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School Violent Crime and Academic Achievement in Chicago

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Abstract

Educational outcomes vary dramatically across schools in the United States. Many underperforming schools, especially in Chicago, also deal with high levels of violent crime on school grounds. Exposure to this type of frequent violence may be an important factor shaping already disadvantaged students' educational experiences. However, estimating the effect of school violence on learning is difficult due to potential selection bias and the confounding of other school-level problems. Using detailed crime data from the Chicago Police Department, complete administrative records from the Chicago Public Schools, and school climate surveys conducted by the Consortium on Chicago School Research (2002-2010), this study exploits variation in violent crime rates within schools over time to estimate its effect on academic achievement. School and neighborhood fixed-effects models show that violent crime rates have a negative effect on test scores, but not on grades. This effect is more likely related to direct reductions in learning, through cognitive stress and classroom disruptions, than changes in perceived safety, general school climate, or discipline practices.

Keywords

achievement, violence, crime, safety, school climate

Educational outcomes vary dramatically across schools in the United States. Students in many large urban district schools routinely have achievement that lags behind their suburban peers, and racial and socioeconomic achievement gaps that begin early often become larger as students proceed through formal schooling (Fryer and Levitt 2004; Rothstein 2004). Researchers have most frequently attempted to understand these school-level differences in educational outcomes with measures of school funding, school sector, or the concentration of social and material disadvantage among classmates with mixed results (i.e., Alexander and Eckland 1975; Coleman, Hoffer, and Kilgore 1982; Hanushek 1997; Lauen and Gaddis 2013). However, many underperforming schools, especially in Chicago, also deal with high levels of violence on a daily basis. Of the approximately 100 high schools in Chicago, two-thirds called the police to intervene in at least one violent incident on school grounds during the first seven months of the 2009-2010 school year, and one-quarter of schools called the police more than 17 times during that period. Five percent of schools reported at least 51 violent crimes in one year. This means that police are involved in violent conflicts at these schools on average close to twice a week. Exposure to this type of frequent violence may be an important factor shaping already disadvantaged students' educational experiences in ways that reduce their opportunities to learn in the

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classroom. Furthermore, evidence of a direct, negative impact of violent crime on achievement would add to a growing literature on the "collateral consequences" of crime and violence in urban areas that go far beyond threats to personal safety and emphasize the interrelated structures of criminal justice and educational inequality that shape the long-term life chances of disadvantaged youth (i.e., Harding 2010; Kirk and Sampson 2013; Sharkey 2010).

On the other hand, as with all studies of school effects, selection and confounding are a serious concern. The high levels of violence in low-achieving schools are likely caused by the concentration of the poorly behaved and poorly prepared students in specific schools. High violent crime rates and academic achievement may also both be a function of a school climate in which the police have taken over school discipline and students do not trust that their teachers have their best interests at heart. Separating the effect of violence at school from the selection of students and ruling out alternative explanations requires longitudinal data and careful analysis of the timing of each measure. Therefore, this study uses eight years of individual student data from the entire Chicago Public Schools district. I begin by describing the trends and distributions of violent crime in Chicago public high schools between 2002 and 2010. Then, I use school and neighborhood fixed-effects models to assess the causal relationship between changes in school violent crime and student test scores and grades. Finally, I compare the effects of different types of crime at school and student reports of school climate to explore whether alternative explanations may be driving the relationship. The analysis shows that high levels of violent crime are concentrated in a small number of schools each year, but within any given school, violent crime rates vary substantially year to year. At the individual level, violent crime rates have a negative effect on test scores, but not on grades. The effect of violent crimes is much larger than nonviolent crimes and is unrelated to changes in student reports of school climate over time. Together this suggests that the effect of school violent crime on achievement is more likely related to direct reductions in learning, through cognitive stress and classroom disruptions, than changes in perceived safety or school climate.

LINKING SCHOOL VIOLENCE AND LEARNING

School violence is difficult to define. It can include anything from low-level aggression and bullying to homicide. Most would probably consider violence to be the result of a physical confrontation, but, especially in the school context, verbal abuse can be just as damaging to the victims (Boxer et al. 2003). There is a substantial literature on the frequency and individual consequences of school victimization and bullying (i.e., Bowen and Bowen 1999; Gottfredson and Gottfredson 1985). Macmillan (2001) argues that these consequences are best explained using psychological theories of agency and self-efficacy. After an attack, victims often feel a loss of control over their own lives and a limited sense in which they are purposeful agents in their own future lives. Victimization is also seen to undermine perceptions of interpersonal trust because all others are seen as threats rather than a source of support. However, direct victimization is not the focus of this analysis. Instead of basing the violence measure on the individual experiences of students, this study uses official crime data based on the geographic location of an entire school. By attending a school with a high violent crime rate, students are therefore at *risk* of victimization at that location, regardless of their actual experience with that violence either as perpetrator, victim, or witness.

Maintaining a safe and supportive learning environment is essential for students to trust each other and their teachers. It is also important that students feel safe so that they can concentrate on their studies rather than their personal safety (Bryk et al. 2010). Increased violent crime at school may undermine that necessary perception of safety and security and therefore result in a less productive learning environment. However, the relationship between official crime rates and perceived safety is complicated (i.e., Welsh 2000). Students may not be using the incidence of violent crime at school as their only determinant of their safety. Lower levels of aggression between students or the quality of their relationships with peers, school staff, and on-campus security personnel may be more predictive of their feelings of safety than the actual number of violent events (Steinberg, Allensworth, and Johnson

2011). If students do not feel less safe when violent crime is high, it is hard to see how concerns about physical safety and perceptions of an unsafe learning environment could be the root cause of declines in achievement in violent schools.

Even when students are not the direct victims of violent conflict, attending a school with a high violent crime rate increases the probability that they will witness violence or will know of someone who was involved in a violent incident. This exposure to violence can have psychological consequences for learning even if there are no noticeable changes in their reports of physical safety. Specifically, exposure to this type of violent environment is associated with emotional and cognitive stress as well as symptoms of post-traumatic stress disorder (Gorman-Smith and Tolan 1998; Mazza and Overstreet 2000; Ozer and Weinstein 2004). Stress can also lead to reductions in working memory and cognitive distractions that lead students to perform poorly on tests (Mattarella-Micke and Beilock 2012; Sauro, Jorgensen, and Pedlow 2003; Sharkey 2010). This stress may be particularly problematic for students because the physical location of the violence and their learning are one in the same and their school's hallways and classrooms may be a constant reminder of earlier violent incidents.

Beyond the stress or trauma of a single violent incident, high violent crime rates at school are also an indication of conflict among students or between students and teachers, both of which may result in dysfunctional and disorderly classrooms. Managing student participation and attention to create a classroom environment conducive to learning is a delicate balance even in the safest school. Too much participation from students can derail the focus on instruction, while too little student participation can lead to lack of student engagement (Bidwell 1965). Teacher-centered tasks, such as lectures and exams, allow for strict control of instruction but can reduce student motivation, whereas student-centered tasks, such as small-group work, discussions, or student presentations, relinquish some teacher control in favor of increased student participation and interest (Hallinan and Smith 1989; Metz 1978).

