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Adolescent Obesity and Weapon Carrying at School

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Weapon carrying¹ among adolescents in America remains a topic of public and academic concern. Despite a dramatic decrease in the rates of homicide, suicide, and firearm-related deaths among adolescents in the United States since the mid 1990s (Child Trends Databank, 2015), evidence regarding adolescent violence generally, and gun violence specifically, is disconcerting. For example, estimates suggest that over 17,000 children and teens are shot, either by others or in efforts to commit suicide, with over 2,500 kids dying each year due to such violence (Brady Center, 2016). Such numbers fuel considerable concern about youth carrying weapons to schools. And the data on student weapon carrying supports this concern—one national survey revealed that 16.2% of youth in grades 9–12 reported carrying a weapon in the past 30 days (Kann et al., 2016; pg. 65). While the connection between weapon carrying and physical harm, even death is of obvious concern, evidence exists that weapon use (or even the display of weapons) is associated with psychological trauma for both victims and witnesses (Kingery, Pruitt, and Heuberger, 1996; Muula, Rudatsikira, and Siziya, 2008).

Although a number of explanations have been proffered to explain youth weapon carrying, a popular theory is referred to as the *fear and victimization* hypothesis (May, 1999; Wilcox et al., 2006; Melde, Esbensen, and Taylor, 2009). This hypothesis insinuates that youth who carry weapons are motivated by the fear of being victimized by others—an explanation that might be especially salient in understanding weapon carrying on school grounds, due to the cumulative evidence of student violent victimization, including bullying victimization at school (Musu-Gillette et al., 2017). And while there exists evidence that the percentage of students who feared being victimized at school has been declining over recent years (Zhang, Musu-Gillette, and Oudekerk, 2015; pg. viii), paralleling a precipitous drop in the percentage of students (grades 9–12) that reported being threatened or injured with a weapon on school grounds (Zhang, Musu-Gillette, and Oudekerk, 2015; pg. v.), this same study also revealed that 5 percent of students avoid certain activities or places at school due to victimization fears (Zhang, Musu-Gillette, and Oudekerk, 2015; pg. viii). For some students, victimization fears and/or experiences may be a catalyst in explaining weapon-carrying on school grounds.

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¹Weapons include firearms but also other instruments used to cause physical harm to others, including knives and clubs.

But *which* students will turn to weapon carrying as a means to deter peer victimizations? While a number of correlates of weapon carrying have been identified that may be illuminative, one characteristic that has received little academic attention is youth adiposity. Studies have demonstrated that obese youth are disproportionately the targets of harassment, teasing, ostracism, and exclusion, as well as various forms of bullying and violent victimization (e.g., Janssen et al., 2004; Griffiths et al., 2006). However, few studies have examined whether an association between youth obesity and weapon carrying exists, and whether victimization experiences mediate such an association. The latter issue is a salient concern, because of the well-established association between weapon carrying and criminal involvement (e.g., Wilcox et al., 2006; Lizotte et al., 2000), including gang membership (Lizotte et al., 2000; Tigri et al., 2016). Research examining the association between youth obesity and weapon carrying should consider both the role of victimization fear in the context of criminal involvement, including gang membership, in order to fully assess the veracity of the fear and victimization hypothesis.

In this study, we extend prior research by exploring whether there exists an association between adolescent obesity and weapon carrying at school, using longitudinal data from a nationally representative study of American students (i.e., Add-Health). We consider the possible mediating roles of both victimization experiences and measures of criminal involvement, gang membership, and exposure to deviant peers, to assess the fear and victimization hypothesis.

BACKGROUND

According to Melde and colleagues, there exists three general motivations for adolescent weapon carrying: a) the aforementioned fear and victimization hypothesis; b) as an enhancement feature for the successful completion of criminal behavior; and c) as part of a violent lifestyle or identity (2009; 349). These motivations are overlapping, with self-protection underlying each (Melde et al., 2009; Valdebenito et al., 2017; Simon et al., 1999). Melde and colleagues note that self-protection is based on the popular theoretical constructs of deterrence and opportunity—adolescents arm themselves to deter others from victimizing them and to make themselves an unattractive target to motivated offenders (2009; 351).

