Learning in Harm's Way: Neighborhood Violence, Inequality, and American Schools

By
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Is a school's geographic proximity to violent crime related to characteristics of its student body and to students' academic performance? Our understanding of the educational impacts of students' exposure to violence has been constrained because of various technical and financial limitations that have made research in this area problematic. The work presented here leverages advances in the availability of geo-coded data on incidents of crime to overcome the limitations of prior research in this area, showing that a school's proximity to violent crime is associated with common measures of educational inequality and also with school performance. We discuss the implications of our findings for future research and public policy.

Keywords: education; inequality; schools; crime; violence; GIS

The relationship between schooling and students' exposure to violence often takes center stage in policy debates and the national discourse when whole communities are traumatized by a horrific event such as the shooting

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at Sandy Hook Elementary School in 2012 (Peralta 2013). Yet tens of thousands of American children attend schools in dangerous neighborhoods where violence is an almost-daily occurrence (Osofsky 1999, 34; see also Bieler and La Vigne 2014; Stein et al. 2003; Richters and Martinez 1993a; Bell and Jenkins 1993). Research on how children's exposure to chronic violence affects schools and academic performance is substantial but severely constrained; our focus here is overcoming the limitations of prior work so that research in this area can speak directly and more powerfully to policy.

The Coleman Report—the landmark education study whose implications are the centerpiece of this collection of research—did not directly examine the links between students' exposure to violence and their academic success, but Coleman and his collaborators did highlight important links between the environmental conditions that students experience outside school and their classroom performance. In the report's opening pages, the authors encouraged readers who envision a child at school also to recognize that "home and total neighborhood are themselves powerful contributors to his education and growth" (Coleman et al. 1966, 2). Key findings moved the authors to conclude as such. Among those points were these specific arguments (Coleman et al. 1966, 319–25): that students who feel that they have a low sense of control over their immediate environment tend to struggle more in school, that a low sense of control is exhibited by students who believe that luck rather than hard work is associated with success, that the environment can intervene to prevent students from getting ahead, and that such people have fewer chances to succeed in life. A perceived inability to confront challenging home or neighborhood environments, combined with the lower performance in school that such a view prompts, can snowball over time and lead a student to believe, as the report noted, "that nothing he could ever do would change things" (Coleman et al. 1966, 321). That snowball effect is even larger, due to peer effects, when students attend schools each year where many others have similarly low senses of control over their environments due to the conditions they experience outside school.

The specific home and environmental factors that Coleman et al. (1966) studied did not include violence in the communities where children attend school. Still, the mechanisms that likely lead students to perceive that they have limited ability to control their environments, which Coleman described, are entirely consistent with subsequent bodies of research on child development and student academic success. The links between exposure to violence and the mental health, development, and educational achievement of children are now well documented. Scholars have found school and neighborhood violence to be associated with students having more trouble with school authorities; worse teacher ratings of student functioning; and lower grades, attendance, standardized test scores, graduation rates, and college attendance rates (Bowen and Bowen 1999; Henrich et al. 2004; Ozer 2005; Grogger 1997; Sharkey 2010; Burdick-Will 2013). What is important to note is that children need not personally experience violence to be academically affected by it. Carrell and Hoekstra (2008) found that an increase in the number of children in a classroom who lived amid violence at home was associated with lower peer math and reading scores and higher peer disciplinary infractions and suspensions.

Scholarship on Exposure to Violence and Its Policy Impact

Although a well-known literature exists on the effects of exposure to violence on the academic, social, and emotional development of children, that knowledge has not carried substantial weight in contemporary debates about education policy reform. We believe that there are two reasons why, and we elaborate on them in the sections below. The first is that the scope of how violence is conceptualized minimizes its ability to inform education policy development. The second is the challenge of scaling up methods to measure and incorporate violence into such discussions on a broader scale. Even as modern education data systems have become much better at tracking school characteristics and performance, data collection efforts on youth exposure to violence have operated on separate tracks. That prevents them from being incorporated into larger systems of educational measurement or school accountability.

This article argues for an approach that overcomes the problems of scope and challenges of scale that have prevented youth exposure to violence from having a more central part in discussions about education policy. We propose a method to measure violence exposure that leverages information available in geo-referenced datasets on schools and community violence. We show how this method is easy to implement and can be adapted to help policy-makers across levels of government answer important questions about the prevalence and concentration of violence that bears on individual schools and the associated inequalities that manifest from those conditions. We believe that our method will prove to be nuanced, flexible, accurate, scalable, and an easy way to inform policy discussions and advance research literatures on these topics.

We use the urban public school systems of Atlanta and Philadelphia to illustrate our approach. In so doing, we answer several related research questions. How persistent is the problem of exposure to violence for schools in these two cities? Who attends schools where violence exposure appears to be a substantial problem? And last, what are the implications of violence for school performance and accountability policy? Our descriptive findings show that numerous schools in these cities operate in neighborhoods where dozens of violent crimes occur each month, sometimes at a rate of more than one per day. Further, students who come from economically disadvantaged backgrounds and students who are racial minorities are more likely to be exposed to violence in their neighborhoods. We also show that the intensity of violence around a school appears to be associated with a school's academic performance.

The Devastating Effects of Learning in Harm's Way

Prior research has documented powerful relationships between neighborhood characteristics and youth development (Bronfenbrenner 1979; Jencks and Mayer 1990; Kahne and Bailey 1999; Osofsky 1999; Leventhal and Brooks-Gunn 2000; Morales and Guerra 2006). Building on the classic work of Shaw and McKay

(1942), scholars have found strong associations between a child's exposure to community violence and numerous behavioral and cognitive outcomes. Neighborhood violence is related to mental health concerns such as increased depression and anxiety, increased perceptions of danger, and symptoms of post-traumatic stress disorder, even in children who have only witnessed one violent incident (Richters and Martinez 1993b; Aneshensel and Sucoff 1996; Margolin and Gordis 2000; Lyons 1987; Pynoos et al. 1987). Youth in dangerous neighborhoods are more likely to engage in assaultive behavior and to report carrying weapons (Patchin et al. 2006). They also may have parents who adopt more controlling and less warm parenting behaviors, often intended to protect their children, which, unfortunately, can negatively affect child development (Furstenberg et al. 1993; Chase-Lansdale et al. 1997; Hill and Herman-Stahl 2002).

