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Effects of Community, School, and Student Factors on School-Based Weapon Carrying

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Extant research has theorized that community conditions affect the level of student violence in and around schools, yet few studies have tested this proposition directly. This research does so by assessing whether social conditions in a school's attendance area affect the likelihood of students bringing weapons to school. Current results indicate that the level of economic disadvantage, residential mobility, and violent crime in a school's attendance area are unrelated to student-level weapon carrying. The implications of these findings are discussed.

Keywords: *multilevel framework; school community conditions; student weapon carrying*

Although the influence of community characteristics on school violence has been the focus of theoretical arguments (see e.g., Bursik & Grasmick, 1993; Gottfredson, 2001), few studies have examined explicitly the impact of broader community conditions on student violence in and around schools (Laub & Lauritsen, 1998; Welsh, Greene, & Jenkins, 1999; Welsh, Stokes, & Greene, 2000). In fact, based on the arguments of routine activities theorists such as Cohen and Felson (1979), existing research has been just as inclined to assess whether schools affect the level of crime in nearby areas (see e.g., LaGrange, 1999; Roman, 2004; Roncek & Faggiani, 1985; Roncek & Lobosco, 1983), rather than assess whether conditions in nearby areas affect the level of crime in and around schools.

This research explores the latter relationship by addressing the question of whether community characteristics affect the level of school-based weapon carrying among high school students. In particular, this research examines whether three measures of a school's attendance area—economic disadvantage, residential mobility, and violent crime—are significantly related to between-school variability in student-level weapon carrying, after adjusting for individual correlates of school weapon possession. This assessment is undertaken with a national sample of roughly 10,000 students attending 55 high schools. The analytic model employed in this research contributes to the literature by examining school-based weapon carrying within a multilevel framework that, most notably, incorporates measures of school community characteristics. When examining school weapon possession or student violence more broadly, existing studies have often failed to account for the broader environmental conditions in which schools operate (see e.g., Bailey, Flewelling, &

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Rosenbaum, 1997; DuRant, Krowchuk, Kreiter, Sinal, & Woods, 1999; Simon, Crosby, & Dahlberg, 1999).

Factors Associated With School-Based Weapon Carrying

Many researchers now share a similar conviction that child and adolescent outcomes are best examined from a multilevel or ecological perspective (see Bronfenbrenner, 1979, 1989), which assumes that multiple social contexts, such as families, schools, and neighborhoods, concurrently work together to influence youth behaviors (Rankin & Quane, 2002). This argument is supported by the marked increase in studies recently assessing “neighborhood effects” on child and adolescent outcomes (see Leventhal & Brooks-Gunn, 2000; Sampson, Morenoff, & Gannon-Rowley, 2002). Interestingly, although delinquency-related acts committed by youths in their broader communities have been a regular focus of studies assessing neighborhood effects (see e.g., Anderson, 2002; Elliott et al., 2007; Knoester & Haynie, 2005; Rankin & Quane, 2002; Wikström & Loeber, 2000), comparatively few studies have explored the potential influence of neighborhood or community factors on violence committed by youths at school (Laub & Lauritsen, 1998).

Failing to account for the larger environmental conditions in which schools operate has been a common critique of school violence research. As Gottfredson (2001) indicated, one consequence of studies failing “to measure and separate school from community contextual effects [is they] provide only a combined estimate of the two effects” (p. 68). Although some school violence studies have incorporated measures of a school’s external environment (see e.g., Baker, Mednick, & Carothers, 1989; Clark & Lab, 2000; Gottfredson & Gottfredson, 1985; Gottfredson, Gottfredson, Payne, & Gottfredson, 2005), this research generally has been limited to school-level analyses that are unable to account for more proximate social settings, such as the family, that have been linked to youth violence at school. Welsh et al. (1999) alluded to this limitation in stating that school violence research has “too often been piecemeal, examining specific variables and levels of analysis in isolation from one another” (p. 83). In other words, school violence research has been predominantly undertaken at a single level of analysis, where studies identify characteristics associated with “dangerous schools” or “dangerous students” but do not identify student- and school-level factors linked to school violence simultaneously (Benbenishty & Astor, 2005; Khourny-Kassabri, Benbenishty, Astor, & Zeria, 2004).

This research overcomes these shortcomings by examining school-based weapon carrying within a multilevel framework, where variables measuring attributes across social settings at multiple levels are assessed concurrently, including measures of the broader social environment in which schools operate. This research proceeds with a discussion of factors that have been associated with youth weapon carrying in general and school-based weapon carrying specifically. The following discussion is intended to address how meaningful correlates of student weapon carrying may be operating across multiple contexts, and in the process, underscores how the application of a multilevel framework may advance our understanding of student weapon possession.

Community Factors

When rates of youth violence increased to historically high levels in the late 1980s and early 1990s (Fox, 1996), public concerns emerged as to whether violent behavior in the broader community was spilling over into the hallways of schools (see e.g., Elliott, Hamburg, & Williams, 1998). In particular, given the significance of firearms in contributing to record numbers of lethal encounters among adolescents during this time, questions surfaced as to whether guns were finding their way into schools in record numbers as well (DeWitt, 1993; "When guns go to school," 1992). Furthermore, firearm research undertaken in the late 1980s and early 1990s tended to legitimize these concerns because school-based weapon or gun carrying was reported at an alarmingly high rate among samples usually composed of inner-city or detained youths (see e.g., Callahan & Rivara, 1992; Callahan, Rivara, & Farrow, 1993; Sheley & Wright, 1995; Vaughan et al., 1996; Webster, Gainer, & Champion, 1993). Although this research proved meaningful in shedding light on the prevalence of school-based weapon possession among adolescents, especially with "at-risk" youths, these studies seldom included actual measures of community characteristics and thus were only able to speak of the potential influence of community factors on weapon carrying, anecdotally.

More recent studies have incorporated actual measures of broader environmental conditions when examining youth weapon carrying in the community. For example, in a single-level study using a national sample of roughly 1,200 males aged 15 to 17, Cook and Ludwig (2004) found that adolescents residing in counties with higher rates of robbery were more likely to report carrying a weapon in the prior 30 days, even after controlling for a number of other individual, family, and local area characteristics. Two proxies of neighborhood disadvantage were also examined in the study: the adolescent's housing type (e.g., single-family home or public housing) and the appearance of buildings (e.g., very rundown or well kept) in the adolescent's neighborhood. Although measures accounting for building appearance in a youth's neighborhood were unrelated to weapon carrying, male adolescents residing in public housing were more likely to carry a weapon.

