Income ^b	-0.12	-0.05	-0.17, 0.06	.41
Study Site	-0.02	-0.03	-0.15, 0.09	.65

Note. CI=confidence interval; CM variables reflect abuse through age 12; mother-child relationship quality was measured at age 14; CIs are for standardized estimates; statistically significant estimates based on *p*-value (*p*<.05) are indicated in bold; mother-child relationship quality reflects the cube-transformed variable

^amale=1

^b≥\$20,000=1

Table 5

CPS-Substantiated CM Mediation Model Results Examining Weapon Carriage at Age 18 as the Outcome

Variable	β	<i>B</i>	95% CI	<i>p</i> -value
CPS-Substantiated Emotional Abuse (<i>n</i> =618)				
Emotional Abuse	0.03	0.01	-0.12, 0.13	.90
Mother-Child Relationship Quality	-0.004	-0.11	-0.25, 0.03	.11
Child Gender^a	0.61	0.29	0.17, 0.40	<.001
Annual Family Income ^b	-0.10	-0.04	-0.17, 0.08	.54
Study Site	0.01	0.02	-0.11, 0.14	.81
Propensity Score	-0.67	-0.04	-0.17, 0.08	.54
CPS-Substantiated Physical Abuse (<i>n</i> =618)				
Physical Abuse	0.41	0.12	-0.006, 0.22	.04
Mother-Child Relationship Quality	-0.003	-0.10	-0.23, 0.04	.18
Child Gender^a	0.63	0.30	0.18, 0.41	<.001
Annual Family Income ^b	-0.10	-0.04	-0.17, 0.08	.53
Study Site	0.01	0.01	-0.11, 0.13	.86
Propensity Score	-1.81	-0.10	-0.24, 0.03	.14

Note. CI=confidence interval; CM variables reflect abuse through age 12; mother-child relationship quality was measured at age 14; CIs are for standardized estimates; statistically significant estimates based on *p*-value (*p*<.05) are indicated in bold; mother-child relationship quality reflects the cube-transformed variable

^amale=1

^b≥\$20,000=1

Table 6

Indirect Effects from Mediation Models

Model	Indirect Effect	BC Bootstrapped 95% CI
Child-Report Models		
Emotional Abuse ^a	0.02	-0.03, 0.07
Physical Abuse ^a	0.01	-0.01, 0.04
Sexual Abuse ^b	0.01	-0.001, 0.04
CPS-Report Models		
Emotional Abuse ^a	0.01	-0.001, 0.04
Physical Abuse ^a	0.01	-0.003, 0.04

Notes. BC=bias-corrected; CI=confidence interval; all models include CM through age 12 as the independent variable, quality of relationship with mother at age 14 as the mediator, and weapon carrying at age 18 as the dependent variable; no indirect effects were statistically significant

^aCovariates: child gender, family income, study site, and model-specific propensity score

^bCovariates: child gender, family income, and study site

Table 7

Results Examining Mother-Child Relationship Quality as Moderator in the Relation between Child-Reported Sexual Abuse and Weapon Carriage at Age 18 (n=491)

Variable	β	<i>B</i>	95% CI	<i>p</i> -value
Sexual Abuse	-0.73	-0.24	-0.56, 0.06	.14
Mother-Child Relationship Quality Abuse/Relationship Interaction Term	-0.01	-0.19	-0.33, -0.05	.01
Child Gender^a	0.70	0.32	0.20, 0.41	<.001
Annual Family Income ^b	-0.20	-0.08	-0.22, 0.05	.23
Study Site	-0.04	-0.06	-0.19, 0.08	.41

Note. CI=confidence interval; sexual abuse variables reflects abuse through age 12; mother-child relationship quality was measured at age 14; CIs are for standardized estimates; statistically significant estimates based on *p*-value (*p*<.05) are indicated in bold; mother-child relationship quality reflects the cube-transformed variable