Exposure to violence is also negatively related to numerous student academic outcomes. These include reduced likelihood of graduating (Harding 2009), children having lower self-confidence in their academic abilities (Nettles, Caughy, and O'Campo 2008), worse attendance and behavior at school (Bowen and Bowen 1999; Bryk et al. 2010), and lower test scores and grade point averages (Schwartz and Gorman 2003; Bryk et al. 2010).

Further, teachers have been found to alter their classroom approaches in communities with high rates of violence. Matsumura, Garnier, and Resnick (2010) found that some teachers in such schools were less likely to follow advice from instructional coaches who suggested teaching their lessons more interactively. The teachers feared that those more open-ended approaches could spark conflict and even fights between students. Teachers in such environments who have limited understandings about the impact of violence in students' lives can have more difficulty connecting to their students in the classroom (Dance 2002).

The large body of work on child development and violence exposure helps to expand on the Coleman Report's conclusions about educational inequality and disadvantage by identifying another specific environmental factor—exposure to violence—that can hinder a child's ability to succeed in school. Not only can violence devastate individual children and harm their life prospects, but when such children are concentrated in the same schools, the results are magnified and create huge barriers for children and teachers to overcome. As Coleman et al. (1966) also noted, these kinds of challenges are unequally distributed. Students most likely to suffer the consequences of challenging home or neighborhood environments are from disadvantaged economic backgrounds and are racial minorities.

Problems of Scope and Challenges of Scale

The literature we described above has not played a substantial role in contemporary education policy debates, especially debates that inform discussions of school accountability. Why? We see two reasons and call them problems of scope and challenges of scale.

By *problems of scope*, we mean that learning in harm's way is conceptualized relatively narrowly and in isolation from other important issues. This arises

because many individuals who debate or help to formulate education policy conceptualize violence by focusing entirely or almost entirely on violent incidents occurring at school. For example, the No Child Left Behind Act (NCLB) incorporated concerns about violence into its many provisions when it required states to determine which of their schools were "persistently dangerous." Yet a minuscule number of schools across the country were ever identified as such, in part because NCLB gave states much latitude in carrying out the provision and, important for our purposes, focused attention on violent incidents within a school building rather than the larger neighborhood contexts in which schools reside (Hernandez 2007). Further, policies such as the federal School Emergency Response to Violence (SERV) program illustrate the problem of focusing primarily on high-profile violent events and ignoring the less headline-grabbing levels of persistent violence that challenge some schools each and every day. Funds from SERV are available to help school districts to recover from "a violent or traumatic event" (U.S. Department of Education 2014)—a noble objective—but funds cannot be used for more regular supports in schools where neighborhood violence is persistent.

A further problem of scope is that unlike the connections between violence and the success of individual students, the relationship between persistently violent contexts and overall school performance tends to remain unexplored in policy debates. As we just noted, existing research tends to focus on violence occurring at school during school hours (Robers et al. 2014; Johnson 2009; Henry 2009; National Institute of Education 1978) and occasionally that research relates those conditions to violence outside a school (Astor, Benbenishty, and Estrada 2009). However, the relationship between neighborhood violence and school performance is rarely measured. Given how data are collected, it can be difficult, if not impossible, to relate these two concepts. (An exception at the local level is Bryk et al. 2010). For example, the federal government's School Survey on Crime and Safety includes no questions about academic performance (Robers et al. 2014). Other independent surveys conducted by researchers sometimes ask respondents for their opinions about performance, but those surveys lack concrete student outcome measures (Binns and Markow 1999). As a result, the typical and most comprehensive data collection efforts on youth exposure to violence remain disconnected from academic performance at the school level, a topic that otherwise receives much attention. Contrast this, for example, with efforts to measure the number of students who speak languages other than English in the home. Those data do inform accountability policy, through various exemptions from state testing or the administration of tests in languages other than English for these students.

In addition to problems of scope, we also identify *challenges of scale*. The current popular techniques for assessing the degree to which children learn in harm's way tend to focus on particular locales and are not easily scaled up to more communities. Even if policy-makers wanted to make youth exposure to violence a central issue in education policy discussions or regular data reporting, it would be incredibly difficult, using current popular methods, to gather data on an annual basis across the thousands of school districts and schools in the United

States. This is because the two main techniques used in the aforementioned articles we have cited are incredibly expensive, time-consuming, and require large research teams. One popular method is to survey school personnel to gauge violence in schools or to survey children and their families about the violence that children are exposed to outside school. Surveys are expensive to conduct and, as used in these settings, also tend to ask people about their perceptions of violence. This can be limited because, as Coleman et al. (1966) suggested, such perceptions can vary depending on the relative conditions within particular communities. Scaling up the use of survey methods to gauge the degree to which children in all the nation's schools learn in harm's way would be impractical.

A second prevailing technique used to assess learning in harm's way incorporates survey methods, but also augments them with detailed on-the-ground investigations of the neighborhoods in which students live. An example is the landmark study on school improvement from Bryk et al. (2010). These authors studied Chicago elementary schools and found that more neighborhood violence was associated with worse reading scores, math scores, and student attendance. The researchers posited that exposure to violence is likely to undermine "neighborhood cohesion" (p. 174) and, thus, deprive schools of the community supports needed for success. The ability of Bryk et al. to demarcate the neighborhoods where children attended school and then to link those conditions to schools relied upon a time-consuming and careful ground-level assessment that involved their own observations and the input from people in the community. As a result, Bryk et al. developed a nuanced portrait of the neighborhood conditions confronting Chicago elementary school students and then related those conditions to school performance. Scaling up such an effort to assess learning in harm's way for all schools every year would be impossible due to the time and expense involved and the need to recruit high-quality research teams to explore every community.

Fortunately, the growing availability of geo-referenced datasets on education, crime, and community characteristics is making it possible to begin to overcome the problems of scope and the challenges of scale that we have discussed here. Those advances allow researchers and policy-makers, especially in urban areas, to develop regular and more comprehensive assessments of youth exposure to violence and to relate those measures to school operations and performance. The next section describes our method for measuring violence exposure.

Constructing Measures of Violence Exposure

Our approach to measuring student exposure to violence, which overcomes the problems of scope and challenges of scale that we just explored, relies upon leveraging several data sources that are currently available or becoming increasingly available to researchers and policy-makers. These data are education data that capture measures of school characteristics and academic outcomes, administrative data from school districts that demarcate school attendance boundaries, geocoded crime data from law enforcement agencies, and data on community

characteristics from the U.S. Census Bureau. We demonstrate our method by focusing on Atlanta and Philadelphia during the 2009–10 school year. Descriptive information about schools in these cities is available and, importantly, their city police departments make available geo-coded datasets that measure crime at the individual incident level. That allows us to capture information about the location, offense category, date, and time of each crime that occurred. We use data from the school districts themselves and from the National Center for Education Statistics (NCES) to identify individual schools in our two cities.