The work of McFarland (2001) highlights this delicate balance. McFarland observed multiple classrooms over the course of one year with a focus on the contexts of students' classroom disruptions. He argues that contrary to structural arguments about student resistance (e.g., Ogbu 1987), classroom disruptions are more directly related to student networks and classroom management techniques. Furthermore, student disruptions can lead teachers to manage the classroom in ways that can dramatically reduce the opportunities for and cost of disruptive student behavior. Unfortunately, while these management techniques may reduce overt disruptions, they also tend to undermine creativity and motivation in the classroom. Therefore, when even just a few students succeed in disrupting the flow of instruction, everyone in the classroom suffers (McFarland 2001; see also Metz 1978).

Perceived safety, stress, and classroom disruptions are not competing mechanisms, but interrelated social responses to a violent environment. Students who are stressed and traumatized are also more likely to have behavioral problems and be disruptive in the classroom (Gorman-Smith and Tolan 1998). In turn, these disruptions, especially if violent in nature, have the potential to trigger more stress for their classmates. Furthermore, both experimental and observational studies have shown that the impact of stress on performance can be reduced when students are given a safe and supportive outlet for their emotions (O'Donnell, Schwab-Stone, and Muyeed 2002; Ramirez and Beilock 2011). In schools with high violence rates, that supportive outlet may be hard to come by, leading to higher stress, more disruptions, and lowered perceptions of safety.

ALTERNATIVE EXPLANATIONS

Selection

On the other hand, there are a number of alternative explanations that could undermine the causal relationship between school violent crime and achievement. Selection of already lower achieving students into schools with high violence rates is of particular concern. This type of selection is always an issue when trying to estimate the effects of different aspects of the school environment (see Lauen and Gaddis 2013), but is especially important in this case because the students themselves are likely to be committing those crimes. In fact, one of the only rigorous, quantitative assessments of the relationship between reported violent crime and achievement shows that this type of selection may be a problem. Grogger (1997) uses principals' reports of conflict between teachers and students,

conflict among students, and the prevalence of weapons to create an index of the severity of violence in schools in the High School and Beyond data. He shows that only a few schools experience serious levels of violence, but many deal with moderate or minor levels of violent behavior. Controlling for individual disciplinary problems that may predict violent behavior, his index of school violence is associated with lower test scores in tenth grade, but not with differences in test score growth between tenth and twelfth grades. The lack of an association with test score growth suggests that violent crime rates at school may not be causally related to substantial changes in student achievement. However, since very few of the schools in his data experience severe levels of violence, there may not have been enough variation to detect an effect.

A variation on the individual selection bias critique is related to the other places in which students may be exposed to violence and disadvantage. Perhaps the association between violent crime at school and achievement is really caused by students from disadvantaged neighborhoods bringing the violence they experience around their homes onto school grounds. In this case, the concern is not about the prior achievement levels of students in violent schools, but whether both low achievement and school violence are really just a product of students' exposure to neighborhood violence and disadvantage (Harding 2010; Mateu-Gelabert and Lune 2007; Sharkey 2010).

School Climate

Apart from individual selection, there may also be school-level processes that are related to both violent crime rates and student learning. Personal and emotional connections with teachers are extremely important in engaging students in the learning process (Bidwell 1965; Waller 1932). Mistrust within the school community weakens the bonds between teachers and their students, thereby decreasing one of the key levers teachers can use to elicit student effort. Interpersonal trust also plays an important role outside the classroom. Bryk et al. (2010) make a strong argument for the importance of trust between teachers, principals, parents, and students in improving struggling schools. They use surveys and student test scores from the Chicago Public Schools to examine the relationship between school and community factors and the effectiveness of school reforms implemented in the 1990s. Only schools that were able to create trusting relationships between staff, teachers, parents, and students were able to harness the potential of Chicago school reform efforts and improve student achievement measures. Kirk and Sampson (2011) similarly describe the dynamic relationship between teacher commitment and crime on school grounds.

Unfortunately, high violent crime rates at school may be a sign that trust has eroded. A long tradition in qualitative urban sociology documents how youth cultivate gang connections or reputations for being tough and willing to retaliate in order to gain the respect needed to protect themselves from victimization in violent environments (i.e., Anderson 1999; Bourgois 1995; Horowitz 1983; Jones 2004; Sánchez-Jankowski 1991; Whyte 1955). Evaluation and judgment of student accomplishments and effort are daily tasks for a teacher, but street culture can be frequently misunderstood and misinterpreted by teachers who assume that students who are acting tough as a form of self-protection are necessarily "bad" students, uninterested in learning. This misunderstanding can create a cultural gulf between students and teachers and increase students' feelings that teachers do not have their best interest at heart (Dance 2002).

A second way that school climate may be a common cause of school violence and achievement stems from the fact that violent *crime* necessarily involves the police. Therefore, official measures of violent crime are as much an indication of violent, disruptive behavior as they are of the use of police officers as disciplinarians. In other words, part of what they measure is the discipline practices within a school. Some have argued that bringing police officers onto school grounds reinforces the association between the educational system and the criminal justice system and promotes the spillover of legal cynicism and mistrust from the police to school administrators and teachers. Furthermore, by relying on only professional security guards or police to administer punishments that seem to far outweigh the crimes, teachers undermine their own legitimacy as authority figures and weaken the social bonds of trust necessary in the classroom (Arum 2003; Devine 1996; Harding 2010; Kupchik 2011; Nolan 2011; Sánchez-Jankowski 2008; Sullivan 2007).

The violent nature or severity of the crimes does not play a role in either of these hypotheses.

In fact, it is when minor offenses, such as stealing a pencil, leads to an official crime report that one would expect the largest effects (Hirschfield 2010). Therefore, one would expect the total number of offenses, regardless of type, to have the strongest association with lower levels of achievement. Furthermore, the common cause of low trust predicts that the problem lies in cultural misunderstanding and miscommunication between students and teachers, not in the specific effects of violence at school on an actual reduction in learning. Therefore, this alternative explanation should predict larger effects on grades than test scores because grades are a more subjective measure of achievement, filtered through a teacher's expectations about his or her students' effort.

To summarize, school violent crime may have a direct negative impact on achievement by causing students stress, reducing concentration, and disrupting the classroom learning environment. However, measuring the effect of school violence is difficult because both the crimes and low achievement could be the result of student selection or a school climate that lacks trust. To tease apart these alternative hypotheses, I compare changes over time in achievement within the same school to changes in the crime rates and in measures of school climate. If the estimates represent the direct effect of school violence, one would expect the largest effects for violent crimes rather than nonviolent crimes and for the violent crime rate to be unrelated to changes in school climate.