Patchin, Huebner, McCluskey, Varano, and Bynum (2006), with a sample of approximately 200 males and females aged 9 to 15 from a Midwestern city, found in their single-level study that a six-item factor score measuring neighborhood disadvantage in a youth's census block was unrelated to self-reported weapon possession during the prior 12 months. These scholars did find, however, that a summated variable of exposure to neighborhood violence measuring several risk factors, such as hearing gun shots and seeing drug sales, was significantly associated with youth weapon possession. Luster and Oh (2001), with a national sample of roughly 2,500 adolescent males aged 12 to 15, similarly reported that exposure to neighborhood violence (i.e., hearing gunshots) was related to handgun carrying in the prior 12 months.

Molnar, Miller, Azrael, and Buka (2004) also examined youth gun carrying with data from the Project on Human Development in Chicago Neighborhoods. Specifically, these scholars applied a multilevel framework to a sample of roughly 1,800 males and females aged 9 to 19 residing in Chicago neighborhoods. These researchers found that after adjusting for the effects of individual-level correlates, a neighborhood-level index of concentrated

poverty was not associated with youth gun carrying, whereas other neighborhood-level measures, such as collective efficacy and physical/social disorder were significant determinants of gun carrying. When reviewing these studies collectively, it is difficult to draw any firm conclusions because of sample and measurement particularities (e.g., how community was operationalized), but at minimum, these studies suggest that youths residing in communities with higher rates of violent crime are more likely to carry a weapon.

Similar studies have not been undertaken with school weapon carrying and consequently, it remains unclear if this outcome is influenced by broader community conditions such as the level of violent crime. There are no obvious reasons to presume that school-based weapon carrying would be impervious to community conditions. Available data from the National Incident-Based Reporting System indicate, for example, that during school days gun crimes committed by juveniles are most likely to occur immediately after school (around 3:00 p.m.; Snyder & Sickmund, 2006). It is around this time that many students move from school to home without any direct school or parental supervision. Under these circumstances, a student may feel compelled to carry a weapon to school in order to defend himself or herself or to perpetrate crimes after being released from school. Some communities, however, are likely better at informally monitoring the behaviors of youths once they depart from school. Within these well-monitored communities, students may perceive less of a need to carry a weapon for protection or be deterred from possessing a weapon for predatory purposes. Prior research has found that community conditions such as economic disadvantage are strongly linked to the prevalence of unsupervised teenage groups within communities (Sampson & Groves, 1989; Veysey & Messner, 1999) as well as the willingness of community residents to intervene when they witness youths engaging in delinquent activities (Morenoff, Sampson, & Raudenbush, 2001). Accordingly, students who traverse economically distressed or violent communities on their way to or from school likely experience less informal supervision and presumably have greater reason to carry a weapon.

School Factors

Existing evidence suggests that schools are important in shaping the level of student violence within their halls (Lawrence, 2007). For instance, in summarizing the “school effects” research, Gottfredson (2001, p. 81) began by posing the question, “Does school matter?” Her abbreviated response to this question was simply “Yes.” Similarly, Welsh et al. (1999) noted that there is a developing understanding that, much like individuals, schools have their own distinct personalities that influence student behaviors.

Despite these general assertions, only one study to date has assessed the effects of school-level factors on student-level weapon possession: Wilcox and Clayton (2001). This study examined the effects of individual- and school-level measures on weapon carrying across roughly 12,000 students attending 21 middle schools and high schools in Kentucky. Four measures of school-level structure were assessed (i.e., middle or high school and the percentage of students who were male, non-White, and receiving free/reduced lunch) as well as two measures of school-level climate (i.e., school deficits and school capital) that each combined multiple items such as the proportion of students who were afraid and/or threatened at school. Notably, this study did find significant variation in student weapon

carrying across the 21 sample schools. Moreover, after adjusting for the effects of student-level characteristics (e.g., gender and race), the only school-level structural measure that proved significant in accounting for between-school variability in weapon carrying was socioeconomic status ([SES] i.e., proportion receiving free/reduced lunch). After concurrently modeling the climate measures of school deficits and school capital, however, school SES was rendered insignificant. In fact, Wilcox and Clayton found that none of the school-level measures had a significant effect on student weapon carrying after simultaneously modeling all the individual- and school-level variables.

This research extends the work of Wilcox and Clayton (2001) by assessing school effects across a nationally representative sample of high schools and by incorporating measures of school community characteristics. In addition, although this research was unable to recreate the exact school-level measures used by Wilcox and Clayton, indicators of school conditions employed in this study similarly represent measures of school structure and climate. School structure refers to physical aspects of a school, such as size, which are generally considered beyond the immediate control of a school. The structural measures examined in this research include racial composition, urban location, orientation (i.e., private or public), and size. Within the broader school violence literature, extant research has uncovered systematic variation in a number of school-related misbehavior, victimization, and disorder outcomes based on these structural characteristics. For example, these undesired outcomes have been associated with school size (Bryk, Lee, & Holland, 1993; Gottfredson & Gottfredson, 1985; Stewart, 2003), public school orientation (Bryk et al., 1993), inner-city or urban location (Dinkes, Cataldi, Kena, & Baum, 2006), and greater minority student representation (Felson, Liska, South, & McNulty, 1994; Lee & Croninger, 1996).

Apart from structural characteristics, measures of school climate have also been used to assess the potential influence of school factors on student misbehaviors (see e.g., Stewart, 2003; Welsh, 2000; Welsh et al., 1999; Welsh et al., 2000; Wilcox & Clayton, 2001). Although school climate is a broad term that has come to encompass many facets of schools (Anderson, 1982), Lawrence (2007) referred to school climate as “the ‘feel’ of the school as perceived by students and teachers” (p. 138). In discussing school climate, Moos (1979) underscored the importance of strong relationships and perceived support among stakeholders in (e.g., students and teachers) and outside (e.g., parents) of school. Such a focus is consistent with recent studies assessing the influence of a strong “communal environment” or “school connectedness” on school disorder (see e.g., Payne, 2004; Payne, Gottfredson, & Gottfredson, 2003). It is generally theorized that schools that foster stronger social cohesion and engagement among its stakeholders will be more effective in producing desired student outcomes. This research employs a number of school-level variables that capture mechanisms by which stronger cohesion or networks are likely fostered in schools (e.g., levels of parent–teacher association [PTA] participation and student attendance), as well as a direct measure of the level of social connectedness among students.