We restrict our sample to traditional public K–12 schools, excluding magnet schools and charter schools. Since we measure exposure to violence in school neighborhoods, it makes sense to focus on schools where attendees live within a defined boundary, as is common in thousands of school districts across the country. Magnet and charter schools often pull children from wider geographic areas, sometimes the entire city, making it difficult to calculate neighborhood violence exposure for students in those schools. However, with our method we are able to employ attendance boundaries of different sizes. Therefore, one could identify the levels of violence in larger, nontraditional attendance boundaries (e.g., for magnet or charter schools) should they be available. Such a method could also explore violence in other geographic spaces, such as violence occurring within a certain distance of these nontraditional schools. Our focus in this article, though, is public schools with defined attendance boundaries.

We generate our measures of schools' proximity to violence by comparing geo-coded school location data to geo-coded crime location data. Using ArcMap, we plot school and crime locations using latitude and longitude coordinates and then project these coordinates into a common geographic coordinate system. We develop two different measures of a school's proximity to violent crimes. Each measure associates a school with a certain number of crimes based on a different definition of proximity.

For one conceptualization of proximity, we calculate a school's proximity to violence using a one-half-mile buffer radius drawn around each school. Scholars studying other policy areas, such as environmental science and public health, commonly use buffer radii, but the approach is absent from studies of school accountability (An and Sturm 2012; Green et al. 2004; Chakraborty and Zandbergen 2007). In education, though, public health researchers have used half-mile buffers around schools to study student obesity. Those buffer zones were designed to capture the number of fast food establishments in proximity to schools (Davis and Carpenter 2009).

The buffer radius is a useful way to capture, in a uniform way, neighborhood context defined as the immediate geographic area around the school. With the school buffer radii drawn and the crime point data plotted on the same coordinate system, we can easily aggregate information on crimes contained within the school's buffer radius. We discuss the aggregation procedure below where we explain how we tally crimes for each school.

Another conceptualization for creating a proximity measure takes advantage of datasets created by the School Attendance Boundary Information System (SABINS) project, and expanded by the U.S. Department of Education through

the School Attendance Boundary Survey (SABS) (College of William & Mary and Minnesota Population Center 2011; U.S. Department of Education 2017). These efforts have accumulated shapefiles of school attendance boundaries, which define the geographic area from which a school draws its students. Because schools that serve multiple grades can have different attendance boundary files for each grade level, we chose to use 3rd-, 7th-, and 11th-grade boundaries to incorporate the maximum number of Atlanta and Philadelphia elementary, middle, and high schools into our analysis. As with the buffer zone calculation, we link the attendance boundary information to our crime data, which allows us to calculate the number of crimes within the attendance boundary.

We link the attendance boundaries to schools by matching each boundary's unique identification number to a crosswalk table published by the SABINS database, which in turn links the boundary with school identification numbers assigned by the NCES. Each school is usually associated with a single boundary in a one-to-one relationship, but there are two situations in which the relationship is not one-to-one. First, this can occur when a single school receives children from multiple attendance boundaries uniquely linked to that school (i.e., one-to-many). In this case, we sum up the crime counts from each boundary that serves the school. Second, multiple schools can be served by a single attendance boundary (i.e., many-to-one). In this case, we divide the crime measure by the number of schools served by the boundary, allocating an equal portion of the crimes in the boundary to each school that it serves.

We focus on crimes in Atlanta and Philadelphia that the Federal Bureau of Investigation (FBI) has designated Part I, "violent" offenses that occurred during the 2009–10 school year between the first day of school and the first date of state standardized testing. The "violent" category within Part I comprises homicide, rape, robbery, and aggravated assault, and we consider these crimes for two reasons (FBI 2013). The first reason is theoretical. The literature we use to develop our hypothesis focuses on how exposure to violent incidents influences children (Bowen and Bowen 1999; Henrich et al. 2004; Ozer 2005; Grogger 1997; Sharkey 2010; Burdick-Will 2013; Carrell and Hoekstra 2008; Harding 2009; Nettles, Caughy, and O'Campo 2008).

The second reason is methodological. Measurement issues arise in the official reporting of all crimes, which could lead some incidents to be underreported or overreported given variation in victims' willingness to report and the administrative incentives to which police officers respond as they characterize incidents in official documents (Wilson 1989). Police are not notified of all incidents, and even when authorities respond to crimes there may be definitional ambiguities that make situations difficult to classify. However, previous work has found official crime reporting systems to be more accurate for the most severe offenses (Gove, Hughes, and Geerken 1985).

We aggregate information on these violent crimes within each school's buffer radius and attendance boundary. To do this, we use U.S. Census Bureau block data for each city. We sum the population of all the blocks that have their center in each buffer radius or attendance boundary to generate a population measure for that area. For each buffer radius and attendance boundary, we use a simple

sum of crimes occurring within the buffer radius or attendance boundary for each school, which we then weight by population. The following equation summarizes our approach:

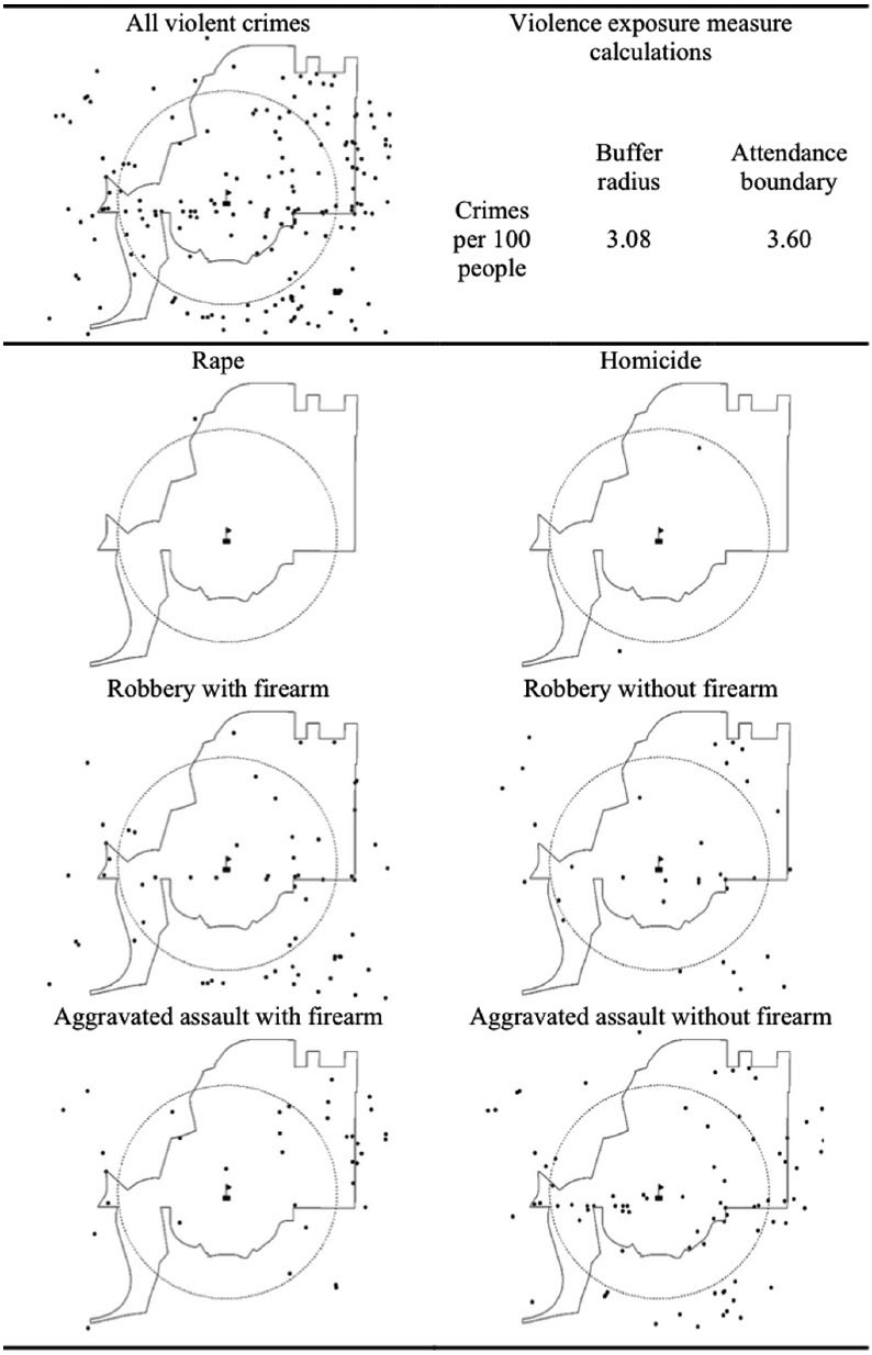
$$CC_i = \frac{H_i + R_i + RWF_i + RNF_i + AAWF_i + AANF_i}{POP_i / 100}.$$

In this calculation, i denotes the polygon of interest associated with a school (either the buffer radius or attendance boundary). The formula produces a crime count (CC), which includes the count of homicides (H), rapes (R), robberies with firearm (RWF), robberies with no firearm (RNF), aggravated assaults with firearm (AAWF), and aggravated assaults with no firearm (AANF). That count is weighted by population (POP) measured in hundreds. For the attendance boundary measure in particular, transforming this variable into a "per capita" metric by weighting by population is essential to produce a meaningful measure. Since the buffer radii are of a uniform size, our per capita violent crime count measure is highly correlated with a raw count of violent crimes (r = .78 for Atlanta; r = .84 for Philadelphia). However, weighting by population makes a substantive difference in the attendance boundary measure; within the school attendance boundaries the raw count of violent crimes is not highly correlated with the per capita measure (r = .18 in Atlanta; r = .13 in Philadelphia). We use the weighted measures in most of our analyses below, but sometimes we report the raw count of violent crimes within the buffer radius (not weighted by population) to more clearly convey the actual number of incidents captured by the measure.

Figure 1 provides a visual example and sample calculations of our measures of school proximity to violence, depicting the buffer radius and attendance boundary for Herndon Elementary School in Atlanta. The circle in each panel of the figure traces the half-mile buffer radius around the school and the other line within each panel shows the school's attendance boundary. Each dot represents a crime that occurred during the 2009–10 school year before the first day of state standardized testing. The first row of Figure 1 presents a visual of all violent crimes and the adjacent table of numbers reports the two measures of violence exposure for Herndon that we calculated based on the buffer radius and attendance boundary. The remaining plots describe the presence of each type of violent crime captured in our overall measures of violence exposure, which demonstrates the versatility of our approach.

While the buffer radius and attendance boundary plots in Figure 1 cover similar areas, they are not identical. For some crimes, the polygons will capture the same number of incidents. Herndon's counts for rape and homicide are the same for the buffer radius and attendance boundary measures as each geographic area contains zero incidents of rape and one homicide. For other types of incidents, there are crimes within the buffer radius that are outside the attendance boundary, and vice versa. For example, as Figure 1 shows, Herndon had thirteen robberies without a firearm within the buffer radius and nineteen within the attendance boundary.

FIGURE 1
Exposure to Violent Crimes for Herndon Elementary School (Atlanta)



NOTE: Multiple crimes reported at the same address appear as a single dot but are analyzed as separate crimes in the statistical analysis.

Violence Exposure in Atlanta and Philadelphia

What does learning in harm's way look like in Atlanta and Philadelphia? In this section, we answer that question by using our buffer radius and attendance boundary measures to report three sets of findings. First are univariate results that describe levels of neighborhood violence for all schools in our sample. Second, we explore how other characteristics of students and neighborhoods relate to our measures of violence exposure. Third, we report bivariate and multivariate results, showing the association between our different measures of violence and school performance. Table 1 presents descriptive statistics for all variables, including our violence exposure measures, indicators of neighborhood poverty and student race, and other school-level variables for which we control in our multivariate models.

We begin by discussing the results within Figure 2, which plots a simple unweighted count of violent crimes near each school in our sample. Each bar represents the number of violent crimes within the half-mile buffer radius for an individual school. The results indicate extremely high variability across schools in each city. Some schools are in close proximity to very few of the most violent crimes, whereas others exhibit strikingly high levels of exposure to violence. For example, in Atlanta, three schools had zero violent crimes occurring within a half mile radius of the school, whereas one school had more than 100 such incidents. In Philadelphia, one school had three violent crimes occurring nearby, and another had 408. The striking variability in this simple measure reflects the dramatically different conditions under which children attend school. Even within the same city school district, significant inequalities are clearly evident.