DATA AND METHODS

Violent Crime

The data for this study come from a variety of sources. The crime data come from incident reports generated by the Chicago Police Department. The Criminal Incident and Arrest Database includes the detailed crime type, the time and date, address block, and a description of the location. This study uses a sum of all crimes that took place at each public high school in Chicago between the 2002 and 2009 academic years. Crimes are considered to have taken place at a public high school if they occurred within school hours on a weekday during the school year prior to the April tests (more on the test dates in the following) and their location code indicates that they took place at a public school. These crimes are matched to the closest public school using the address block of the crime and summed to create counts of violent, property, drug, and total crime during the school year prior to each test date.[1] To give a sense of the neighborhood around the school, there is also a measure of violent crimes within a one-mile radius of the school address.

Student Demographics and Achievement

Individual-level student demographic variables come from Chicago Public Schools (CPS) administrative files that record the age, ethnicity, grade, and school and census block group identifiers for every student enrolled in the district during each semester. The achievement outcomes also come from CPS administrative files. There are three tests given to Chicago high school students. The EXPLORE and PLAN are typically taken in 9th and 10th grades, respectively. These tests are taken during the first few weeks of school and are better measures of how much a student learned during (and has not forgotten since) the previous year. The PSAE is a test given to 11th graders in the spring. This third test is required for graduation and a portion of the test contains the ACT college entrance exam. Here, I focus only on the PSAE test scores because only they reflect actual learning during the current school year. Using only the PSAE means that only students who stay in school until the end of 11th grade enter into the analysis. If school violent crime is particularly bad for younger students early in high school, those results will not show up here.[2]

Annual grade point averages also provide an alternative measure of achievement. The grade point average takes into account all grades that a student receives for each class during both semesters, weighted by the level of the class (i.e., extra credit for honors classes and no credit for remedial classes). Students can earn up to six points if they only take honors classes and receive all As. The comparison of grades and test scores provides important information about the nature of the effect. Grades are subjective measures of achievement and behavior relative to the rest of the class over the course of a semester, where test scores measure objective knowledge about specific questions on a specific day. If the whole classroom is dysfunctional and unable to cover all of the required material, one would expect to

see an effect in test scores but not necessarily grades. On the other hand, if the effect of school violence is only about behavior, not actual learning, then one would expect there to be a larger effect on grades than test scores.

Neighborhood Variables

One limitation of administrative records is that they include very little information about individual students' families. Therefore, census block group measures of neighborhood disadvantage and social status from the 2000 census and neighborhood-level crime data will be used descriptively as the best available measure of the social and economic resources available to each student. Neighborhood disadvantage is based on the male unemployment rate and the proportion of families under the poverty line. Social status is based on the average level of adult education and the proportion of adults working in managerial or professional jobs. Each of these measures has been standardized to the distribution of the city of Chicago. The annual violent crime rate in a student's neighborhood (census block group) is calculated using the Chicago Police Department database of crime incident reports described previously.

School Climate

Surveys conducted by the Consortium on Chicago School Research (CCSR) capture students' subjective feelings of safety, discipline, and trust at school. These surveys are conducted in the late spring during odd-numbered years. In addition to conducting the in-school surveys, CCSR also uses multilevel Rasch models to convert the individual responses to a 10-point scale and generate reliable school-level measures that are adjusted for student-level missing data.[3]

Average student perceptions of safety at school come from four survey questions—how safe do students feel: outside around the school, traveling to and from school, in the hallways or bathrooms of the school, and in the classroom? In general, students feel most safe in their classrooms and least safe in the areas around their school where there are lower levels of adult supervision (Steinberg et al. 2011).

The surveys also include a variety of measures that address students' emotional connection with their teachers. Average teacher trust comes from a number of agree or disagree responses, namely, how much do students agree with the following statements about their teachers: teachers really care about us, teachers always keep their promises, teachers always try to keep their promises, students feel safe and comfortable with their teacher, when teachers tell us to do something we know he or she has a good reason, teachers treat us with respect.

Finally, there is a measure of the quantity of disciplinary action in each school. Questions used to create this measure ask students how often during the school year they have gotten into trouble, been sent to the office for getting in trouble, been suspended, or had their parents contacted because they got into trouble. This measure provides at least a rough picture of the relative frequency of low-level discipline problems at the school.

Empirical Strategy

These various data sources are combined to create two different samples for analysis, one at the individual level and the other at the school level. The individual-level data set will be used to assess the relationship between school violent crime and individual achievement. Estimating this relationship is difficult due to the potential selection of different types of students into different schools. Since the violent crimes in a school are most likely committed by the very students in the school, schools with high crime rates may just be schools with already lower achieving, more delinquent students. While it is difficult to completely remove the potential for selection effects with observational data, I will employ multiple strategies to assess whether violent crime has a causal effect on test scores or grades.

Individual achievement will be estimated using models that control for prior achievement as well as both school and neighborhood fixed effects. These models only compare students who have chosen to attend the same school and live in the same neighborhood but are in different calendar year cohorts. The idea is that students who live in the same neighborhood (defined by relatively small census block groups) and choose to attend the same school should be similar on many of the characteristics that might bias the results by being related to both delinquency and achievement, such as family income and parental

preferences regarding education. These school fixed effects also control for other school-level characteristics that change little over time and may be related to differences in achievement, such as inexperienced teachers, large class sizes, low levels of funding, or a large number of students from disadvantaged backgrounds. The formal model is as follows:

$$Y_{tijk} = \beta_0 + \beta_1 Z_{tj} + \beta_2 X_{tijk} + \beta_3 S_{tj} + s_j + b_k + \varepsilon_{tijk}, \quad (1)$$

where Y_{tijk} is the outcome measure (either test scores or grades) for student i, in school j and neighborhood k, during calendar year t; Z_{tj} is the reported violent crime count in school building j, during year t; X_{tijk} are the student characteristics for student i, in neighborhood k and school j, during year t; S_{tj} are time-varying school characteristics, such as school size and number of unique school IDs within school building j, during year t; b_k are dummy variables for each neighborhood; s_j are dummy variables for each school; and ϵ_{tijk} are the individual-level error terms. Since even estimates that control for unobserved differences between schools and neighborhoods may be subject to selection or omitted variable bias, I will also compare test scores to later violent crime rates to assess the strength and direction of the association and the potential for unobserved student-level confounding.

It is important to remember that the reported violent crime measure, Z_{tj}, is a function of both the violent crime rate and the probability that school administrators and teachers will report those crimes to the police:

$$\textit{Reported Violent Crime} = P(\textit{Report}|\textit{Violent Crime}) \times \textit{Violent Crime}. \quad (2)$$

Only comparing students who attend the same school will reduce the influence of the differences in reporting to some degree. However, it is still possible that changes in the administration, for example a new principal with different ideas about disciplinary practices, could change the probability of reporting within a school. By comparing the effects of different types of crime it will be possible to tease apart the relative influence of generally reporting more crime and the violent nature of that crime.