While the logic of the fear and victimization hypothesis is alluring, empirical evidence supporting this hypothesis is mixed, with some studies supporting the notion that fear of victimization, prior victimization, or need for protection is associated with weapon carrying (Kingery et al., 1996; Simon et al., 1999), while others have failed to find evidence of a significant association (Bailey et al., 1997; DuRant et al., 1997; Simon et al., 1997; Fagan and Wilkinson, 1997; May, 2001; Wilcox Rountree, 2000). The equivocal nature of the evidence supporting the fear and victimization hypothesis is further complicated by the considerable overlap between victims and offenders among youth (Jennings, Piquero, and Reingle, 2012). Given strong evidence of the association between offending and victimization (e.g., Lauritsen, Sampson, and Laub, 1991), tests of the fear and victimization hypothesis are incomplete if measures of offending or adhering to a deviant lifestyle are not also considered. Indeed, there exists much stronger evidence supporting the link between

adolescent criminal offending and weapon carrying (Vaughn et al., 2006; Cao et al., 2008) than exists in support of the fear and victimization hypothesis.

A few studies have examined both offending and the fear and victimization hypothesis simultaneously. Spano and Bolland, for instance, found that both prior violent victimization and prior violent behaviors were predictive of the initiation of gun carrying and found no statistically significant difference between the likelihood of youth initiating gun carrying for offensive (prior violent behavior) versus defensive (prior violent victimization) purposes (2013; 207). Cao and colleagues (2008) found in their analysis of the school crime supplemental data (to the National Crime Victimization Survey) that although measures of criminal involvement (i.e., physical fights) were predictive of weapon carrying (both guns and other weapons), measures representing the fear and victimization hypothesis (i.e., prior victimization, being bullied, and fear of being attacked) were largely not significant predictors of weapon carrying. The authors interpret their findings as supportive of the argument that student weapon carrying in school is largely offensive and not defensive based behavior (see also Webster, Gainer, and Champion, 1993). Vaughn and colleagues (2006) found that although prior victimizations were predictive of weapon carrying among a sample of incarcerated youth, being in a gang fight and lifetime poly-substance use were stronger predictors of weapon carrying, suggesting that such behavior was better viewed as externalizing/criminal behavior. And Melde and colleagues, examining data collected from over 1100 6th to 9th graders across 15 schools in the US, found strong support for both associations between criminal involvement (including gang membership) and weapon carrying as well as prior victimization and gun carrying (2009). However, they found that their measure of fear of victimization was inversely associated with weapon carrying, a finding that led authors to note that fear itself is likely “not the driving force” for adolescent weapon carrying (2009; 370). While not exhaustive, these studies illustrate the importance of considering criminal involvement/violent lifestyle when predicting youth weapon carrying.²

Obesity and Weapon-carrying

Obesity has been characterized as a global health problem (Malik, Willett, and Hu, 2013) and is an acute health issue in America, with recent evidence revealing that nearly seventy percent of adults in America are either overweight or obese (National Center for Health Statistics, 2014). The prevalence rate for obesity among American adolescents has also risen dramatically over the past few decades, with one study finding that the prevalence rate for adolescent obesity has increased nearly fourfold since 1970 (Ogden et al., 2012).

Obesity is perceived as a health problem due to the various adverse consequences that have been identified. Although physical health consequences (e.g., high cholesterol, high blood pressure, diabetes, etc.) are most commonly mentioned as outcomes, research is now beginning to document the adverse psychosocial consequences of obesity. Research has

²We are not positing that obese youth are more likely to carry weapons because of a commitment to a violent lifestyle; the little evidence that exists regarding adiposity and violence found that BMI had an inverse association with being arrested for interpersonal violence (Ekmekcioglu et al., 2015). Nonetheless, it is important to control for established predictors of student weapon carrying, especially given the dearth of studies examining the association between youth obesity and weapon carrying.

found that such psychosocial aspects as depression, anxiety, and self-esteem are associated with obesity (e.g., Luppino et al., 2010), including among adolescents (Needham et al., 2010).