Student Factors

Whereas few studies have assessed the influence of community- or school-level factors on student weapon possession, a comparatively sizeable number of studies have assessed

the effects of student-level factors. In particular, the student-level factors examined in this research represent four general categories of variables that capture sociodemographic characteristics, family structure/relationships, school performance/attachment, and fear/victimization. Each of these general categories has been explored with some regularity in the literature and, to varying degrees, systematically linked to school-based weapon carrying. With sociodemographic characteristics, for example, research has consistently found that male students carry weapons to school more often than female students (DuRant et al., 1999; DuRant, Kahn, Beckford, & Woods, 1997). Some research has also found that students of lower socioeconomic standing are more likely to carry weapons to school (Martin, Sadowski, Cotten, & McCarragher, 1996; Williams, Mulhall, Reis, & DeVille, 2002). The effects of other sociodemographic characteristics, such as age and race, have shown less consistent results across studies. For instance, whereas some research has found that minority students are more likely to carry weapons to school (May, 1999; Wilcox & Clayton, 2001; Wilcox, May, & Roberts, 2006), other studies have found no statistical relationship between student race and weapon carrying (Bailey et al., 1997; DuRant et al., 1997).

Additional studies have assessed the influence of family and parental processes on student weapon carrying. Williams et al. (2002) found that, relative to two-parent households, students residing in single-parent households were more likely to carry a handgun to school (see also Forrest, Zychowski, Stuhldreher, & Ryan, 2000). Research also suggests that students who have a closer relationship or attachment to their parents are less likely to take a weapon to school (Bailey et al., 1997). Moreover, given that the outcome in this research is school-related, a student's general performance in or commitment to school may affect their willingness to disregard school rules and take a weapon to school. Research has been generally mixed, however, concerning the relationship between academic performance and school weapon possession (cf. Bailey et al., 1997; DuRant, Kahn, et al., 1997; DuRant, Krowchuk, et al., 1999), but some research has found that students who express dislike for school or school personnel are more likely to carry a weapon to school (Kingery, Coggeshall, & Alford, 1998, 1999).

A common explanation offered as to why juveniles or adults carry weapons is that it is out of fear of being victimized (see Wright, Rossi, & Daly, 1983). Most studies have included measures of student fear when examining school weapon possession, but such measures are generally rendered insignificant after controlling for other relevant correlates of school-based weapon carrying (see e.g., Bailey et al., 1997; Sheley & Brewer, 1995; Wilcox & Clayton, 2001; Wilcox et al., 2006). In contrast, indicators of prior student experiences with verbal or physical victimization have been consistently linked to an increased likelihood of carrying a weapon to school (see e.g., Coggeshall & Kingery, 1999; DuRant, Beckford, & Kahn, 1996; Simon et al., 1999).

Method

The preceding review of the literature illustrates that several factors may be operating across multiple social contexts that influence school-based weapon carrying, but most studies have focused exclusively on student factors and thus have been unable to assess the

potential effects of broader environmental conditions, such as school and community factors, on student weapon possession. This research overcomes this shortcoming by examining school-based weapon carrying within a multilevel framework, where community, school, and student factors are examined within a single or “holistic” analytic framework.

Sample

This analytic framework is applied to restricted-use data from the National Longitudinal Study of Adolescent Health (hereafter Add Health). The Add Health data were gathered using a two-stage stratified cluster sampling technique. In the first stage, 80 high schools were selected from a list of all U.S. high schools sorted by region, urbanicity, size, school type, and racial composition. The selected high schools then identified middle schools from which they received students, and, for each high school in the sample one middle school was recruited to participate in the study. In each of the participating middle schools and high schools, all students in grades 7 through 12 were eligible to complete an in-school questionnaire that was administered during the 1994-1995 school year. Along with a student survey, an administrator from each school also completed a questionnaire regarding characteristics of their respective institution. The second stage of the sampling design involved schools providing student rosters to select adolescents to complete an in-home interview. In total, there were 20,745 adolescents who completed the Wave I in-home interview in 1995, and, for each participant, his or her home address was geocoded and then linked to contextual data sources (see Harris et al., 2003 for a detailed description of the Add Health study design).¹

Prior research has found systematic differences in the explanatory measures that best account for variation in student disciplinary and victimization outcomes across middle schools and high schools (see e.g., Gottfredson & Gottfredson, 1985; Hellman & Beaton, 1986). One explanation for these differences is that middle schools are generally more homogenous than high schools because they receive students from fewer geographical enclaves and thus are more neighborhood-based than high schools. Consequently, social processes unfolding among students and staff in high schools are presumably more dynamic than in middle schools, which may explain, in part, why scholars have tended to examine school-based weapon carrying among either middle- or high-school students but seldom both concurrently (see e.g., Bailey et al., 1997; DuRant, Kahn, et al., 1997; DuRant, Krowchuk, et al., 1999; Martin et al., 1996). For these reasons, this research limits the focus to school-based weapon carrying across *high schools*.² Furthermore, with the exception of one school serving students in grades 8 through 12, this research also removed any high schools that housed students in 8th grade or lower for similar arguments.³

The removal of these schools resulted in the current sample being composed of 55 stand-alone high schools serving students in grades 8 through 12. Across these 55 high schools, there were 11,809 adolescents who completed the Wave I in-home interview. Roughly 1,500 of these participants, however, were removed from the current sample because they did not have a valid sample weight that adjusted for differential selection, or they changed schools between the administration of the in-school and in-home surveys. After excluding these students, 10,308 adolescents were retained in the current sample.⁴

Variables

Dependent variable. The student-level dependent variable is a binary outcome that scores students 1 if they reported carrying a weapon, such as a gun, knife, or club to school at least once during the prior 30 days. This outcome is consistent with other studies examining school-based weapon carrying (see e.g., Rountree, 2000; Wilcox & Clayton, 2001; Wilcox et al., 2006; Williams et al., 2002), and a similar measure has shown good test–retest reliability among a national sample of high school students (see Brener et al., 2002).

School-level variables (community factors). To capture the potential effects of community factors on student weapon possession, this research uses three measures that capture social conditions in a school's attendance area, which Welsh et al. (1999) referred to as the "imported" school community. Two data sources were used to construct measures of the imported school community: 1990 census data and 1993 Uniform Crime Report (UCR) data. The census data that correspond to the census tract in which a student resided were used to create school-level indicators of school community disadvantage and school community mobility. In applying the aggregation technique employed by Welsh et al. (1999), the census tract items comprising these two variables were initially multiplied by the total number of students residing in a given tract, and then these product terms were summed across all tracts within a school to provide a single summary measure. The final step in the process was to divide each summated item by the total number of students who participated in the study from a given school. As Welsh et al. (1999, p. 90) indicated, the resulting value represents a "weighted average" of characteristics of neighborhoods (e.g., poverty) from which schools received students.