The results in Figure 2 also reflect the failure of current policies to account for the presence of violence in and around the nation's schools (Klein 2007). For example, when NCLB was the law of the land it allowed parents to transfer their children out of schools deemed "persistently dangerous," a designation we described earlier. Despite the high levels of neighborhood violence around schools that Figure 2 describes, data reported by the Georgia and Pennsylvania state education agencies for 2009–10 show that the NCLB designation only identified seventeen schools in Philadelphia in our sample as persistently dangerous and not a single school in Atlanta as persistently dangerous.

Next we illuminate the characteristics of students who attend schools with higher proximity to violence by presenting bivariate relationships between our violence exposure measure and two other characteristics of schools: neighborhood poverty and student racial composition. This part of the analysis further explores one of Coleman et al.'s (1966) major findings about educational inequity. Students who are exposed to violence struggle to succeed in school, and Coleman et al.'s findings imply that such exposure is likely to be skewed more toward disadvantaged students.

As our measure of neighborhood poverty, we use the 2010 American Community Survey 5-year estimates of the percent of families with related children under 18 years whose income in the past 12 months is below the poverty

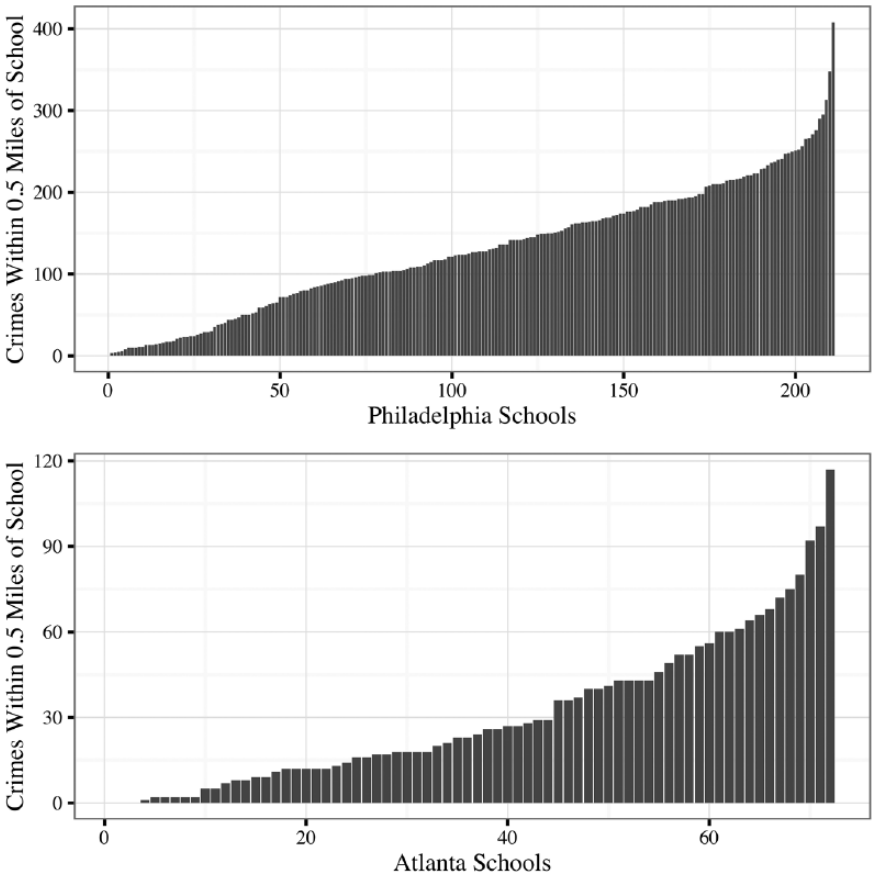
TABLE 1
Descriptive Statistics in the Analytical Sample

	Mean	*SD*	Min	Max
Atlanta variables				
% proficient or better in reading	86.19	7.85	67.60	100.00
% proficient or better in math	69.50	13.28	45.70	98.20
Buffer radius violence exposure	1.13	0.80	0.00	3.08
Attendance boundary violence exposure	1.20	0.69	0.09	3.60
% nonwhite students	91.75	20.73	23.82	100.00
% students with meal subsidy	83.82	25.55	8.03	99.52
Pupil to teacher ratio	13.06	1.77	8.78	18.03
Teacher experience, average years	10.73	2.41	5.58	16.37
% neighborhood poverty	35.59	19.21	1.40	77.20
Elementary school indicator variable	0.71	0.46	0.00	1.00
High school indicator variable	0.11	0.32	0.00	1.00
Philadelphia variables				
% proficient or better in reading	46.94	17.80	6.30	85.40
% proficient or better in math	54.78	21.48	2.20	92.20
Buffer radius violence exposure	0.84	0.42	0.05	1.82
Attendance boundary violence exposure	0.84	0.45	0.06	2.61
% nonwhite students	88.19	18.92	15.30	100.00
% students with meal subsidy	85.84	18.83	22.11	99.83
Pupil to teacher ratio	14.00	2.05	7.92	20.21
Average teacher degree attainment	4.40	0.10	4.13	4.79
% neighborhood poverty	32.12	17.82	1.40	85.40
Elementary school indicator variable	0.77	0.42	0.00	1.00
High school indicator variable	0.13	0.34	0.00	1.00

NOTE: N = 72 for Atlanta variables; N = 211 for Philadelphia variables. Philadelphia teacher degree attainment coded as 4 = bachelor's degree, 5 = master's degree, and 6 = PhD.

level. We find that our measures of violence exposure, encompassing incidents in both school attendance boundaries and half-mile buffers, are strongly positively correlated with prevalence of neighborhood poverty in both cities. The scatterplots in Figure 3 illustrate these relationships. Across Atlanta and Philadelphia, the correlations between neighborhood poverty and violence exposure are always positive and range from .67 to .73. Furthermore, schools with the highest levels of proximity to violence tended to have significantly higher neighborhood poverty rates when compared with the average for all schools in the city. Schools in the top quartile of our attendance boundary violence exposure measure in Philadelphia had an average neighborhood poverty rate of 47.5 percent. In comparison, the average for all schools in the city was 32.1 percent. Similarly, in Atlanta, the schools most proximate to violence had an average neighborhood poverty rate of 50.9 percent, compared with a citywide average of just 35.6 percent.