Why might obese youth be at risk to carry weapons to school? Routine activities theory suggests that in order for a criminal event to occur, there needs to be a convergence of a motivated offender, a suitable target/vulnerable victim, and the lack of a capable guardian (Cohen, Kluegel, and Land, 1981). Applying this theory, obese youth may be perceived as vulnerable targets by motivated offenders because they are widely stigmatized due to their weight (Kahle and Peguero, 2017). Janssen and colleagues (2004) suggest that being an obese or overweight youth triggers cues among peers, based on stereotypes, that such children are suitable targets for teasing, bullying, and victimizing. Finkelhor and Asdigian (1996), in their reformulation and extension of routine activities/lifestyle theory, noted that target vulnerability would increase the risk of victimization because of the victims' limited capacity to resist or deter being victimized. These authors noted that such characteristics as emotional deprivation or psychological problems were "prototypical risk factors in the vulnerability category" (Finkelhor and Asdigian, 1996: 6). Indeed, there is considerable evidence that victims of bullies suffer long term psychological consequences of their bullying experiences. For example, Olweus (1995) found that childhood victims of bullying exhibited lower levels of self-esteem well into young adulthood. And there is evidence that obese children who have been bullied suffer lower levels of self-esteem and higher levels of depression (Gray et al, 2008; Farrington et al., 2012), which, if our predictions about target vulnerabilities are correct, would heighten their risk for additional, violent victimization experiences as well (as noted by Adams and Bukowski, 2008). Indeed, other researchers have found that those who experienced victimization as a child (e.g., age 8) are likely to continue to experience victimization well into adolescence (e.g., age 16; Sourander et al., 2000), reinforcing the notion that the characteristics that made one vulnerable to bullying may contribute to that individual being defined as a suitable target for victimization into adolescence.

Because of their higher risk of being victimized, stigmatized, and bullied by peers, obese youth may be prime candidates to carry weapons consistent with the fear and victimization hypothesis. Ford, Schroeder, and Dotson (2014) note that obese adolescents experience negative affect as a result of the prejudicial and discriminatory treatment of them by others; such negative affect, particularly if experienced over time or chronically, may lead one to adopt maladaptive coping mechanisms. In this regard, weapon carrying can be seen as a coping mechanism to manage the negative affect and reduce the chances of experiencing victimization due to obesity.

Of the two identified studies that have explored the association between obesity and weapon carrying, both have found a positive association. Farhat and colleagues (2010) found in their analysis of data collected from over 7,800 adolescents that among American boys, being overweight/obese was associated with weapon carrying (the finding did not apply to obese girls). These authors did find that obese adolescents (of both sexes) were more likely to be victims of bullying, consistent with the fear and victimization hypothesis, although they did not assess whether being victimized mediated the risk of weapon carrying. Likewise,

Kukaswadia and colleagues (2012), in a study of over 7,800 Canadian youth, found that overweight and obese males were at a heightened risk of weapon carrying, relative to their peers. Additionally, they did find that being a prior victim (bullying), or being a perpetrator, partially mediates the association between obesity and weapon carrying, suggesting that obese youth carry weapons for *both* protection and externalizing behavioral reasons.³

However, in both prior studies (Kukaswadia et al., 2012; Farhat et al., 2010), the relationship between overweight/obesity and weapon carrying only pertained to *males*, adding an additional issue to consider—the role of gender in these associations. There are a number of reasons for why the proposed associations between the key theoretical variables of interest may not apply to females. First, males are much more likely to carry weapons than females (Kann et al., 2016). Secondly, research on the relationship between fear of crime and subsequent behaviors has found that males are more likely to engage in constrained behaviors than females; females are more likely to engage in avoidance behaviors (e.g., avoid going out alone at night) than males. Indeed, many consider this to be part of a gendered response to strains or stresses generally, with males more likely to respond to such stressors with external behaviors while females are more likely to respond with internal thoughts or feelings (Umberson, 2003; May, Rader, and Goodrum, 2010: 5). At the heart of such differences in behavioral responses to fear, victimization, and stressors may be what Rader and Haynes (2011) referred to as a gendered fear of crime socialization process, wherein males and females are socialized to “feel, think, and act differently in response to potential victimization” (292). From this perspective, females are socialized to exercise caution in their behavior (May, Rader, and Goodrum, 2010), taught to be sensitive to their vulnerabilities and learn to see themselves as less capable of defending themselves (Riger, Gordon, and LeBailly, 1978; Schafer et al. 2006: 286). Through the socialization process, “women define victimization as part of being a woman, whereas men define victimization as something that happens to women” (Rader and Haynes, 2011, 300). Such gender differences can also extend to how overweight/obese females respond to fear and victimization, with such females unlikely to carry weapons to defend themselves. Hence, our study must consider that these associations differ by gender.