Six items were used to construct a summated scale for school community disadvantage ($\alpha = .78$), whereas three items were used to create a summated index for school community mobility ($\alpha = .61$; see Appendix A for items used to construct the summated index variables).⁵ School community violent crimes were generated from county-level UCR data pertaining to the violent crime rate in 1993. Although very few schools received students from more than two counties, the identical aggregation process was used to construct a single summary measure of community violent crime for each school. Due to heavy skew, a natural log transformation was performed for each of the three school community variables.

School-level variables (school factors). The broader school violence literature has uncovered systematic variation in school-related outcomes based on school structural characteristics. Four measures of school structural characteristics are examined in this research. *Percent black* is measured on a 4-point scale (quartiles) wherein higher scores represent schools with a greater proportion of Black students.⁶ *Urban school* is scored 1 if a school is located within the central city of a metropolitan area and scored 0 otherwise. *Private school* is coded 1 if a school is a parochial or a nonparochial private school and coded 0 if a school is public. *School size* represents the average number of students per grade in a school.

Additional school factors assessed in this research include indicators of school climate that aid in generating social cohesion or a stronger sense of community in a school. Participation in the PTA was constructed from a survey in which school administrators were

asked whether their school had a PTA, and, if so, what proportion of students had family members who took part. PTA participation, therefore, captures the approximate percentage of students in a school who had family members who attended PTA meetings. This measure in its original metric was heavily skewed and thus was logged. School administrators were also asked about the average daily attendance for their school, with response categories ranging from 1 (95% or more) to 5 (75% to 79%). The vast majority of school administrators indicated that daily student attendance exceeded 90%, so *student absenteeism* was coded 1 if the average daily attendance for a school was less than 90% and coded 0 if it was more than 90%. *Student disconnectedness* is a six-item summation scale that provides a direct measure of the level of social cohesion within a school. This measure was aggregated from responses on the school attachment index (see Appendix A) and then reverse coded, with higher scores representing greater feelings of student disconnectedness at a school ($\alpha = .91$).

The final school factors assessed include a measure of the perceived level of school safety among students and an indicator of the prevalence of physical violence among a student body. Specifically, *fearful students* measures the proportion of students who agreed or strongly agreed that they did not feel safe in their school, whereas *physically fought* captures the proportion of students who reported being in a physical fight in the prior year. Students are likely to perceive a greater need for a weapon when attending schools where students express uncertainty about their safety and partake in physical violence. Of course, such arguments have been explored with some regularity at the individual level (i.e., fear-and-loathing hypothesis) but have seldom been explored at the school level.

Student-level variables (student factors). The student-level factors accounted for in this research fall into four general categories starting with sociodemographic characteristics. *Gender* is coded 1 for males and 0 for females. *Age* is treated as a continuous variable, whereas *race/ethnicity* is captured with four dummy variables that differentiate non-Hispanic Whites (reference category), non-Hispanic Blacks, non-Hispanic others, and Hispanics. Consistent with prior research (e.g., Kodjo, Auinger, & Ryan, 2003; Simon et al., 1999), *parent education* is used as a proxy for an adolescent's SES and is measured on a four-point scale, which ranges from a score of 1 (*less than a high school education*) to 4 (*college or university graduate*).⁷ In addition, two variables were created that provided indicators of household structure and quality of parent–student relationships. Household structure is measured wherein adolescents residing in a *single-parent household* are scored 1. The quality of an adolescent's relationship with his or her parents is measured with five survey items that were summed to form a *parental attachment* index ($\alpha = .86$), wherein higher scores indicate greater attachment.

Three variables account for a student's general performance in or attachment to school. *Grade point average (GPA)* captures the self-reported grades a student received for English, math, science, and social studies during their last evaluation period, with responses initially ranging from 1 (*A*) to 4 (*D or lower*). These four items were reverse coded and then averaged to provide a measure of a student's overall GPA. *School suspension* is coded 1 if a student reported ever being suspended from school and coded 0 otherwise. A *school attachment* scale was also constructed from six survey items, with higher scores indicating greater school attachment ($\alpha = .86$).

The final student-level variables assessed include measures of self-perceived fear and victimization experiences, as well as a student's association with delinquent peers. *School fear* is a single-item variable that ranges from 1 to 5, with 5 signifying that adolescents *do not feel safe* in school. *Weapons victimization* is a dummy variable created from four survey items that asked adolescents if they (a) saw someone shoot or stab another person, (b) had someone pull a gun or knife on them, (c) had been shot, or (d) had someone cut or stab them in the last year. Students who reported experiencing any one of these four behaviors were coded 1 and 0 if otherwise.⁸ Adolescents who associate with peers who also take part in delinquent activities are more likely to report carrying weapons to school. There was no direct measure of peer delinquency posed during the in-home interview and so a three-item proxy was used. Adolescents were asked how many of their three best friends used cigarettes, alcohol, or marijuana. These items were summed to construct the *peer drug use* index in which scores range from 0 to 9 ($\alpha = .76$). Bellair, Roscigno, and McNulty (2003) argued that peer drug use likely serves as "a reasonable proxy because drug use is strongly correlated with other forms of delinquent behavior . . ." (p. 19).

Analytic Strategy

Given the binary structure of the dependent variable, nonlinear (logistic) multilevel regression models are estimated (see Guo & Zhao, 2000). The level-1 model uses the student-level factors to predict the likelihood of a student carrying a weapon to school, whereas the level-2 model uses the community and school factors to explain variability in the conditional level-1 intercepts (see Raudenbush & Bryk, 2002).⁹ Because the primary focus here in estimating two-level models is to assess the potential influence of community factors "above and beyond" the effects of student-level correlates, the advice of Hofmann and Gavin (1998) is adopted and each student-level variable is grand-mean centered. The school-level variables, however, are modeled in their original metrics unless otherwise indicated.¹⁰ Moreover, sample weights are made available for adolescents and schools in the Add Health study, which adjust for unequal selection probabilities and differential response rates (see Tourangeau & Shin, 1999). Winship and Radbill (1994) recommended using sample weights in regression analyses when they adjust for specific sample features (i.e., design weights). Accordingly, student- and school-level weights are applied throughout the analyses in this research.¹¹ Finally, missing data were not an issue with the school-level variables but were present among the student-level measures. To impute missing values for the student-level variables, a multiple imputation procedure was undertaken using *Amelia* (see Honaker, Joseph, King, Scheve, & Singh, 2001; King, Honaker, Joseph, & Scheve, 2001).¹²