The school-level data will be used to describe the trends in school violent crime and school climate between academic years 2002-2003 and 2009-2010. During this period, Chicago Public Schools divided some of its largest high schools into smaller "schools within a school." These small schools share buildings but are technically separate school organizations with distinct student bodies, teachers, and administrators. Since the violent crime measures are only available based on the address of the school, the descriptions of the trends and distributions of violent crime and school climate will count a single address as one school building. Survey measures, achievement, and other school demographics have been averaged for all school IDs that have the same address. The individual analysis will also include a control for the number of "schools" (i.e., unique school IDs) at each address. Most research on school violence and safety is cross-sectional, comparing different schools at the same time. In contrast, this analysis focuses on the longitudinal relationship between violent crime, perceived safety, trust, and achievement, to show how these measures change (or not) over time within schools over close to a decade.

RESULTS

Violent Crime in Chicago Public High Schools

Table 1 reports the means and standard deviations of the annual crime measures between September and April (when spring tests are administered) in Chicago public high schools across all academic years. The distributions are quite skewed, with just a few schools accounting for the large majority of crimes. Not surprisingly, simple batteries are by far the most common type of violent crime in schools. More severe crimes, especially homicides and sexual assaults, are quite rare. In fact, during this eight-year period there were no homicides on school grounds. There were 11 homicides in the street just outside of a school, but those were not included in this analysis. Property and drug crimes are far less common than violent crimes, with half and one-quarter of the average number of incidents, respectively. This may be an indication that school administrators tend to handle nonviolent problems internally. In contrast, violent incidents may make staff feel that their immediate

Table 1. Summary of school crimes in each academic year (September-April).

	Mean	Standard deviation	Minimum	Maximum
Homicide	0	0	0	0
Sexual assault	0.013	0.114	0	1
Aggravated battery	0.812	1.375	0	9
Aggravated assault	0.349	0.762	0	6
Assault	4.071	5.935	0	44
Battery	9.787	12.323	0	89
Robbery	0.404	1.025	0	10
Violent	15.639	19.608	0	132
Property	6.655	7.127	0	35
Drug	3.514	4.977	0	37
Total	30.792	34.570	0	229

Source: Author's calculation based on data from the Chicago Police Department.

safety is threatened and therefore more likely to directly involve the police.

The measures for schools with low, medium, and high average violent crime over the whole period are shown in Table 2. Schools in the bottom quartile of average violent crime (less than or equal to 1) are considered low; schools in the top quartile of average violent crime (more than 25) are considered high. All other schools fall into the medium category. Both between- and within-school standard deviations are shown in parenthesis. In each of the categories, the within-school variation is almost as large as the between-school variation. Violent crime is highly correlated with size. High violence schools are more than twice the size of low violent schools, on average. There is no clear correlation between school violence and the number of "schools within a school." Nor is the relationship between violent crimes in school and one mile around the school particularly strong. Overall, the correlation between violent crime within a one-mile radius of the school and at the school is only 0.18.

Figure 1 shows why that association is relatively low. The size of the circle is proportional to the average level of violent crime for each school address over the whole period. Low violence schools are located very close to and scattered among many of the highest violence schools. This highlights that violent crime at school is not just a function of the neighborhood around that school. In addition, despite the skewed annual distribution, average violent crime over the whole period does not appear to be concentrated in just one or two very dangerous high schools. There are quite a large number of schools with relatively high average levels of violent crime. Only three schools (shown in very small gray dots) did not have a single incident of violent crime during this whole period.

On average, achievement levels for all high schools in the district have not changed much over this period. The same is true for school violent crime rates. Unlike the violent crime rates for the city as a whole, which decreased substantially during this decade, there is no clear trend in school violent crime rates over this period. However, this systemwide stability masks a remarkably large amount of variation in annual violent crime for any given school. Figure 2 shows the variation in violent crime over time for individual schools. The figure shows the 24 individual schools that were ever included in top 10 percent most violent schools in any year. Each school's violent crime count changes substantially over time and there is no clear ordering of the schools. Schools with high violent crime rates one year are near the bottom of this distribution in other years. Some of these schools even experienced high rates of violent crime one year and none the next. While the scale is substantially more limited, similar levels of year-to-year variation occur in all of the other high schools (not shown). Overall, this high level of variation over time within schools suggests that school-level differences in discipline practices or other general school characteristics are unlikely to explain all of the difference in violent crime rates across schools. Changes in

Table 2. School characteristics.

	All school-years	Low violence schools	Medium violence schools	High violence schools
School-level measures				
Violent crimes at school	15.68	0.23	12.38	40.43
Across-school *SD*	(19.5)	(0.6)	(9.0)	(21.0)
Within-school *SD*	(9.2)	(0.6)	(6.0)	(16.5)
Violent crime within 1 mile	72.56	72.57	66.20	83.64
Across-school *SD*	(39.5)	(37.1)	(37.1)	(43.8)
Within-school *SD*	(22.2)	(19.6)	(20.0)	(28.3)
School size	1,139.7	690.6	1,222.2	1,548.7
Across-school *SD*	(797.6)	(628.6)	(882.3)	(511.6)
Within-school *SD*	(160.2)	(167.1)	(128.4)	(197.9)
Unit numbers in one building	1.24	1.55	1.04	1.20
Across-school *SD*	(0.61)	(0.89)	(0.24)	(0.49)
Within-school *SD*	(0.22)	(0.23)	(0.13)	(0.31)
Survey measures				
Safety	5.27	5.45	5.45	4.77
Across-school *SD*	(0.58)	(0.62)	(0.51)	(0.27)
Within-school *SD*	(0.16)	(0.12)	(0.18)	(0.16)
Teacher trust	3.58	3.79	3.56	3.38
Across-school *SD*	(0.35)	(0.37)	(0.30)	(0.25)
Within-school *SD*	(0.15)	(0.17)	(0.16)	(0.12)
School discipline	2.92	3.03	2.68	3.22
Across-school *SD*	(0.69)	(0.79)	(0.68)	(0.39)
Within-school *SD*	(0.16)	(0.12)	(0.17)	(0.19)
N observations	759	235	333	191
Addresses	113	33	52	28

Source: Author's calculation based on data from the Chicago Police Department, the Chicago Public Schools, the Consortium on Chicago School Research, and the 2000 United States census.

reported violent crime are more likely to be due to changes in the actual number of violent incidents, rather than rapid changes in disciplinary policy, for example, because the school hired a new principal.