Current Study

Our interest is in extending such prior work examining the obesity-weapon carrying association in the following ways. First, we utilize longitudinal data (the aforementioned studies both used cross-sectional data) to evaluate whether victimization experiences at T1 influence subsequent (T2) weapon carrying. Second, we explore evidence regarding the victimization hypothesis in the context of other factors influencing weapon carrying, including criminal involvement, exposure to deviant peers, and gang membership, given that there exists robust evidence of an association between criminal involvement and weapon carrying (Vaughn et al., 2006; Cao et al., 2008) and evidence of an association between gang

³It must be noted that most of the research exploring an association between adolescent obesity and victimization has focused on bullying, instead of violent victimization. This research has largely found an association between obesity and bullying victimization (e.g., Farhat et al., 2010; Janssen et al., 2004; Kukaswadia et al., 2011). However, there is evidence that being bullied is associated with being a victim of violence as well (Nansel et al., 2003; Schwartz and Proctor, 2000; Holt, Finkelhor, and Kantor, 2007; Turner, Finkelhor, and Ormrod, 2010.)

membership and weapon carrying (Decker and Van Winkle, 1996; Bjerregaard and Lizotte, 1995; Melde et al., 2009).⁴ And finally, we consider whether these associations differ by gender, given the gendered fear of crime socialization process (Rader and Haynes, 2011).

In summary, the present study attempts to test the fear and victimization hypothesis, extended to obese (versus non-obese) students in predicting weapon carrying at school. Based on the fear and victimization hypothesis and prior research examining obese youth, victimization, and weapon carrying, we predict the following:

H₁: Obese youth are more likely to carry weapons to school than their counterparts.

Additionally, based on the fear and victimization hypothesis, we expect the following:

H₂: The association between obesity and weapon carrying should be significantly attenuated, once prior victimization is considered.

We assess these hypotheses in the context of other known predictors of weapon carrying, including race/ethnicity (some evidence that non-Hispanic whites are less likely to carry (Kingery et al., 1996; Wilcox and Clayton, 2001; Wilcox et al., 2006). And finally, we examine these models for males and females separately, given the potential importance of gender in such associations.

METHODS

This study analyzes data from Waves I and II of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a nationally representative study of adolescents (7th-12th grade in 1994 when the study began; Wave II data were collected in 1995). The Add Health sample is representative of US schools with respect to region, urbanicity, school size, school sector, and racial composition (Harris et al., 2009). However, wave II intentionally excluded respondents who were in the 12th grade at wave I. This and other attrition resulted in approximately 75 percent of the original wave I respondents remaining in the wave II sample. For our sample (n=12,872), we selected adolescents from the wave I in-home sample based on the following criteria: a) adolescents who indicated that their racial/ethnic identity was non-Hispanic white, African-American, Hispanic, or American Indian; b) respondents who participated in both of the first two waves of the in-home interview and for whom a valid wave II sampling weight was available; and c) respondents who answered questions about weapon carrying at wave II. While only a small percentage of responses on any given variable were missing, we imputed a set of values for missing data using a model-based multiple imputation method (mi) available in Stata 14. This method obtains imputations by simulating from a Bayesian posterior predictive distribution of the missing data (or its approximation) under the conventional chosen distribution. We imputed five (5) complete datasets.

⁴Because the Add Health data does not include measures of fear of crime, we cannot directly assess whether fear of victimization is predictive of weapon carrying in these analyses.

Measures

Dependent Variable.—*Weapon carrying in school* was a self-reported dichotomous measure, asking if the respondent had carried a weapon, gun/knife/club, to school in the past 30 days. The dependent variables were collected at wave II whereas the independent variables were measured at wave I (with one exception, gang membership, which was only available as a measure at wave II), in order to reduce concerns about temporal ordering.