Results

Descriptive Statistics

Table 1 displays descriptive statistics for each of the student- and school-level variables. A total of 6% of the students reported carrying a weapon to school in the prior 30 days. Regarding sociodemographic characteristics, approximately one half of the adolescents are

Table 1
Descriptive Statistics for Research Variables

Variable	Student-Level Variables ^a			School-Level Variables			
	Mean	SD	Range	Variable	Mean	SD	Range
Carried weapon	0.06	0.24	0-1	Percent Black ^b	2.49	1.24	1-4
Male	0.51	0.50	0-1	Urban school ^b	0.17	0.38	0-1
Age in years	16.45	1.25	13-21	Private school ^b	0.07	0.26	0-1
Non-Hispanic White	0.65	0.48	0-1	School size ^b	233.20	163.75	66-887
Non-Hispanic Black	0.16	0.37	0-1	PTA participation (<i>log</i>) ^c	2.29	1.17	0-4.1
Non-Hispanic other	0.08	0.27	0-1	Student absenteeism ^c	0.15	0.36	0-1
Hispanic	0.11	0.32	0-1	Student disconnectedness ^d	5.59	0.54	4.1-6.9
Parent education	2.75	1.06	1-4	Fearful students ^d	0.13	0.07	.03-.38
Single-parent household	0.46	0.50	0-1	Physically fought ^d	0.44	0.06	.31-.65
Parental attachment	22.25	2.99	5-25	School community disadvantage (<i>log</i>) ^e	4.37	0.29	3.6-5.2
GPA	2.74	0.77	1-4	School community mobility (<i>log</i>) ^e	3.95	0.47	3.4-4.9
School suspension	0.30	0.46	0-1	School community violent crime (<i>log</i>) ^f	6.39	0.73	4.7-8.0
School attachment	22.78	4.06	6-30				
School fear	2.28	1.03	1-5				
Weapons victimization	0.21	0.41	0-1				
Peer drug use	3.12	2.72	0-9				

Note: SD = standard deviation; PTA = parent-teacher association; GPA = grade point average.

- 1995 Wave I in-home interview.
- From school information made available by the Carolina Population Center.
- From 1994-1995 school administration questionnaire.
- From 1994-1995 student in-school survey.
- From 1990 census data.
- From 1993 Uniform Crime Report data.

males; the average age was roughly 16 years at the time of the in-home interview; and Whites make up 65% of the sample. A total of 30% of the adolescents reported being suspended from school at some point whereas 21% of the students either witnessed or directly experienced a weapon victimization in the prior year.

The school-level variables indicate that on average, there were 233 students per grade across the high schools in the sample, and the majority of high schools were public institutions. A total of 15% of the schools reported having an average daily attendance of less than 90%, and, in general, 13% of students in each school reported feeling unsafe while attending school. Moreover, when examined in its original metric, the average school community violent crime rate across the 55 high schools in the sample is 752 per 100,000 population. Notably, the violent crime rate for the United States was 747 per 100,000 population in 1993. Therefore, it appears that at least with respect to violent crime, retained communities in the current sample are representative of the nation as a whole.¹³

Unconditional Model

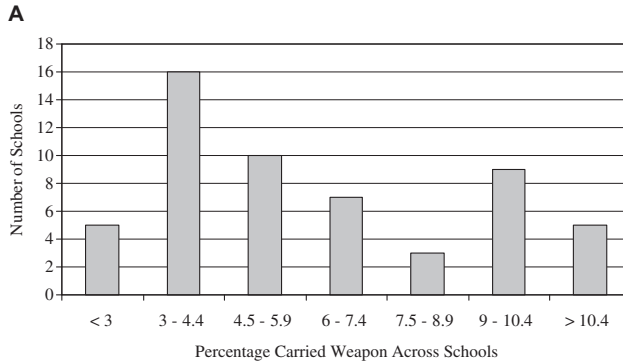
As Luke (2004) indicated, the first step in constructing a multilevel model is determining whether one is even needed. This is generally accomplished by estimating a fully unconditional model, with subsequent results indicating whether there is significant variation in the outcome across contextual units. Before estimating an unconditional model, however, Figure 1, panel A displays the distribution of weapon carrying across the 55 high schools in the sample. The range of this distribution is from less than 1% to nearly 15%. This range suggests that meaningful between-school variation in weapon carrying exists. Panel B of Figure 1, however, provides a more formal test of this observation by presenting findings from an unconditional model. Most importantly, the significant variance component of .202 ($\chi^2_{(54)} = 150, p < .001$) for the level-2 random effect (μ_{0j}) indicates that weapon carrying varies significantly across the 55 high schools in the sample.¹⁴

Student-Level Model

Table 2 presents results from a fully specified level-1 model without any estimation of level-2 (community or school) effects. Moreover, each of the student-level variables listed in Table 2 was grand-mean centered. Among the sociodemographic variables, gender is significantly associated with weapon carrying, whereas the measures of age, race/ethnicity, and parent education do not exert a significant effect on the log odds of school-based weapon carrying. In addition, Table 2 further indicates that a stronger attachment to parents and school significantly reduces a student's likelihood of carrying a weapon to school. Specifically, a one unit increase in parental or school attachment reduces the odds of an adolescent carrying a weapon to school by more than 6%. Furthermore, whereas having been suspended from school at some point is significantly associated with school weapon possession, a student's recent academic performance in school (i.e., GPA) is not.

Regarding the fear-and-loathing hypothesis, there is no support in Table 2 for the contention that expressed fear is a motivating factor to carry a weapon to school. It is found,

Figure 1
Distribution of Weapon Carrying Across High Schools



B

Fixed Effects	Coefficient	Standard Error	t-Ratio	p-Value
Intercept, γ_{00}	-2.78	0.092	-30.127	0.000
Random Effects	Variance	Standard Deviation	χ^2	p-Value
Level 2, μ_{0j}	0.202	0.449	150.859	0.000

Table 2
Hierarchical Logistic Regression Model of Weapon Carrying Regressed on Fully Specified Level-1 Equation