School Violent Crime and Individual Achievement

The previous description shows that violent crime is a serious problem for some Chicago public schools and that for any given school, violent crime rates vary substantially over time. But does the annual school violent crime rate have an effect on individual academic achievement? Table 3 describes the individual characteristics of students in 11th grade during school years with different levels of violent crime. Here the categories are based on the distribution of annual violent crime rates, not the average at each school. The first column shows the characteristics of the whole sample. The next three columns show years with low (bottom quartile = less than 7), medium, and high (top quartile = more than 30) levels of violent crime separately. The number of school buildings and neighborhoods in the final rows indicates the number of unique school addresses or block groups that appear in each category. Since the categories are based on individual calendar years, a single school may show up in multiple categories in different years.

Table 3 shows that students in higher violent crime school-years are more likely to be minority, were typically lower achieving in middle school, and from poorer, more violent neighborhoods than students in lower violent crime school-years. However, these characteristics are by no means

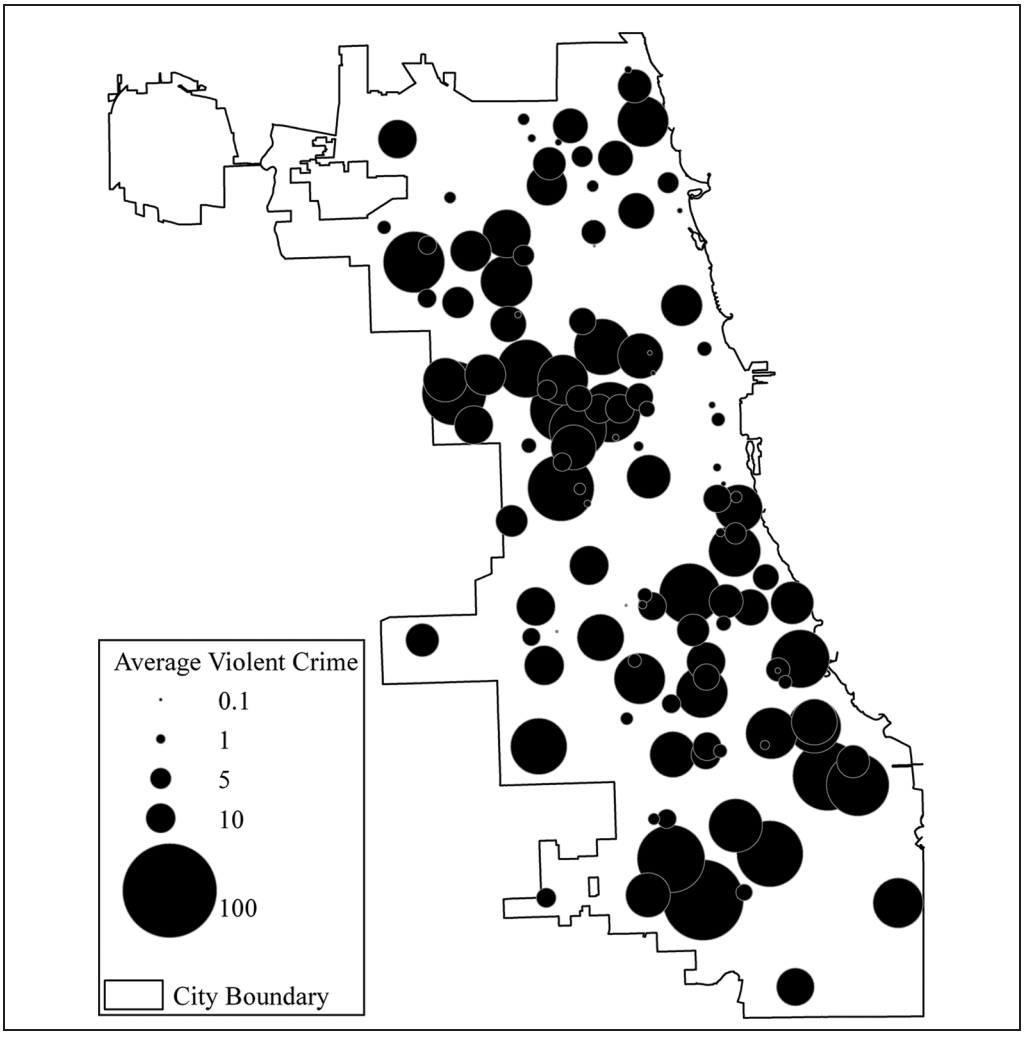

Figure 1. Average violent crime count in Chicago public high schools.
Source: Author's calculation based on data from the Chicago Police Department and the Chicago Public Schools.

synonymous with school violence. A substantial proportion of minority students are found in low violence school-years, and students in low violence school-years are actually more likely to be African American and come from high disadvantage neighborhoods, on average, than students in middle violence school-years. On average, high violent crime schools have students from somewhat more violent neighborhoods, but even students in very low violence schools come from relatively violent parts of the city. The observation-level association between neighborhood violent crime and school violent crime is not particularly strong, only 0.09. This low correlation suggests that the violent crime in schools is not simply a reflection of students from violent neighborhoods bringing their conflicts into their school (see Mateu-Gelabert and Lune 2003).

Table 4 shows the individual-level results predicting reading, math, and grade point average. All terms have been standardized so that the coefficients represent standardized effect sizes. The first two columns show naïve regression models without fixed effects. The initial relationship between

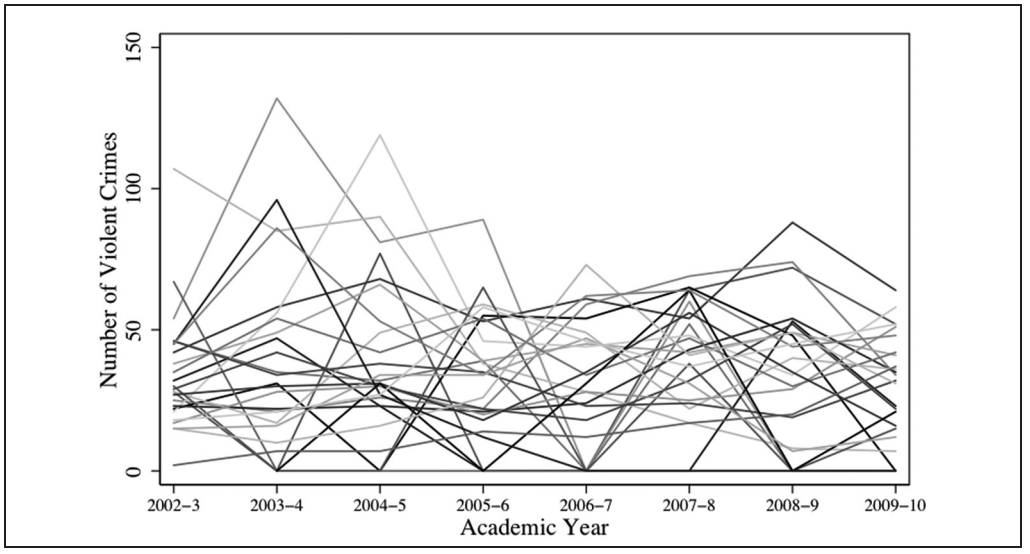

Figure 2. Fluctuations in school violent crime—24 most violent schools.
Source: Author's calculation based on data from the Chicago Police Department and the Chicago Public Schools.

school violent crime and achievement appears quite strong, between −0.193 for standardized math scores and −0.1 for grades. However, more than half of that association is explained by differences in prior achievement and special education status. The final models for each outcome include fixed effects for both school and neighborhood, thereby controlling for unobserved differences between families that would lead them to live in the same relatively small area of the city and send their kids to the same school. Since these estimates rely only on year-to-year variation in violent crime rates within a single school, they also control for other constant characteristics of the school staff and student body. The coefficients for violent crime predicting grades are small and not statistically significant, but one standard deviation increase in school violent crime is associated with −0.012 and −0.031 standard deviation decreases in reading and math scores, respectively.