^amale=1

^b≥\$20,000=1

Appendix B

Figures

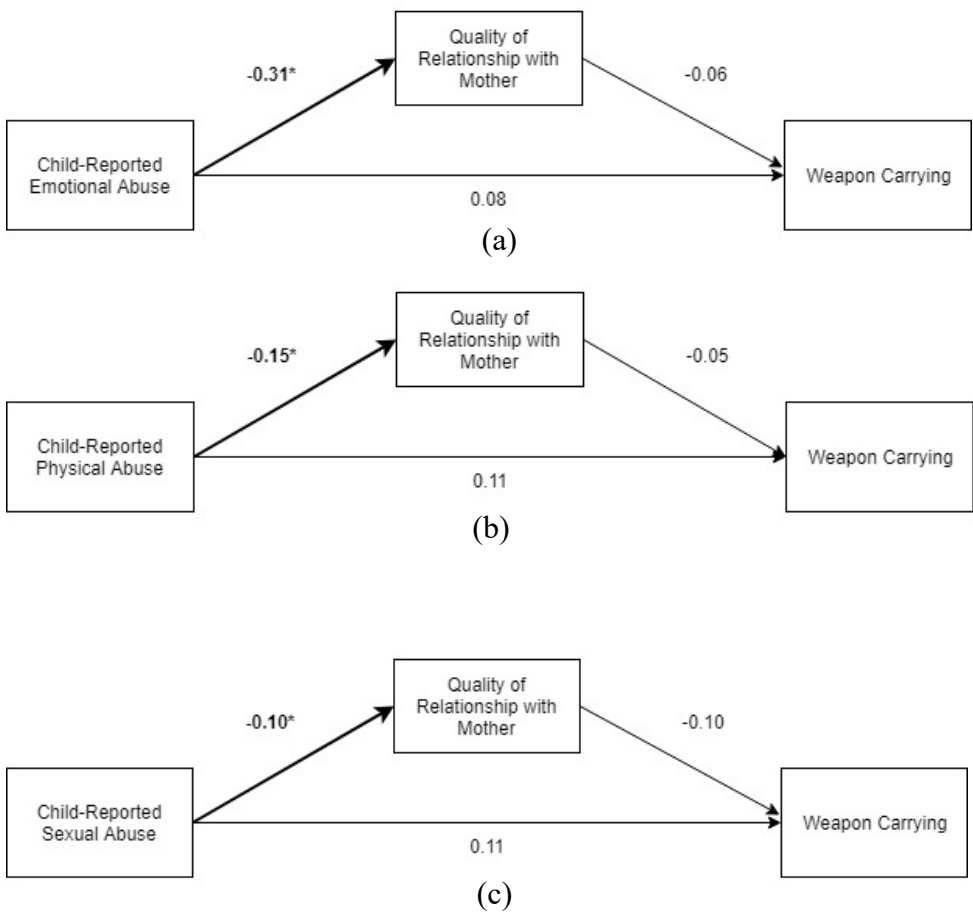


Figure 1. Mediation models exploring quality of relationship with mother at age 14 as a mediator between child-reported emotional abuse (a), physical abuse (b), and sexual abuse (c) up to age 12, and weapon carrying at age 18. Standardized estimates are presented. The models in panels (a) and (b) include child gender, family income, study site, and model-specific propensity score as covariates. The model in panel (c) includes child gender, family income, and study site as covariates. Paths in bold and marked with an asterisk are statistically significant ($p < .05$).

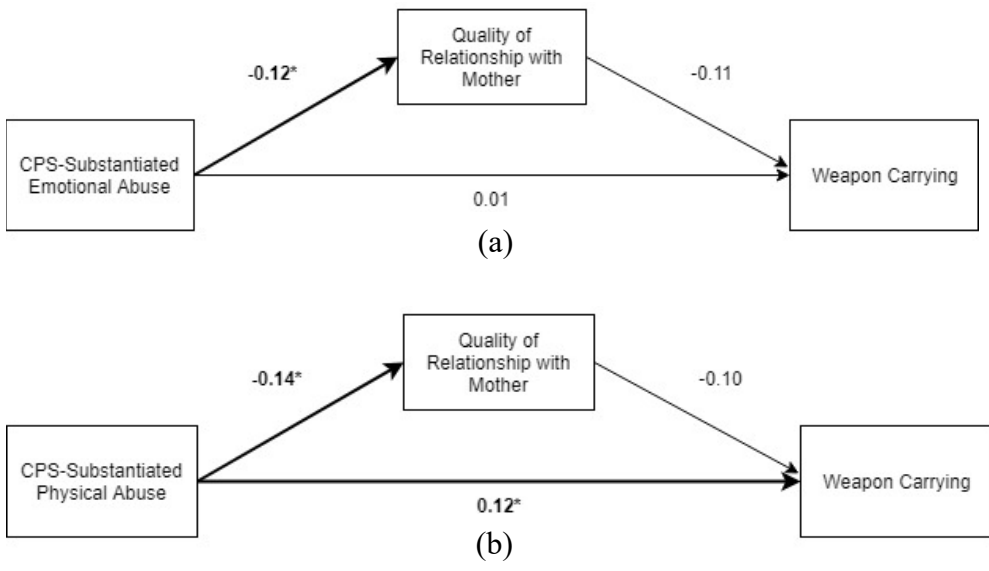


Figure 2. Mediation models exploring quality of relationship with mother at age 14 as a mediator between CPS-reported emotional abuse (a) and physical abuse (b) up to age 12 and weapon carrying at age 18. Standardized estimates are presented. Both models include child gender, family income, study site, and model-specific propensity score as covariates. Paths in bold and marked with an asterisk are statistically significant ($p < .05$).