Fixed Effects	Coefficient	Standard Error	Odds Ratio	p Value	Significance
Level-1 Variables					
Intercept, γ_{00}	-3.400	-0.133	0.033	.000	*
Male	1.100	0.187	3.004	.000	*
Age	-0.107	0.096	0.899	.265	
Non-Hispanic Black	-0.045	0.211	0.956	.832	
Non-Hispanic other	0.386	0.202	1.471	.056	
Hispanic	0.081	0.205	1.084	.694	
Parent education	-0.006	0.053	0.994	.903	
Single-parent household	-0.232	0.181	0.793	.202	
Parental attachment	-0.075	0.021	0.928	.001	*
GPA	-0.112	0.122	0.894	.357	
School suspension	0.394	0.178	1.484	.027	*
School attachment	-0.088	0.015	0.916	.000	*
School fear	0.058	0.052	1.059	.266	
Weapons victimization	1.198	0.133	3.312	.000	*
Peer drug use	0.118	0.026	1.125	.000	*
Random Effects	Variance	Standard Deviation	Chi-Square	pValue	Significance
Level 2, μ_{0j}	0.227	0.477	167.390	.000*	*

Note: PQL unit specific models with robust standard errors. $N = 10, 308$ students (level 1); $N = 55$ schools (level 2). * $p < .05$.

however, that being a victim or witness of a weapon crime (in or away from school) is significantly associated with school-based weapon carrying. More precisely, the odds of a student carrying a weapon to school are more than three times greater if they reported being a victim or witness of a weapon crime in the year prior to the interview. It is also found in Table 2 that the proxy used for delinquent peer association—peer drug use—is meaningfully associated with a student's likelihood of carrying weapon to school.¹⁵

School-Level Models

After adjusting for the student-level correlates, the “random effects” portion of Table 2 indicates that significant variation in mean weapon carrying (μ_{0j}) is still present across the 55 high schools in the sample. Table 3, therefore, displays findings from multilevel models that assess whether level-2 indicators of community and school factors account for this significant variation in mean weapon carrying. More precisely, the results in Table 3 identify the distinct effect of each school-level variable on weapon carrying, that is, because of collinearity between the school and community factors each school-level variable was modeled separately to assess if it has a significant effect on the conditional mean level of weapon carrying (see Fearn, 2005). In addition, each of the 12 models displayed in Table 3 estimated a fully specified level-1 equation (as shown in Table 2), but coefficients are not shown for the level-1 variables because findings remain unchanged.

Most importantly, the first three models in Table 3 estimate the effects of school community factors on school-based weapon carrying. These results reveal that the school community measures of disadvantage, mobility, and violent crime do not account for significant variation in mean weapon carrying across the 55 high schools in the sample.¹⁶ Consequently, these null findings do not offer support for the contention that violence or environmental conditions external to schools directly influence the likelihood of student weapon carrying in and around schools. In fact, none of the school-level variables examined in Table 3 have a significant effect on school weapon possession.

One explanation for the insignificant effects of the community and school factors is that by estimating a fully specified level-1 equation, the multilevel models generated in this research make for a conservative test of school-level effects. In recognition of this possible explanation, each of the models presented in Table 3 were reestimated while only adjusting for the level-1 measures of student sociodemographic characteristics (i.e., age, race/ethnicity, and parent education). Findings (not shown) revealed that school community factors remained insignificant, whereas the school-level measure of fearful students emerged as significant, that is, adolescents attending schools where a greater proportion of students feared for their safety were more likely to report carrying a weapon to school.

Summary and Discussion

In a review of the literature for empirical studies that have assessed the level of interdependence between community factors and school violence, Laub & Lauritsen (1998, p. 140) concluded the following:

Table 3
Hierarchical Logistic Regression Models of Weapon Carrying
Regressed on Level-2 Variables

Fixed Effects	Coefficient	Standard Error	Odds Ratio	<i>p</i> Value	Significance
(Model)/Level-2 Variable					
(1) School community disadvantage	-0.056	0.244	0.946	.805	
(2) School community mobility	-0.268	0.340	0.765	.435	
(3) School community violent crime	-0.028	0.153	0.973	.857	
(4) Percent Black	0.049	0.111	1.051	.658	
(5) Urban school ^a	0.199	0.228	1.221	.386	
(6) Private school ^a	0.210	0.301	1.233	.489	
(7) School size	-0.000	0.001	0.999	.658	
(8) PTA participation	-0.002	0.080	0.997	.972	
(9) Student absenteeism ^a	0.125	0.215	1.133	.562	
(10) Student disconnectedness	0.025	0.172	1.025	.885	
(11) Fearful students	1.686	1.257	5.397	.186	
(12) Physically fought	-0.142	1.408	0.867	.920	

Note: PQL unit-specific models with robust standard errors. $N = 10,308$ students (level 1); $N = 55$ schools (level 2). Each model estimates a fully specified level-1 equation. PTA = parent-teacher association.

a. Level-2 variable *not* centered.

Despite pleas from many researchers who study school violence not to ignore the community context, relatively few empirical studies have systematically examined the relationship between macrolevel community characteristics and crime and violence in schools. (p. 140)

Similar conclusions have been echoed by other scholars as well (see e.g., Benbenishty & Astor 2005). This research filled a part of this void in the school violence literature by examining the level of interdependence between school community factors and student weapon carrying across a national sample of 55 high schools. Overall, current findings revealed that within a school's attendance area, the level of economic disadvantage, residential mobility, and violent crime are not significantly associated with students bringing weapons to school.

As to the null effect for violent crime in the school community, this finding runs contrary to recent single-level studies that have explored youth weapon possession in the broader community (not limited to school) and found that residency in a violent community increases adolescent weapon carrying (e.g., Cook & Ludwig, 2004). Conversely, two other multilevel studies have examined the association between crime in the school community and school-related victimization and misconduct and found no relationship. For example, Khoury-Kassabri et al. (2004), with a sample of 10,444 students attending 162 Israeli junior and senior high schools, found that the crime rate in the local school community (census tract surrounding school) was unrelated to four types of student victimization at school. In addition, Welsh et al. (1999), with a sample of roughly 7,500 students

attending 11 Philadelphia middle schools, similarly found that the level of serious property crime in a school's local and imported community was not associated with student misconduct (a four-item index that did not capture weapon carrying) at school.

Khoury-Kassabri et al. (2004) and Welsh et al. (1999) did find, however, that certain economic conditions (e.g., low income and level of poverty) in the school community were generally associated with school-related victimization and misconduct. Likewise, Woolley and Grogan-Kaylor (2006) in a multilevel study of 2,000 middle- and high-school students attending 93 schools found that the level of economic affluence in the local school community reduced the likelihood of student involvement in problem behaviors at school (a seven-item index that did not measure weapon carrying); a comparable effect was not found for the level of residential stability in the school community. Welsh et al. (1999) also found no statistical relationship between residential stability in the school community and student misconduct. Among the school community variables examined in this research, therefore, the null effect for economic disadvantage is most at odds with findings from other multilevel studies examining school violence whereas the null effects found here for school community violent crime and residential mobility are generally consistent with findings from these studies. Future research may be able to reconcile the absence of a school community economic effect in this research by following the lead of Woolley and Grogan-Kaylor (2006) and accounting for the level of economic affluence in a school community. Relative to disadvantage, community affluence has demonstrated a more consistent effect on academic-related outcomes for students (Boyle, Georgiades, Racine, & Mustard, 2007), which may hold true for delinquency-related outcomes such as student weapon carrying as well.