Independent Variables.—We created a dummy measure of adolescent *obesity*, using body mass index (BMI) percentile curves that are published by the Centers for Disease Control (CDC, 2000) that are age and sex-adjusted. Adolescents with a BMI more than 95th percentile (for that age and gender) are coded obese, with the rest of the respondents being coded not obese. *Gender and Race*—respondents self-identified their race and gender (female=1). *Violent Victimization* was a self-reported dichotomous measure of whether any of the following events happened to the respondent in the past 12 months: someone pulled a knife/gun on respondent; someone shot or stabbed the respondent; the respondent was ‘jumped’ by someone; the respondent was injured in a fight badly enough to require medical attention (1=any of those events occurred; else=0). *Delinquent behavior* was a self-reported count of the number of different acts that the respondent committed in the past year, including both property and violent acts (n=17 different acts). We also include a measure of *deviant peers*, which is a scale derived from the average score across 3 items asking the respondent how many of his/her three best friends smoke daily, smoke marijuana monthly, and drink alcohol monthly. The scale suggests high reliability ($\alpha=.76$). There exists evidence that weapon carrying is influenced considerably by peers (e.g., Dijkstra et al., 2010). *Gang membership* was captured by a single item, measured at wave II, asking the respondent whether he/she had been initiated into a named gang. We include violent victimization, gang membership, and exposure to deviant peers in an effort to clarify whether weapon carrying appears to be for self-protection or another aspect of delinquent involvement.

Controls.—We employed a number of variables as controls, including *age*, *family structure* (whether or not the child resides in a two-parent family), *welfare recipient* (whether the family was receiving welfare assistance or not), *parental education* (whether one parent earned a college degree or not) and *school setting* (dummy measures of whether the school they attended was located in an urban, suburban, or rural setting). We also include a measure of *self-control*, comprised of four items. Items include such questions as “when you have a problem to solve, one of the first things you do is get as many facts about the problem as possible” and “when you are attempting to find a solution to a problem, you usually try to think of as many different ways to approach the problem as possible.” Higher scores indicated greater self-control. The scale suggests high reliability ($\alpha=.74$).

Analysis Strategy

Our analysis plan starts with an examination of the descriptive measures (Table 1) for both obese and non-obese respondents. In order to assess adiposity differences, we conduct an adjusted Wald test for each variable. Next, we examined models predicting weapon-carrying at school (Table 2). We consider a number of models—a baseline model with controls and the obesity measure (H_1), followed by models that introduce the variables that represent the

victimization hypothesis (H_2) and established predictors of weapon carrying (victimization-prior victimization, gang membership, delinquent behavior, and exposure to deviant peers) separately as well as one that includes all of the risk factors together. We utilized logistic regression analyses because the dependent variable was a dichotomous measure. Due to the unequal probability of sample selection in Add Health (Chantala, 2006), all analyses were weighted to account for the Add Health design effects.

Finally, based upon preliminary analyses, we only report our analyses for males only. As expected, analyses that included only females failed to adduce evidence of significant associations between the key variables of interest that guided these analyses, consistent with the aforementioned discussion of the gendered fear of crime socialization process (Rader and Haynes, 2011). Results of these analyses are available upon request.

RESULTS

Table 1 provides the means for each of the variables included in the analyses, for both obese and non-obese respondents. As one can adduce from the table, there are five significant differences in the mean scores for the variables. Of the key variables of interest, obesity was only found to be associated with being a gang member, with obese youth more likely to have joined a gang (.092 versus .063).

Table 2 provides the results of the logistic regression models predicting weapon carrying. The baseline model (model 1) predicting weapon carrying reveals a few significant predictors ($p < .05$) of the dependent variable. Older respondents are less likely to carry a weapon, holding all other variables constant. Urban respondents (relative to rural ones) are more likely to report weapon carrying. For example, attending a school in an urban setting increased the odds of weapon carrying by about the same amount (71 percent, holding all other variables constant). More importantly, as expected, being obese was associated with an increased risk of weapon carrying—being obese increased the odds of weapon carrying by about 46 percent, holding all other variables constant.

Models 2 and 3 introduce the aforementioned risk factors for weapon carrying separately, while model 4 includes all four variables in the analysis. Being a victim (model 2), as expected, was found to be associated with an increased chance of weapon carrying; prior victimization increased the odds of weapon carrying by approximately 38 percent (holding all other variables constant). Likewise, becoming a gang member (model 3) was found to greatly increase the risk of weapon carrying—gang membership increased the odds of weapon carrying by approximately 287 percent. Delinquent behavior, as expected, was also found to be a risk factor for weapon carrying (odds ratio=1.148). However, peer deviance was not found to be a statistically significant predictor of weapon carry.