At first these test score effects do not seem very substantial. The distribution of test scores across the whole system is wide and a change of just a few hundredths of a standard deviation sounds very small. However, the within-student growth in test scores over one school year is only about 0.32 standard deviation units for reading and 0.18 standard deviation units for math. The most violent schools shown in Figure 2 tend to vary year to year by around 40 violent crimes, or two standard deviation units. In high crime years, this would lead to predicted test scores that are approximately one-fourteenth of a year's growth in reading and a little over one-third of a predicted year's growth in math. Therefore, for any individual student, high violent crime rates at school appear to lead to a nontrivial reduction in their learning, especially in math where classroom instruction time matters more than reading.

One might expect that the effect of school violence would be different for different types of students and in different school contexts. However, there is very little evidence of meaningful interactions between school violent crime and student demographics or school climate. Students with higher middle school achievement and students in somewhat safer schools appear to be slightly more affected by school violence, but the interactions are very small. Furthermore, since safety, prior achievement, and violent crime are so strongly correlated, there is very little actual data from which to estimate these potential

Table 3. Student characteristics.

	All school-years	Low violence years	Medium violence years	High violence years
School violent crime	21.81	2.21	18.14	50.24
	(20.37)	(2.49)	(6.24)	(18.04)
Reading	17.01	18.94	16.89	15.09
	(5.17)	(6.09)	(4.78)	(3.84)
Math	17.14	18.88	17.00	15.44
	(4.06)	(5.11)	(3.60)	(2.49)
Grade point average	(2.32)	(2.58)	(2.33)	(2.07)
	(1.02)	(1.05)	(1.00)	(0.97)
Eighth-grade test score	251.63	260.70	251.80	241.37
	(29.8)	(32.9)	(27.9)	(26.2)
Male (percentage)	44.6	44.4	45.0	44.1
	(49.71)	(49.68)	(49.75)	(49.65)
African American (percentage)	52.2	50.7	43.6	70.5
	(49.95)	(50.00)	(49.59)	(45.61)
Hispanic (percentage)	34.3	30.3	41.1	25.9
	(47.48)	(45.96)	(49.20)	(43.78)
Special education (percentage)	15.1	14.1	14.6	17.1
	(35.80)	(34.76)	(35.33)	(37.68)
Age	16.18	16.15	16.17	16.23
	(0.39)	(0.37)	(0.39)	(0.43)
Neighborhood disadvantage	0.234	0.189	0.152	0.441
	(0.79)	(0.81)	(0.78)	(0.73)
Neighborhood social status	–0.298	–0.190	–0.339	–0.338
	(0.80)	(0.82)	(0.83)	(0.72)
Neighborhood violent crime	101.49	98.78	94.49	117.81
	(85.45)	(86.20)	(82.49)	(87.97)
Students	115,027	31,690	55,132	28,205
Schools	113	63	63	38
Neighborhoods	2,353	2,306	2,322	1,948

Source: Author's calculation based on data from the Chicago Police Department, the Chicago Public Schools, the Consortium on Chicago School Research, and the 2000 United States census.

interactions. There are no schools with high levels of violent crime but low levels of safety and very high achieving students. Any linear interaction that suggests larger effects of violent crime in very safe schools would then be extrapolating to a nonexistent population.

Testing Alternative Explanations

Despite the strong controls for constant differences between schools and neighborhoods, it is still possible that the coefficients shown in Table 4 are due to selection of low-achieving, more violent students into specific cohorts of students. To test for this possibility, I use the violent crime rate during an entire school year to predict freshman and sophomore tests taken just a few weeks after the start of school. If having lower achieving students leads schools to have high violent crime rates, and not vice versa, the coefficient should be just as strong in these models as the models predicting spring tests. However, these coefficients are only -0.003 and -0.005 for reading and math, respectively, and not statistically significant. To ensure that these small fall results are not just a result of testing younger students, I also predict the same 11th-grade test scores in the main analytical sample using the violent crime rate in each student's school during the year after the test. Again, these coefficients are much smaller than

Table 4. Estimated effects of school violent crime on individual achievement.[a]

	Reading			Math			Grades		
Violent crime	–0.175	–0.058	–0.012	–0.193	–0.080	–0.032	–0.104	–0.045	0.003
	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)
Male	–0.080	–0.080	0.123	0.090	0.094	0.046	–0.360	–0.358	0.118
	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)	(0.006)	(0.006)	(0.005)	(0.009)
African American	–0.887	–0.334	–0.122	–1.114	–0.580	–0.058	–0.733	–0.449	–0.126
	(0.008)	(0.007)	(0.005)	(0.008)	(0.006)	(0.004)	(0.009)	(0.008)	(0.007)
Hispanic	–0.740	–0.300	–0.070	–0.865	–0.442	0.107	–0.525	–0.299	–0.358
	(0.008)	(0.007)	(0.004)	(0.008)	(0.006)	(0.004)	(0.009)	(0.009)	(0.006)
Age	–0.579	–0.131	–0.187	–0.494	–0.053	–0.383	–0.349	–0.119	–0.389
	(0.007)	(0.005)	(0.013)	(0.007)	(0.005)	(0.012)	(0.007)	(0.007)	(0.015)
Eighth-grade achievement		0.709	0.574		0.682	0.513		0.362	0.320
		(0.003)	(0.004)		(0.002)	(0.004)		(0.003)	(0.004)
Special education		0.243	–0.141		0.185	–0.254		0.170	–0.258
		(0.007)	(0.009)		(0.006)	(0.010)		(0.008)	(0.012)
School size			0.066			0.065			0.018
			(0.013)			(0.011)			(0.018)
Unit count			0.027			–0.047			0.013
			(0.017)			(0.015)			(0.026)
Constant	0.848	0.263	–0.091	0.918	0.358	–0.014	0.792	0.488	0.224
	(0.008)	(0.006)	(0.026)	(0.007)	(0.006)	(0.022)	(0.008)	(0.008)	(0.036)
Fixed effects			X			X			X

Source: Author's calculation based on data from the Chicago Police Department and the Chicago Public Schools.
[a]Robust standard errors in parentheses. All models also include calendar year dummy variables, and fixed-effect models also include school and neighborhood dummy variables.

the coefficients for the earlier measure of violent crime and only the math coefficient is even marginally statistically significant.