Regarding the school factors, this research also found no association between school structural and climate factors and the likelihood of students bringing weapons to school. A limited number of studies have also examined indicators of school-based violence and disorder within a multilevel framework, and among this research, it is not uncommon to find limited to no relationship between school structural factors and student outcomes. For example, some studies have found no association between school size (Khoury-Kassabri et al., 2004; Lee & Croninger, 1996; Welsh et al., 1999), school racial composition (Stewart, 2003; Wilcox & Clayton, 2001), and urban location (Felson et al., 1994) and a number of violence-related behaviors at school.

What is likely more noteworthy concerning the school factors is the absence of school climate effects. Gottfredson (2001) theorized that relative to school structural characteristics, school climate factors serve as more proximate determinants of student problem behaviors at school. The school climate factors assessed in this research generally provided indicators of the level of social connectedness and engagement within a school. Using a comparable indicator, Welsh et al. (1999) found that a school-level measure of student attachment (overall liking for school) was not associated with student misconduct. Stewart (2003), with a sample of 10,578 students attending 528 schools, found that a composite school-level indicator of student and teacher cohesion was unrelated to student misconduct (a four-item index that did not include weapon carrying) at school. Similar findings have been found in the neighborhood effects literature in that strong interactions or informal networks among residents are not consistently associated with lower levels of crime (Bursik & Grasmick, 1993; Sampson & Groves, 1989). School factors were also examined in this

research that accounted for perceived school safety and the use of physical violence among students. Supplemental analyses revealed that after adjusting for only student-level sociodemographic characteristics, the proportion of students feeling unsafe at school was significantly associated with increased student weapon carrying. Felson et al. (1994), with a national sample of 87 high schools, found that favorable attitudes toward violence were significantly associated with between-school variability in student delinquency. Although favorable attitudes toward violence and concerns over safety are not one and the same, they nonetheless are adverse conditions that may come to characterize the “dominant peer culture” within a school (see Gottfredson, 2001). Findings here suggest that school-wide interventions aimed at overcoming adverse environmental conditions in schools such as a culture of fear and trepidation could prove effective in reducing the likelihood of students bringing weapons to school. Future research should continue to explore the effect of school-level fear on weapon carrying, which to date has been assessed primarily at the individual level (e.g., testing of the fear-and-loathing hypothesis).

Current findings pertaining to the effects of student-level characteristics are generally consistent with prior research in that male status, weak attachment to school and parents, experiencing/witnessing interpersonal victimization, and delinquent peer association were all related to school weapon possession (see e.g., DuRant, Krowchuk, et al., 1999; Kingery et al., 1999; Simon et al., 1999; Wilcox & Clayton, 2001). More specifically, male status and exposure to weapons violence were especially strong in predicting a student’s risk of bringing a weapon to school. Nearly all research that has examined weapon carrying with mixed-gender samples has reported a male effect. Given this consistent finding, in-school interventions that have demonstrated a treatment effect among male students in particular likely hold more promise in reducing the occurrence of school-based weapon carrying. Findings here also underscore the importance of having school personnel (e.g., teachers, resource officers) to direct students to the available support services if they are aware that a student(s) has been subjected to weapons violence in or away from school.

These findings and implications should be considered in light of the limitations of this research. For instance, this research only examined the direct effects of school community conditions on school-based weapon carrying. Some scholars have argued that community conditions may influence school violence (or violence more broadly) by affecting the environmental conditions of schools (Gottfredson, 2001) or by shaping peer associations and activities (Leventhal & Brooks-Gunn, 2000; Meyers & Miller, 2004). Within this theoretical framework, one would test for both the direct and indirect effects of community conditions on student weapon carrying or violence at school. More research is needed that systematically examines the total effects of community conditions on violence in and around schools.

This research was also unable to account for certain variables that may suppress school community effects. For example, during the 1999 to 2000 school year, roughly 3% of public high schools required their students to pass through metal detectors everyday, and nearly 15% of public high schools reported conducting “random checks” on students with mobile metal detectors. Moreover, available data suggest that the use of such security devices systematically varies based on community and school characteristics (DeVoe et al., 2004). This finding suggests that schools in which weapon carrying or social conditions (e.g., poverty) are most problematic are also more likely to use metal detectors and other security measures

to prevent weapon-related activities. Consequently, the null effects for school community disadvantage, residential mobility, and violent crime in this research may be attributable, in part, to high schools in more disadvantaged, mobile, or violent communities using security measures to suppress weapon carrying among their students. Thus, future research should attempt to control for the nonrandom use of school security devices in examining school-based weapon carrying.

The final limitation deals with the measurement of the school community variables. In particular, the community variables examined in this research aggregated conditions across census tracts (and counties) to create summary measures of school community factors. As a result, variability in residential conditions within schools (e.g., economic disadvantage) was not accounted for in this research. This proves noteworthy, for as Clark and Lab (2000) indicated, "If a school's catchment area draws students from a range of different locations, such as different socioeconomic neighborhoods or ethnic enclaves, this may enhance crime and conflict in the school" (p. 40). This argument is most applicable with large urban and suburban high schools that receive students from sizeable catchment areas, and such high schools were primarily represented in this research. Future research would prove greatly beneficial if efforts were made to better account for variability in student residential conditions within schools.

Appendix

Survey Items Comprising the Summated Index Variables

School Community Disadvantage Index ($\alpha = .78$)

- Percentage of the population who is Black
- Percentage aged 25 and older without high school diploma or equivalent
- Percentage of households that is female-headed with no husband present
- Percentage of persons who are unemployed
- Percentage of persons with income below poverty
- Percentage of males who never married

School Community Mobility Index ($\alpha = .61$)

- Percentage of occupied housing units that is owner-occupied
- Percentage aged 5 and older in the same house as in 1985
- Percentage of population who are foreign born

Parental Attachment Index ($\alpha = .86$)

- How close do you feel to your mother/father?
- How much do you think your mother/father cares about you?
(1 = *not at all* to 5 = *very much*)
- Most of the time, your mother/father is warm and loving to you?
- You are satisfied with the way your mother/father and you communicate with each other?
- Overall, you are satisfied with your relationship with your mother/father?
(1 = *strongly agree* to 5 = *strongly disagree*)

School Attachment Index ($\alpha = .73$)

- Since school started this year, how often have you had trouble getting along with your teachers?
- Since school started this year, how often have you had trouble paying attention in school?
(0 = *everyday* to 4 = *never*)
- You feel close to people at your school?
- You feel like you are a part of your school?