When we consider all of the variables simultaneously (model 4) we find that the three risk factors remained significant predictors of the dependent variable. Prior victimization, gang membership, and delinquent behavior are each significant risk factors for weapon carrying. Furthermore, as expected, the inclusion of these risk factors serves to attenuate the association between obesity and weapon carrying, to the extent that it no longer reaches

statistical significance. However, the reduction in the coefficient is fairly modest. None of the Sobel tests for mediation were found to be significant; and (for instance), only 2 percent of the effect of being obese was mediated through gang membership (MacKinnon and Dwyer, 1993). Hence, we must conclude that these risk factors do not mediate the association between obesity and weapon carrying.

DISCUSSION

Despite a voluminous number of studies examining the issue of adolescent weapon carrying, our present study examines an understudied issue—the role of obesity in explaining the phenomenon of carrying weapons on school grounds. Our study is predicated on the pattern of correlates already established between key variables of interest: the association between obesity and victimization and the role of victimization in predicting weapon carrying. Our analyses of two waves of Add Health data revealed four central findings: a) obesity is associated with an increased risk of weapon carrying; b) violent victimization is a robust predictor of weapon carrying; c) prior delinquent behavior and gang membership are also strong predictors of weapon carrying, consistent with a violent lifestyle thesis; and d) the association between obesity and weapon carrying is modestly attenuated once violent victimization and criminal lifestyle factors are considered, but this association is not mediated through these variables.

With regards to the obesity-weapon carrying association, our findings are consistent with prior studies that had examined this link (Farhat et al., 2010; Kukaswadia et al., 2012). Untangling the reason for why obese adolescents are more likely to carry weapons on school grounds than their counterparts, however, is a more daunting task. Based on our results, we find little evidence for the victimization hypothesis as an explanation for the obesity-weapon carrying association. However, we do find that our measure of victimization predicts weapon carrying generally, even while controlling for factors representing a violent lifestyle, but including this measure did little to explain the *obesity-weapon carrying link* specifically. One possible explanation for our failure to find support for the victimization hypothesis—we were unable to account for the spectrum of teasing, harassment, and ostracizing that many obese youth face. As mentioned before, bullying that does not rise to the level of violent victimization (as it was captured in the present analyses) is a common experience for obese youth and future research should explore whether bullying can help make sense of the obesity-weapon carrying association found in the present study.

Our results also support prior findings that gang membership and delinquent behavior are both robust predictors of weapon carrying on school grounds, a finding that is consistent with the violent lifestyle thesis (Vaughn et al., 2006; Cao et al., 2008) and prior studies (Melde et al., 2009; Decker and Van Winkle, 1996; Thornberry et al., 2003; Vaughn et al., 2012). What is novel, however, is our finding that obese youth are more likely to be members of gangs than their counterparts. Indeed, the unadjusted odds ratio (not reported in any table) for an obese youth being a gang member is 1.66—being an obese youth increases the odds that one would be a gang member by 66 percent. As mentioned earlier, it may be the case that obese youth are vulnerable to recruitment to gangs because of the perceived need for protection and support that gangs may provide. Prior research has found that

protection is a common rationale given by youth as a reason for joining gangs (Thornberry et al., 2003). Coupled with the finding that past victimization is greater among obese youth, there is some support found for this thesis in the present study (see also Peterson et al., 2004, who found that gang members had higher violent victimization rates prior to joining gangs than their counterparts). However, it may also be the case that obese youth may be attracted to gangs because of their involvement in delinquent behavior. Additional research into this association is clearly needed to understand why such an association between obesity and gang membership exists.

We also largely failed to find evidence that a youth's demographic characteristics were predictive of weapon carrying. For instance, we failed to find that race was a predictor of weapon carrying—consistent with some studies that have failed to find such an association (DuRant et al., 1997; Abel and Burrow, 2011; Melde et al., 2009; but see also. Wilcox and Clayton, 2001). We also failed to find that our two measures of SES, being a welfare recipient and parental education, were predictive of weapon carrying, consistent with some studies (James et al., 2014; Apel and Burrow, 2011; Lizotte et al., 2000), but contrary to others (Wilcox and Clayton, 2001).⁵ Experiences with crime, either as a victim or a perpetrator, appear to matter more than one's social location.