FIGURE 2
Violent Crimes within a Half Mile of Schools in Atlanta and Philadelphia

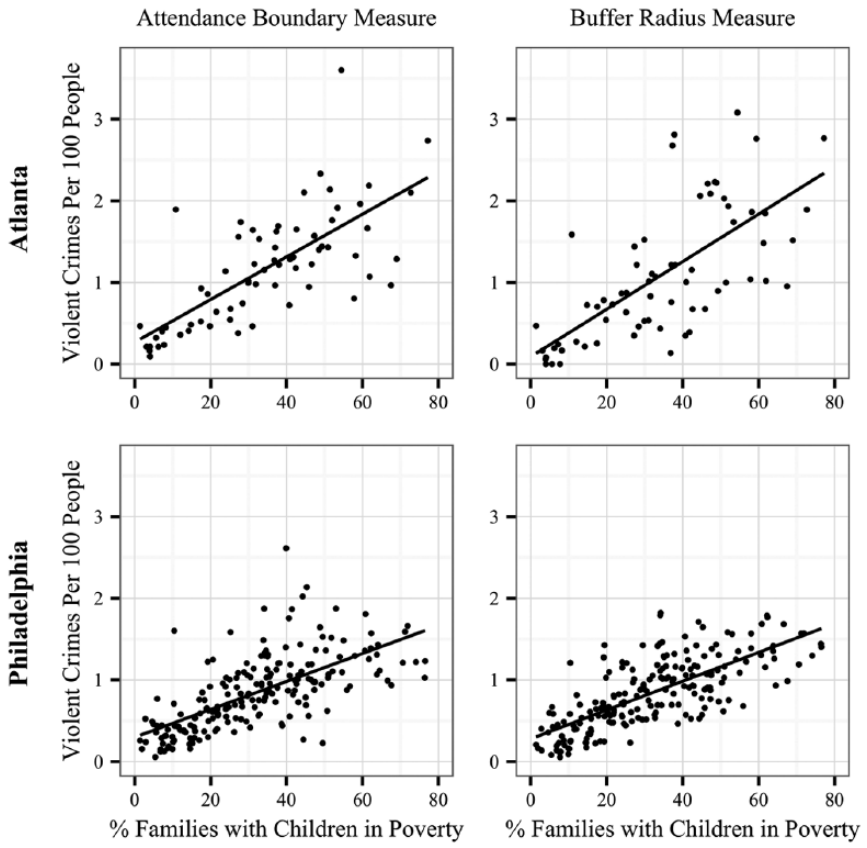


NOTE: Each bar represents an individual school. Counts for each school are not weighted by neighborhood population in these plots. *N*: Atlanta = 72 and Philadelphia = 211.

Next, we examine the relationship between our violence exposure measures and the percent of students of color in schools. We again find positive correlations between our violence exposure measures and the percent students of color, as the scatterplots in Figure 4 demonstrate. However, these relationships are not as strong as those between violence exposure and neighborhood poverty. This is due partly to less variability in the race measure given that a high number of schools, especially in Atlanta, clustered near 100 percent students of color. Still, the results show positive correlations ranging from .48 to .56 across both cities.

Taken together, Figures 3 and 4 suggest that school proximity to neighborhood violence tends to be disproportionately higher for students of color and students living in poorer neighborhoods. The challenges perpetuated by the violent

FIGURE 3
Relationship between Violence Exposure and Neighborhood Poverty

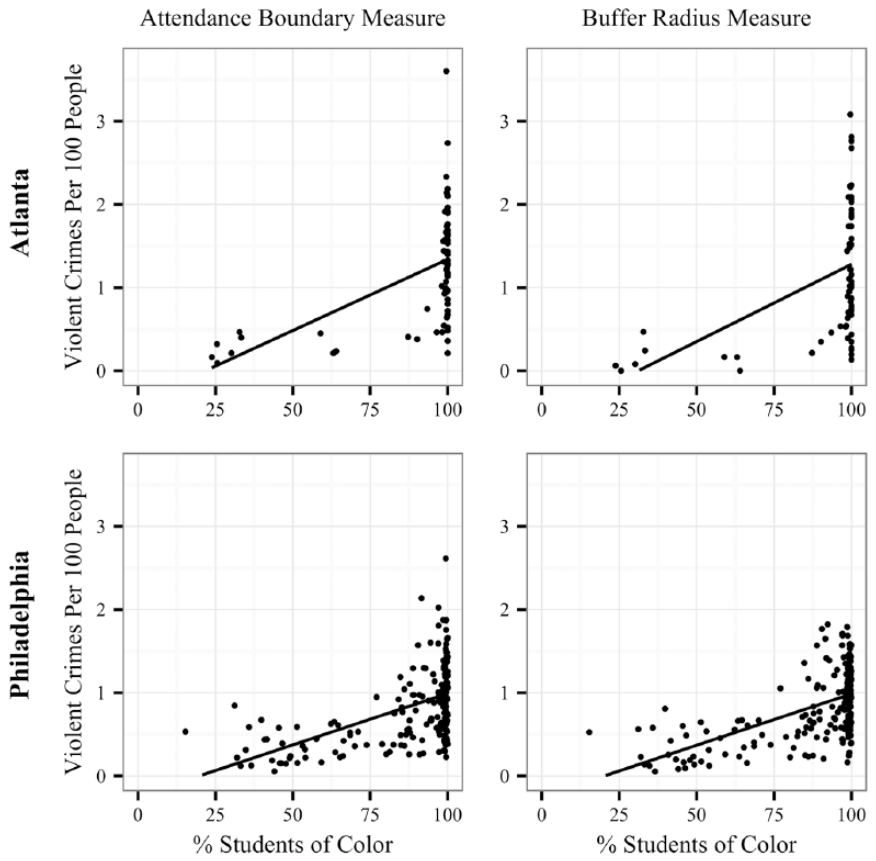


NOTE: $N = 72$ for Atlanta; $N = 211$ for Philadelphia.

contexts that we identify are layered on top of other dimensions of inequality, which Coleman et al. (1966) and many others since have documented. Just as students of color and economically disadvantaged students tend to find themselves in schools that have worse conditions, they also tend to attend schools that are disproportionately located in neighborhoods with persistently high levels of violence.