(continued)

Appendix (continued)

You are happy to be at your school?

The teachers at your school treat students fairly?

(1 = *strongly disagree* to 5 = *strongly agree*)

Peer Drug Use Index ($\alpha = .76$)

Of your 3 best friends . . .

How many smoke at least 1 cigarette a day?

How many drink alcohol at least once a month?

How many use marijuana at least once a month?

(0 = *no friends* to 3 = *three friends*)

Notes

1. The average participation rate for the in-school survey across middle schools and high schools was approximately 76% (Swahn, Hamming, & Ikeda, 2002), which is consistent with response rates found in other national school-based samples (see e.g., Gottfredson et al., 2005), whereas the approximate response rate for the Wave I in-home interview was 78%.

2. In addition, allowing middle schools to remain in the sample greatly confounds the construction of school community variables in this research because the attendance areas for middle schools and high schools serving the same community overlap.

3. The Add Health study classified a school as a “high school” if it contained an 11th grade, but some of these high schools also housed elementary and/or junior high students. For example, nine schools in the original Add Health sample served students from kindergarten through 12th grade. Returning to the conceptual arguments just raised, it seems plausible that relative to schools composed entirely of high school students (e.g., grades 9 through 12), social processes or dynamics likely unfold differently in schools housing students from multiple developmental levels (e.g., K through 12).

4. The removal of these 1,500 adolescents had no effect on the distribution of the student-level dependent and independent variables examined in this research.

5. Items used to create summated index variables in this research, such as school community disadvantage and mobility, were initially multiplied by a principal components factor loading and then summed across a given scale.

6. This variable was created from data provided by the Carolina Population Center concerning characteristics of the high schools that administered the in-school survey. Unfortunately, no continuous measure of racial composition was made available.

7. In cases where both a “resident” mother and father (biological or nonbiological) were living in the home, the higher of the two educational attainment scores was used as the assigned value; an identical approach was used in constructing the parental attachment index.

8. As one reviewer noted, it may be problematic to combine questions about witnessing weapons victimization with questions about directly experiencing weapons victimization. To address this concern, the four survey items used to compose the weapons victimization measure were modeled separately on the outcome (analyses not shown). Each item had a statistically significant effect on weapon carrying ($p < .001$), and in each case, the effects of the other independent variables remained substantively unchanged. Therefore, rather modeled individually or in a collapsed measure (as done so in subsequent analyses), it can be concluded that students who witness or directly experience weapons victimization are at greater risk of carrying a weapon to school.

9. As Welsh et al. (1999) indicated, “A three-level model, with individuals (level 1) nested within schools (level 2), and schools nested within communities (level 3) would be desirable” (p. 95, footnote 19), but the working sample used in this research has only one high school per community. And even if middle schools were allowed to remain in the sample, there would still be at most two schools per community, which would offer little statistical power for assessing community or level-3 effects.

10. As Raudenbush and Bryk (2002) noted, "In general, the choice of the location for the W s [level-2 variables] is not as critical as for the level-1 predictors" (p. 35). Moreover, supplemental analyses (not shown) revealed that the centering strategy (grand- vs. group-mean centering) did not substantively alter the interpretation (in terms of strength and direction) of the level-1 variables.

11. Lohr (1999) recommended estimating regression models with and without sample weights, and, if results differ, "then you should explore alternatives to the model you have adopted" (p. 365). This with and without samples weights approach was undertaken in this research, and findings (not shown) revealed no meaningful differences when estimating models using unweighted data.

12. Results remained substantively unchanged when using listwise deletion rather than multiple imputation to handle missing data.

13. For the sake of brevity, correlation matrices for the student- and school-level variables are not presented. In general, there is no bivariate association among the student-level variables displayed in Table 1 that exceeds .6. Among the school-level variables, however, a number of bivariate associations are quite strong (e.g., fearful students and social disorder, .68). Due to concerns of multicollinearity, it would be misguided to model each of the school-level variables simultaneously (see Allison, 1999). As an alternative, each of the school-level variables is modeled individually in the subsequent multilevel models (see Fearn, 2005).

14. In an unconditional model with a standard linear outcome, one would find two additional statistics that are not presented in Panel B of Figure 1: a level-1 variance component (r_{ij}) and an intraclass correlation coefficient. With regard to the level-1 variance component, Raudenbush and Bryk (2002) noted that the level-1 variance in a logistic regression model is not assumed to be homoskedastic, for the variance is entirely determined by the mean. As a result, the level-1 variance is not particularly meaningful in log-linear models. However, a level-1 dispersion parameter can be modeled in hierarchical linear models, but supplemental analyses revealed that this estimated parameter was unwarranted (i.e., it was not substantially different from one and had no substantive effect on results). Moreover, because the level-1 variance is less informative in logistic regression models, the intraclass correlation (a ratio of the level-2 variance to the total variation) is also not especially meaningful.

15. In addition to associating with delinquent peers, most studies have linked student involvement in other forms of delinquency, such as drinking, fighting, and gang membership, to school weapon carrying (see e.g., Bailey et al., 1997; Kodjo et al., 2003; May, 1999). Although not presented, supplemental models were estimated in which a student's prior involvement in *property crime*, *interpersonal violence*, or *drug sales* were allowed to predict school weapon possession, and each of these variables was statistically significant. These delinquency measures also mediated the effect of peer drug use (when modeled concurrently) but had no such effect on any other student, school, or community variables examined. The decision was made to exclude these delinquency measures from presented models to avoid the tautological criticism that student involvement in delinquency (e.g., drug sales) is used to predict student involvement in delinquency (i.e., school-based weapon carrying).

16. The issue of nonlinearity with the school community variables was explored by recoding these measures as dummy variables that distinguished whether schools were 1 standard deviation (*SD*) below the mean (reference category), within 1 *SD* of the mean, or 1 *SD* above the mean on each school community factor. After incorporating these dummy variables in multilevel models, the results (not shown) confirmed prior findings by revealing no significant differences in mean weapon carrying across the dummy coded community measures.

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