Finally, we failed to find any evidence that supported any significant associations between the key theoretical variables for females, consistent with prior studies examining the association between obesity and weapon carrying (Kukaswadia et al., 2012; Farhat et al., 2010). We interpret these 'non-findings' as supportive of Rader and Haynes (2011) gendered fear of crime socialization thesis, which suggest that females are socialized to think, feel, and behave differently (than males) to victimization experiences (or potential criminal victimization). Based on our analyses, obese and overweight females are no more likely to engage in weapon carrying than other females, suggesting that this socialization process does not differ based on body size/type, although clearly more research is warranted to investigate whether obese females experience greater fear of victimization and whether they employ different coping mechanisms compared to other females.

Implications

Overall, these findings may have practical implications for obese male youth. Our finding that obese youth are at a heightened risk of joining a gang suggests that anti-gang efforts/initiatives need to be inclusive of such youth if these initiatives are to maximize their success. In this regard, obesity in adolescence may be a *risk* factor for gang membership and weapon carrying and school officials and other interested parties may want to craft policies that incorporate such information into their strategies. More generally, the finding that obesity is positively associated with weapon-carrying provides additional support for Jessor's (1992) argument that violence prevention initiatives should target multiple risk behaviors, risk and protective factors. While a variety of strategies to discourage weapon carrying are warranted, our findings support efforts that educate students to the risks of weapon carrying, including evidence that weapon carrying is actually a positive correlate of victimization (Gainer et al., 1993), should be included.

Limitations

As is the case with all studies, readers should consider the following limitations when evaluating the merits of this study. First, our measure of deviant peers is not capturing peers involved in violent behavior, but rather only measuring substance using peers. A stronger measure of peers that captured exposure to friends who engaged in serious, non-substance using activity may have affected the results, although past research has found such a measure to be predictive of school weapon carrying (Cao et al., 2008). Likewise, we have no measures of fear of crime or perceived risk of victimization; including such measures may alter the relationships uncovered in these analyses (Wilcox et al., 2006; Melde, Esbensen, and Taylor, 2009). Nor do we have a measure of peer weapon carrying, a factor that has been found to be predictive of individual weapon carrying (Wilcox and Clayton, 2001). And although our measure of weapon carrying was school-specific, and therefore sampling students is an appropriate strategy, school-based surveys likely miss those adolescents who are most likely to be weapon carrying as a means to commit crimes, since these youth may have dropped out of school (Wilkinson and Fagan, 2001). Our measure of violent victimization omits the forms of harassment and peer victimization that are much more commonplace than violence—the various forms of harassment and bullying that has been found to have a robust relationship with adolescent obesity (e.g., Farhat et al., 2010; Janssen et al., 2004; Kukaswadia et al., 2011) is not considered in these analyses. Finally, the Add Health data, despite its richness and comprehensiveness, collected data on respondents at these ages over twenty years ago. While we have little reason to believe that the associations detected in these analyses would not persist today, these results must be considered in light of dated nature of the data. Clearly, additional research exploring the role of obesity in weapon carrying with more recently collected data is warranted.

Future Research

It is our hope that the present study inspires additional research into the associations between youth obesity and weapon carrying. As mentioned above, future research should examine the association between obesity and weapon carrying in the context of a number of possible fear and victimization experiences—bullying (both physical and verbal), emotional-based fear of crime, even domestic violence experiences may serve to be important mediators of this association. Likewise, the unexpected positive association between obesity and gang membership warrants further examination. Obese youth may seek joining gangs as a means of protection and belonging, given the previously mentioned heightened risk to be victimized, ostracized, and bullied by their peers. Under what conditions are obese youth attracted to gangs, and does the gang-obese youth association persist across racial and ethnic groups? Relatedly, our study did not consider the possible role of neighborhood context in understanding these associations. Youth obesity is associated with neighborhood factors including economic disadvantage and racial composition, which are correlates of crime, victimization, and fear of crime; future research should explore the role of such contextual factors to further clarify these complex associations.