Next, we examine the relationship between violence exposure and school performance. Our first set of results appear in Figure 5, which includes scatterplots that illustrate the relationship between our violence exposure measures and academic performance metrics in both cities. Across all subjects and both cities, every correlation is negative. Despite that overall pattern, the plots also show that how one defines the neighborhood around the school affects the relationship between violence exposure and school performance. In Atlanta, the correlation

FIGURE 4
Relationship between Violence Exposure and Racial Composition of Schools

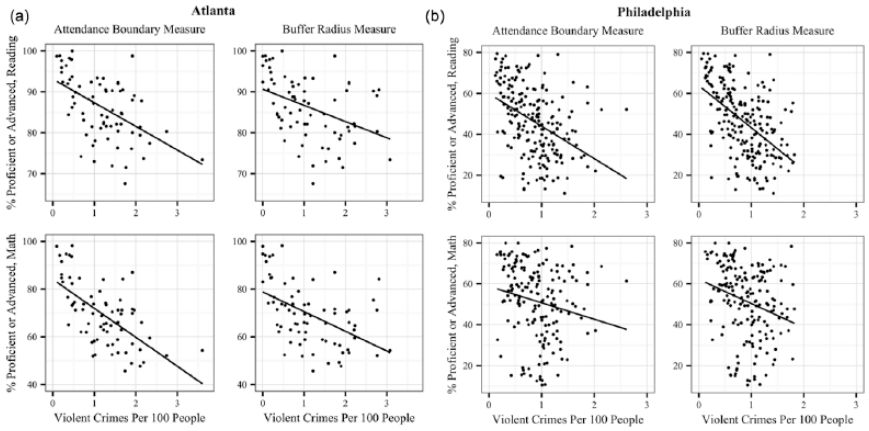


NOTE: N = 72 for Atlanta; N = 211 for Philadelphia.

between exposure to violence and proficiency percentages in reading and math is stronger for the attendance boundary exposure measure (–.51 for reading and –.63 for math) than for the buffer radius exposure measure (–.41 for reading and –.50 for math). In Philadelphia, however, the pattern is reversed; a stronger correlation exists between exposure and performance when the buffer radius measure is used (–.51 for reading and –.39 for math) compared to the attendance boundary measure (–.44 for reading and –.31 for math), a difference we discuss further below.

In addition, across both cities the strength of the correlation between violence exposure and test performance varies by academic subject. In Atlanta, violence exposure is more negatively correlated with math performance than other subjects. In contrast, in Philadelphia violence exposure is more negatively correlated with reading performance than other school subjects.

FIGURE 5
Relationship between Violence Exposure and School Performance Measures



NOTE: N = 72 for Atlanta; N = 211 for Philadelphia.

A summary of key results from our multiple regression analyses appears in Table 2.[1] In each city, we examine the percent of students meeting or exceeding expectations on state standardized assessments in math and reading as our dependent variables. For each of the four school performance dependent variables (math and reading in Atlanta and Philadelphia), we estimate three models using the attendance boundary violence exposure measure and three models using the buffer radius. In all models, we control for the pupil-teacher ratio, a measure of teacher experience, the percentage of nonwhite students, and indicator variables of whether the school is an elementary or high school (middle school is the omitted category). To control for student socioeconomic status, we include multiple combinations of control variables in different models: (1) only the percentage of students with a meal subsidy; (2) only the percentage neighborhood poverty variable as described above; and (3) both the meal subsidy and neighborhood poverty measures, which correspond to the first, second, and third result for each group of three coefficients appearing in Table 2.

As Table 2 shows, the violence exposure measures are nearly always negatively signed, as predicted, even when we control for student and school characteristics. This is true in twenty-three of our twenty-four models. Further, eleven of the twenty-four coefficients that measure violence exposure are statistically significant at the $p < .10$ level or stronger. Interesting patterns also emerge when one considers different ways to measure violence and its relationship to performance across academic subjects.

How one defines the neighborhood around a school sometimes appears to influence the strength of the statistical relationship between violence exposure and school performance. Out of the twelve buffer models, zero of six in Atlanta and four of six in Philadelphia produce statistically significant results for the

TABLE 2
Regression Coefficients for Attendance Boundary Violence and Buffer Radius Violence Measures for Atlanta and Philadelphia Models

	Attendance Boundary Models			Buffer Radius Models		
Atlanta—Math	1	2	3	4	5	6
Attendance boundary violence	−4.718**	−5.098**	−3.443			
	(−1.837)	(−2.307)	(−2.148)			
Buffer radius violence				−1.533	−0.755	0.242
				(−1.544)	(−1.924)	(−1.743)
Atlanta—Reading	7	8	9	10	11	12
Attendance boundary violence	−2.341*	−3.609**	−2.593*			
	(−1.242)	(−1.546)	(−1.465)			
Buffer radius violence				−1.007	−1.479	−0.876
				(−1.021)	(−1.283)	(−1.189)
Philadelphia—Math	13	14	15	16	17	18
Attendance boundary violence	−5.092*	−1.614	−2.019			
	(−2.73)	(−2.99)	(−3.048)			
Buffer radius violence				−8.088***	−4.471	−5.076
				(−2.995)	(−3.428)	(−3.499)
Philadelphia—Reading	19	20	21	22	23	24
Attendance boundary violence	−8.043***	−3.987	−4.204			
	(−2.407)	(−2.602)	(−2.655)			
Buffer radius violence				−11.032***	−6.642**	−7.001**
				(−2.625)	(−2.974)	(−3.039)

NOTE: Regression model coefficients and standard errors in parentheses are reported. These results are excerpts, omitting control variables, from full regression models examining the relationship between neighborhood violence and school performance. All models contain controls for percent of minority students, pupil-teacher ratio, teacher experience, and indicator variables for whether a school is an elementary school or a high school (middle school is the omitted category). Within each group of three models reported here, the first contains an additional control for percentage of students on meal subsidy, the second contains an additional control for the percentage of people in the neighborhood in poverty, and the third contains both the meal subsidy and neighborhood poverty controls. Full results for all models are available from the authors.
*$p < .10$. **$p < .05$. ***$p < .01$.

violence exposure measures; for the attendance boundary models, statistically significant results accompany five of six in Atlanta and two of six in Philadelphia. In general, the boundary measure appears to be a more consistent predictor of school performance. One reason for this could be because it can better capture violence in the neighborhoods where children who attend particular schools live, and by extension can accurately account for peer effects on achievement, a finding that would be consistent with Coleman et al.'s (1966) conclusions. Still, in Philadelphia, the results are similar whether one considers buffer radii or attendance buffers; whereas for Atlanta, the definition of proximity matters substantially. This result could be due to the higher population density in Philadelphia, which contrasts with Atlanta's less dense patterns of development. Higher density in Philadelphia could, in practice, end up producing school attendance boundaries that more closely follow the buffer radii. This variation across cities underscores one of the virtues of considering proximity measured by both buffers and boundaries, which are easy results to produce given our method.