This comparison of timing suggests that the relationship between violent crime and achievement is not due only to selection, but it does not address the relationship between neighborhood and school violence. Perhaps school violence levels are really an indication of large numbers of students from disadvantaged or dangerous neighborhoods who bring their conflicts from the street into the classroom. The neighborhood fixed effects in the final models already control for constant differences in the demographic characteristics of census block groups, but what about variation in violent crime? Neither the coefficient for neighborhood violent crime nor the interaction between school and neighborhood violent crime are statistically significant, nor do they alter the direct relationship between school violence and achievement. The same is true for all violent crimes that take place within one mile of the school. There seems to be something unique about violence that takes place *at* school above and beyond what students experience around their homes or in the neighborhood around school.

Next, is the observed relationship simply due to a problematic and untrusting school climate that causes both high rates of reported violent crime and low achievement? The difference in the effects for grades and test scores suggests that increases in school violent crimes result in objectively lower measures of achievement, rather than teachers lowering their ratings of students' abilities through grades. Therefore, violent crimes appear to represent reductions in the amount of material learned over the course of the year and not just the deterioration of trust and communication between students and teachers.

Furthermore, by comparing the coefficients for violent crimes, nonviolent crimes, and total crimes, it is possible to distinguish between the potential effect of violent disruptions and administrators' willingness to call the police for any type of disciplinary problem on school grounds. The coefficients for nonviolent crimes and total crime

Table 5. Correlations between school violent crime, school climate, and achievement.

	Violent crimes	Total crimes	Average test scores	Average grade point average	Perceived safety	Teacher trust
Total crimes	0.963					
Average test scores	–0.249	–0.183				
Average grades	–0.237	–0.201	0.697			
Perceived safety	–0.477	–0.449	0.729	0.576		
Teacher trust	–0.365	–0.400	0.196	0.200	0.559	
School discipline	0.161	0.088	–0.743	–0.545	–0.559	–0.287

Source: Author's calculation based on data from the Chicago Police Department, the Chicago Public Schools, and the Consortium on Chicago School Research.

(not shown) are less than half as large as the coefficients for violent crimes, and in the case of reading, none are statistically significant. If police presence were driving the effect, one would expect the total number of reported incidents to have the largest effect on achievement and the effect of each type of crime to be quite similar. Therefore, the negative effect of violent crimes at school appears to be due to the violent and disruptive nature of those incidents rather than the overall level of police intervention.

Survey measures of school climate paint a similar picture. Table 5 shows the correlations between school violent crime, each of the survey measures, average test scores, and annual grade point averages. These are naïve estimates of the relationship because they include all school-year observations, but they provide a picture of the relationship between safety, trust, and discipline across the district. Interestingly, violent crime is not nearly as correlated with student reports of discipline problems at school as one might expect. There are three reasons for this low correlation. First, students may not be accurately reporting their discipline problems either because they do not remember or because they are worried about getting into more trouble for their answers. Second, the measure only asks about discipline practices by school administrators. Schools where the staff is more involved in discipline may actually rely on police officers less often for similar offenses, therefore lowering their reported violent and total crime rates. Third, this measure better captures the proportion of students who get in trouble than the actual number of disruptions. The response categories range from never to more than 5 times. A student who gets in trouble more than once a week will therefore appear the same as a student who has only had a handful of discipline problems during the whole year.

Another surprising correlation in Table 5 is the relatively weak relationships between school crime, trust in teachers, and achievement, especially when compared to the other measures. The correlation between teacher trust and safety are similar for both measures of crime at school. However, the correlation between teacher trust and average achievement is surprisingly low (r = 0.20). This suggests that even if frequent intervention by the police does undermine the social bonds between students and teachers, this mistrust may not translate to large reductions in test scores or grades.

If school climate is truly confounding the relationship between school violent crime and achievement, then changes in violent crime at school should be associated with changes in school climate over time. However, compared to the official violent crime statistics, students' reports of their school climate are much more evenly distributed and stable over time. The final rows of Table 2 describe the survey measures in low, medium, and high violence schools. All survey measures have been scored on a scale of 1 to 10. As expected, students in school-years with high levels of violent crime report that their schools are less safe and more disorderly than low violent crime school-years. They also report having less trusting and supportive relationships with their teachers. However, these differences are relatively small given the potential range of the measures. Interestingly, there is not

a substantial amount of variation in the school-level survey measures across schools and years. The within-school variation in each of the measures is especially small with a standard deviation of approximately 0.15 points. Tracking individual schools over time does not show any clear relationship between the reported violent crime rate and the school climate measures. Observers are right to suggest based on cross-sectional comparisons that schools with high levels of violent crime have less supportive school climates and have students who are behaving and performing poorly, but these measures of school climate appear slow to change even as the violent crime rate rises and falls dramatically year to year.

DISCUSSION AND CONCLUSIONS

The evidence described in this study shows that violent crime is a serious issue in some of Chicago's public high schools. Many students are exposed to violent crime on a routine basis just by entering school grounds. Just a few high schools each year account for the large majority of violent crimes in the whole district. However, within any given school, violent crime rates appear to fluctuate dramatically year to year without any clear trend over time, either in specific schools or in the district as a whole. While the source of this variation remains unclear, some have argued that the demolition of large-scale public housing projects, along with the closing of quite a few neighborhood high schools, has shuffled students from different neighborhoods and gang territories into the same schools (see e.g., Banchero 2006). The conflict generated by this churning composition of students from different neighborhoods could account for the rapid fluctuations in school violent crime rates despite relatively little change in school climate or other measures of the student body over time.

Regardless of their source, these changes in school violent crime appear to have a direct negative impact on student learning. Specifically, this analysis shows that school violent crime has a negative effect on both reading and math standardized test scores. The size of this effect is relatively small considering the full range of student achievement in the district. However, since on average student test scores appear to grow relatively little over the course of a year, even these small standardized effect sizes represent nontrivial reductions in student learning, especially in math. Interestingly, the negative effect on standardized test scores is not reflected in students' grades. This suggests that the mechanisms involved affect the classroom as a whole rather than any specific student. More than test scores, grades reflect a teacher's assessment of students' relative achievement compared to their peers. For example, it should be harder to get an A in an advanced class than a regular class, despite the advanced class covering more material because the expectations for performance are different. Standardized tests, on the other hand, measure knowledge about a specific topic relative to the state standards. The fact that school violence did not affect grades in the same way as test scores suggests that in schools with high violence rates the expectations for the whole class have been lowered. Therefore, not only does a violent school environment potentially lead to physical harm and psychological stress, it also results in real reductions in learning and lowered expectations for everyone in the building. In the short term, it may seem like a good thing that students' grades do not suffer and students are not more likely to fail their classes. However, if they are learning less and getting the same grades, it may mean that they are less well prepared for higher education or the workforce when they leave high school.