Despite our limitations, our study provides additional insights into the associations between obesity, weapon carrying, and prior victimization. Building upon past research, our study utilized longitudinal data collected from a nationally representative sample of schools (and

students) that enabled us to examine whether obesity predicted weapon carrying and whether prior victimization and other correlates served to mediate the obesity-weapon carrying association. Being an obese male was found to be a significant predictor of weapon carrying, and while victimization and other known correlates of weapon carrying predicted carrying weapons, the evidence failed to support the hypothesis that the obesity-weapon carrying association would be significantly attenuated once prior victimization experiences were considered. An important caveat to our findings is that they apply only to males; we did not find any evidence of an association between weapon carrying and obesity, a result we interpreted as consistent with Rader and Haynes' (2011) argument that there exists a gendered fear of crime socialization process, that leads to fundamentally distinct ways in how males and females think, feel, and act regarding the threat of criminal victimization. Overall, our findings enhance our understanding of the correlates of student weapon carrying, but much remains unanswered about how fear, victimization, and bullying coalesce and explain student defensive behaviors such as weapon carrying.

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Table 1.

Descriptive statistics for Obese and Non-obese adolescent males (means reported; standard errors in parentheses)

	Non-obese (n=5,535)	Obese (n=882)	Difference of Means Test
Weapon Carrying	.052 (.003)	.061 (.008)	
Age	15.412 (.022)	15.265 (.055)	*
Parental Education	.399 (.007)	.333 (.016)	***
Family Structure	.544 (.007)	.561 (.017)	
<i>Race/Ethnicity</i>			
Hispanic	.168 (.005)	.211 (.014)	**
African American	.206 (.005)	.218 (.014)	
American Indian	.017 (.037)	.037 (.006)	***
Asian American	.081 (.004)	.077 (.009)	
<i>School setting</i>			
Urban	.278 (.006)	.270 (.015)	
Suburban	.540 (.007)	.539 (.017)	
Welfare recipient	.114 (.004)	.113 (.011)	
Self-control	-.000 (.014)	.058 (.033)	
<i>Victimization Hypothesis</i>			
Victimization	.702 (.017)	.774 (.045)	
<i>Violent Lifestyle measures</i>			
Gang member	.063 (.003)	.092 (.010)	**
Delinquent behavior	3.143 (.041)	3.145 (.104)	
Peer Deviance	2.458 (.036)	2.631 (.089)	

Note: $p < .001 = ***$; $p < .01 = **$; $p < .05 = *$

Table 2.

Logistic regression predicting weapon carrying among adolescent males (n=6,417); standard errors in parentheses)

	1	2	3	4
Age	-.083 * (.038)	-.129 ** (.038)	-.139 ** (.044)	-.145** (.044)
Parental Education	-.106 (.171)	-.082 (.174)	-.065 (.179)	-.053 (.179)
Family Structure	.009 (.151)	.127 (.158)	.229 (.162)	.255 (.165)
<i>Race/Ethnicity</i>				
Hispanic	.084 (.223)	.045 (.236)	-.091 (.245)	-.099 (.247)
African American	.225 (.210)	.214 (.219)	.181 (.238)	.184 (.237)
American Indian	.220 (.379)	.125 (.368)	-.009 (.375)	.019 (.362)
Asian American	-.365 (.364)	-.275 (.375)	-.465 (.386)	-.424 (.385)
<i>School setting</i>				
Urban	.534* (.268)	.378 (.268)	.500 (.261)	.442 (.263)
Suburban	.224 (.250)	.165 (.249)	.186 (.244)	.170 (.244)
Welfare recipient	.114 (.206)	.042 (.210)	-.057 (.213)	-.066 (.214)
Self-control	-.092 (.077)	-.073 (.074)	.031 (.074)	.023 (.072)
Obesity	.381* (.162)	.377* (.169)	.286 (.175)	.285 (.175)
<i>Victimization Hypothesis</i>				
Victimization		.323*** (.035)		.122** (.043)
<i>Violent Lifestyle measures</i>				
Gang member			1.353*** (.189)	1.282*** (.186)
Delinquent behavior			.138*** (.024)	.116*** (.026)
Peer Deviance			.052 (.036)	.041 (.036)
Constant	-1.953* (.642)	-1.557* (.634)	-1.984** (.721)	-1.872*** (.711)
F ratio df	2.65** (12, 121)	9.15*** (13, 121)	15.40*** (15, 121)	13.94*** (16, 121)

Note: $p < .01 = **$; $p < .05 = *$ (two-tailed tests)