In addition to statistical significance, we also note that the relationships between violence and school performance in Table 2 are substantively important. Consider these illustrative examples. In Atlanta, a 1 standard deviation increase in the violence measure in model 1 corresponds to a 0.24 standard deviation decrease in math performance. A similar substantive relationship exists in model 7, where the same increase in violence is associated with a 0.20 standard deviation decrease in math performance. In Philadelphia, the results from model 13 show that a standard deviation increase in the violence measure is associated with a 0.11 standard deviation decrease in math performance. In model 19, a standard deviation increase in the violence measure in Philadelphia corresponds to a 0.20 standard deviation decrease in math performance.

Discussion and Policy Implications

Our analysis extends important insights of Coleman et al. (1966) about inequality and educational opportunity of the nation's children. Those opportunities vary depending not only on the conditions that children experience in school but also on the conditions in the neighborhoods where their schools reside. Our research contributes to the long body of work that has explored those topics by offering a new method for measuring exposure to violence and illustrating how that method can enhance understandings of contemporary inequalities confronting the nation's schoolchildren.

We recognize that no measure of any social science concept is perfect, and even though we find several virtues in our measures of violence exposure, a few limitations of those measures are worth mentioning for researchers applying them in future work. To overcome the challenges of scale that we described earlier, our measure sacrifices some methodological precision that could come with an analysis that takes advantage of specific local knowledge (Bryk et al. 2010). Both attendance boundaries and buffer radii are only approximations of

neighborhoods around schools. Local experts may have different understandings of neighborhoods than those that our two measures define. Still, by providing a path forward for overcoming challenges of scale, our approach does increase the chance for violence exposure to become a more salient topic in state and national policy debates as others employ our methods to explore a broader range of communities.

Additionally, our attempt to overcome challenges of scale leads us to rely on police reports of violent incidents. These reports can only approximate the true level of exposure to violence that children experience. Like any administrative dataset, police incident reports reflect biases and incentives of agents recording information and may be incomplete. Our focus on the most violent crimes does help to attenuate those potential problems, although it does not eliminate them. Further, children may experience violent incidents in neighborhoods other than those where they attend school. Our measures would not pick up those additional incidents, whereas survey methods might. The trade-off, of course, is that survey methods are expensive to implement and difficult to scale up across many communities.

A final limitation to note emerges from our use of Census Bureau block data to help in our calculation of violence exposure by weighting our measures by population, and in our use of those data to help us design a control measure for neighborhood poverty. As time marches on past years in which the decennial census is conducted, researchers constructing these measures may sacrifice some precision as not all census geographies (i.e., census blocks) are available in intervening years. Additional methods of estimation will be needed to help ensure that subsequent measures of buffer or boundary populations and poverty rates are keeping up with population changes. One reason we chose the 2009–10 school year for our analysis was to eliminate the need to address that additional issue and to focus, instead, on demonstrating proof of concept for our method and two measures of violence exposure.

Before discussing additional conclusions, it is also worth addressing the possible presence of errors in our school performance data for Atlanta, given the well-known cheating scandal in that district during the academic year that we studied (Blinder 2015). The decision of district and school officials to alter answers on state exams, if affecting our results, likely would attenuate rather than accentuate the relationship between violence and school performance. Schools challenged by excessive neighborhood violence would have felt particular pressure to perform and, perhaps, to alter test scores (Meier and O'Toole 2006). The fact that we still found statistically and substantively significant relationships between violence and student performance in Atlanta could mean that efforts to alter student test scores cannot completely overcome the effects of violence. Alternatively, if the cheating were as widespread as some have suggested, the overall effect could have been simply to increase all scores by some amount (e.g., a shifting upward of school means), which could still enable us to observe the relationships that we observed.

Moving beyond our analysis, we believe that our method for estimating violence exposure helps to overcome the problems of scope and challenges of scale

that we described. In so doing, the method provides a launching pad for other researchers interested in violence, school performance, and accountability. Others could extend our work, for example, by applying the method in other cities and for other years, or across multiple years.

Future researchers also might examine different approaches to weighting violent incidents that occur in proximity to schools. In analyses not reported in this article, we began to experiment with weighting violent crimes by their severity.[2] Violent crimes that are considered more severe in federal sentencing guidelines were weighted more heavily than those that were not. Additional use of weights might consider whether violent crimes occurring more closely to state testing dates have a stronger relationship to achievement than crimes occurring many months earlier. Recall that our analysis weights all crimes equally, but there may be reasons to try a different approach.

In communities where they are available, it also would be interesting to examine additional school-level administrative data that might show how schools react when they operate in communities with high levels of violent crime. Records might be able to show things like the number of lockdown drills, the level of school resources devoted to protecting the school from violence in the neighborhood, and the frequency with which students seek help from school personnel as they cope with the challenges of living amid neighborhood violence. The results could show the added resource burden that schools face as they spend money and devote personnel to address these pressing student needs.

In closing, we consider important policy implications that flow from our work. A first virtue of our approach from a policy perspective is that our measures of violence exposure are scalable, easily replicable at low cost, make transparent assumptions, and, perhaps most importantly, allow for comprehensive considerations of the violent environments in which schools operate. Although knowledge about violence within schools is certainly essential to help improve learning opportunities for children, alone it provides a very limited perspective. Given the growing availability of public, geo-referenced data on urban crime, generating high-quality measures of school proximity to neighborhood violence is becoming increasingly feasible.

Second, our work highlights the value of incorporating more nuanced interventions for school improvement into accountability frameworks. Current policies tend to rate schools based on standardized test results and prescribe remedies for schools deemed not making progress. To date, these policies have not accounted for neighborhood violence when passing judgments on schools. If high levels of neighborhood violence are undercutting student achievement, then accountability policies that ignore those conditions, as with firing the school's principal or staff or changing academic programs, are unlikely to solve the problem. Knowing that high concentrations of violence exist around schools should move policy-makers to consider a variety of interventions that attend to the consequences of violence exposure, specifically.

Last, perhaps a relatively basic, but nevertheless important, policy implication of our work emerges from the sobering school-level portraits that appear in our descriptive plots in Figure 2. Those results reveal that every day hundreds of

children in Atlanta and Philadelphia attend school in neighborhoods with alarmingly high levels of violent crime. We suspect that one could produce similar plots by examining other cities. This is nothing short of a national tragedy. Federal, state, and local leaders and others interested in equality of educational opportunity and school accountability policy should take the reality of persistent neighborhood violence more seriously as they craft their proposals. Doing so will help schools to better meet the academic and mental health needs of children who struggle as they try to learn in harm's way.

Notes

1. Full results are available from the authors.
2. Available from authors upon request.

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