While there is clearly substantial selection in the cross-sectional comparison of violent and less violent high schools, rigorous controls and the comparison of violent crimes that take place after testing show that the lower test scores are a consequence of the violence and not the other way around. The effect also does not appear to be a spurious result of general problems with the school climate, cultural misunderstandings between students and teachers, or the direct involvement of police in school discipline. This does not mean that school climate or perceived safety do not matter. In absolute terms, the standardized effect of perceived safety is at least three times larger than the effect of violent crime at school using the same fixed-effects models. The coefficients for reading and math are both 0.08 and highly statistically significant (not shown in tables). Despite the narrow range of responses, even very small changes in perceived safety predict much larger improvements in test scores than relatively dramatic changes in the violent crime rate.

Furthermore, the relationship between safety and violent crime rates appears to be very dynamic. Within schools, increased violent crime rates predict somewhat lower perceptions of safety in the following year, but improvements in safety also predict future reductions in violent crime. Similar dynamic relationships between crime, safety, discipline, and trust using the same data from Chicago Public Schools are described in more detail in Bryk et al. (2010), Steinberg et al. (2011), and Kirk and Sampson (2013). These studies show that feelings of safety improve when school teachers build supportive relationships with each other, with students, and with their parents. This improved safety in turn improves the strength of the relationships at the school and is likely to lead to lower violent crime rates. The lack of overlap in the distributions of perceived safety and violence emphasizes this point. While the crime rates at individual schools change year to year, most of the variation is in schools that report low levels of perceived safety. In schools where students feel safe, there is some variation in the annual violent crime rates, but they never reach the violence levels of schools where students report feeling generally unsafe. Therefore, while violent crime does appear to have a negative causal effect on test scores, focusing only on the actual number of violent crimes or the general behavior of police officers at each school may not be the most efficient way to improve achievement across the district. Instead, improving students' perceived safety by creating more welcoming and supportive school communities is not only likely to lead to lower levels of violent conflict, but it is also likely to yield large increases in learning.

It is important to note that this study is not without its limitations. The most obvious is the lack of detailed personal and family background measures for individual students. While administrative data are helpful because they provide insight into the entire system, they do not provide anything but the most basic demographic variables to describe students. This means that it is impossible to tell from these data which students have been directly involved in the violent events recorded in official crime statistics, either as victims, perpetrators, or witnesses, and whether the effect of violent crime varies for those more or less directly involved. The estimates presented here are districtwide averages, which are likely to underrepresent the specific effect for the specific students most affected by violence.

Official crime data also have their limitations. They are only a rough estimate of the actual level of conflict at school. Many acts of violence, especially low-level aggression and bullying, likely go unreported on a regular basis. Reported violent crimes are likely to be just the tip of the iceberg when it comes to school conflict, and it is possible that the estimated effects of official violent crime reports underestimate the consequences of unreported violence in Chicago high schools. Student reports of disciplinary action capture some of this, but they better measure the number of students who get in trouble at school than the frequency of disciplinary problems.

Moreover, this study focuses only on Chicago during a specific time period. During this period Chicago was, and continues to be, one of the most violent cities in the country. For many students attending public high schools, violent events either at school or in their neighborhoods are frequent and routine. This is clearly not the case in all parts of the country and means that the experience of students in Chicago may not be representative of students nationwide. It is unclear whether the effects of school violence in safer areas of the country would be smaller or larger than those reported here. On the one hand, in safer areas extreme acts of violence come as more of a shock. On the other hand, because violence is less frequent it may be easier for students and communities to process and deal with emotionally. More research is needed on responses to stressful violent events at the individual, classroom, and district levels to understand exactly how and when violence has the largest negative effect on student achievement and social and economic outcomes later in life.

Despite its limitations, this analysis clearly shows that violence at school is a problem for many students in Chicago public high schools and that this violence has negative consequences for their learning. In some ways, documenting the results of violence and crime on education seems unnecessary. No one would question the desire to reduce crime and violence in our cities and schools or argue that exposure to violence is not a problem in and of itself. However, this work highlights the fact that the criminal justice system and the education system are interrelated institutions and cannot be understood in isolation. For students in Chicago, going to school in a violent environment represents yet another form of educational disadvantage as well as a risk to their

physical safety. In addition, since the passage of No Child Left Behind, the results of these state tests have real consequences for teachers and school administrators. It is low achievement on these state tests that, in part, determines whether the district decides to close a school entirely (Burdick-Will, Keels, and Schuble 2013). Understanding that reducing violence can have academic consequences as well as behavioral consequences may help schools justify allocating more resources to help prevent violence in addition to preparing for the tests. Overall, this research adds to a growing literature on the "collateral damage" of crime and violence and their role in perpetuating a range of other social inequalities that are not generally associated with the criminal justice system (i.e., Harding 2010; Kirk and Sampson 2013; Sharkey 2010). In an age of increasing school accountability and shrinking public budgets, it is important to understand how policies that on the surface only affect one social sphere, such as policing strategies, have larger consequences for other social institutions, including schools, in ways that have lasting consequences for individual life chances and national levels of inequality.

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NOTES

1. There is reason to believe that violent confrontations at school spill out into the street just outside of school and it is possible to include those crimes in the count as well. These counts are highly correlated with the crime that takes place on school grounds and including them does not change the standardized coefficients at all. However, since they do not take place at the school, it is difficult to know whether any students were involved in those events or even witnessed them, so they have been left out of the final reported results.
2. If violent crime rates at school lead the most vulnerable students to drop out of high school before 11th grade, these estimates might also underestimate the effect of violent crime on achievement. However, there is no evidence that school violent crime is associated with leaving school. Violent crime rates during freshman year are not significantly associated with the probability that a student takes the test, has a valid grade point average, or is still enrolled in school in 11th grade. Grade point average analysis using all grade levels yields the same results as a sample restricted to 11th graders, and there is no sign of significant or substantial interaction by age or grade. Therefore, for the sake of simplicity and comparability to the test score results, all of the individual analysis presented will focus only on eleventh graders.
3. The surveys tend to have individual response rates of approximately 60 percent, which makes it difficult to use individual student responses in the models. However, school-level measures weight individual responses by the inverse of their standard error, such that individuals with unreliable answers or missing data are given less weight. CCSR uses the Bigsteps program developed by MESA Press at the University of Chicago to develop these measures. For more details see: http://ccsr.uchicago.edu/downloads/9585ccsr_rasch_analysis_primer.pdf.

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