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High Stakes in the Classroom, High Stakes on the Street:

The Effects of Community Violence on Students' Standardized Test Performance

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ABSTRACT

This paper examines the effect of exposure to violent crime on students' standardized test performance among a sample of students in New York City public schools. To identify the effect of exposure to community violence on children's test scores, we compare students exposed to an incident of violent crime on their own blockface in the week prior to the exam to students exposed in the week after the exam. The results show that such exposure to violent crime reduces performance on English Language Arts assessments, and no effect on Math scores. The effect of exposure to violent crime is most pronounced among African Americans, and reduces the passing rates of black students by approximately 3 percentage points.

Key Words: community violence, neighborhood effects, academic performance

INTRODUCTION

There is a longstanding debate about the degree to which conditions outside of school settings shape academic performance and contribute to the large and persistent gaps between students of different backgrounds. This article contributes to this debate by focusing on the importance of community violence as a pathway by which inequality outside the school setting makes its way into the school to affect educational inequality.

Our analysis is designed to overcome two central challenges facing the empirical literature on neighborhoods and academic performance. The first challenge is the difficulty in specifying what it is about a child's home or neighborhood environment that affects her when she enters the school setting. Most of the empirical literature on neighborhood effects has focused on the relationship between neighborhood poverty and student outcomes, but the mechanisms through which high-poverty neighborhood environments make a difference to children's ability to learn are unclear. In this paper, we focus on one precise, concrete way in which neighborhoods may affect children's capacity to learn in school – through exposure to specific incidents of violent crime. Drawing on an extensive literature from psychology and child development, we argue that exposure to violent crime can affect children profoundly and shape their ability to focus on academic tasks.

The second challenge facing researchers studying neighborhoods and academic performance is the problem of selection bias. Observational studies of neighborhoods and school outcomes have relied on an increasingly sophisticated set of methods to identify the causal effect of exposure to disadvantaged neighborhoods, but these studies remain vulnerable to the possibility that unmeasured characteristics of families shape their neighborhood environments as well as the academic trajectories of children. In this article we utilize an alternative approach that exploits variation in the relative timing of violence in children's residential environments and standardized assessments to identify causal effects. Specifically, we employ an empirical strategy that compares the test scores of students living on blockfaces (street segments bordered by the two closest cross streets) where violent crimes occur just before a standardized test to the scores of otherwise comparable students who live on blockfaces where similar crimes occur just after a test. Under the assumption that the timing of violent crime incidents relative to the timing of standardized assessments is exogenous, any differences in test scores should reflect the acute effect of pre-test exposure to violent crime. The precision in our measurement of exposure to violent crime on the child's blockface represents a significant improvement over prior research in this literature, and allows for more precise estimates of the acute impact of specific incidents of violence on children's standardized test performance.

Results from an array of models indicate that students who live on blockfaces where violent crimes occur just before a standardized test perform significantly worse on English Language Arts (ELA) assessments than students who live on blockfaces where violent crimes occur just after the exam. Impacts appear to be particularly pronounced for black students. Although rates of violent crime across the United States have declined over the last three decades, millions of children are still exposed to violence in their homes or communities each year (Finkelhor et al. 2009). Our research suggests that such exposure has profound effects on children and on their performance in school in particular.

LITERATURE

Understanding the sources of academic inequality: A focus on mechanisms

Questions about the role that schools can play in overcoming or reducing social and economic inequality have led to a contentious debate in the education field. On one side of this debate are researchers and advocates who argue that good schools can provide effective learning environments and reach all children, no matter the disadvantages that students face outside of the school environment (Thernstrom & Thernstrom 2003). Those who argue that schools can overcome disadvantages faced by students can point to examples of exceptional schools serving highly disadvantaged students that perform well above students from less disadvantaged backgrounds (Chenoweth 2007; Dobbie and Fryer 2011). A “school-centered” view on academic achievement gaps is broadly consistent with an extensive literature pointing to the role of school resources, teacher quality, school and classroom segregation, institutional practices and teacher/student interactions in exacerbating academic inequality (e.g., Kotlowitz 1992; Rivkin, Hanushek and Kain, 2005; Tyson 2011).

On the other side of the debate are researchers and advocates who argue that schools are unfairly held accountable for obstacles to student learning that emerge from students’ home or neighborhood environments (Rothstein 2004). Those who argue that schools alone cannot overcome the problems of poverty and inequality can point to a long tradition of research demonstrating the importance of family and neighborhood background for academic success, dating back to the Coleman Report on educational inequality (Coleman et al. 1966; see also Bryk et al. 2010; Rothstein 2004). More recently, researchers studying the seasonal timing of academic growth have documented that much of the gap in academic achievement between students from different socio-economic backgrounds emerges in the summer months, when school is out of session (Alexander, Entwisle and Olson 2001; Downey, von Hippel, and Broh 2004).[1] One interpretation of this evidence is that the quality of the home and neighborhood environment may be more important than the quality of the school in explaining inequality in academic success. There are alternative ways to interpret the summer learning loss, however. As noted in Downey, von Hippel and Broh (2004), growing academic gaps in the summer months suggest only that the environments of low and high SES students are more unequal in the summer than they are in the school year—this interpretation does not imply that schools do not contribute to achievement gaps or that schools serve all students equally well. Interpretation

[1] Although this finding is less conclusive for racial achievement gaps. See: Downey, von Hippel and Broh 2004.

becomes even more muddled when one considers the possibility that schools may engender habits of learning and skills that students use outside the school setting.

The complexities involved with interpreting the literature on summer learning loss reflect the broader difficulty of disentangling the relative importance of families, neighborhoods and schools in explaining academic inequality. Rather than attempt to decompose the relative importance of the home, neighborhood, and school settings for academic performance—an exceedingly difficult task given the overlap and inevitable interactions among these settings — we argue that it is more productive to identify the specific pathways through which the family and neighborhood environments affect performance in school. This approach is not only more tractable than the more abstract attempts to decompose the relative importance of each social setting, but it is also more pragmatic. If it is possible to identify the specific mechanisms through which the family and neighborhood environments affect school performance, then educators and policymakers will be able to respond more effectively.

Research focusing on the mechanisms through which family background translates into academic disadvantage has demonstrated the importance of factors like families' communication patterns and parenting strategies (Hart and Risley 1995; Lareau 2000). The literature on neighborhoods and academic performance has made much less progress in specifying how it is that living in a disadvantaged neighborhood affects children in school. Building on a growing base of evidence, we examine the role played by community violence.

Neighborhood disadvantage, community violence and school performance

With few exceptions, the empirical literature demonstrates a strong link between neighborhood disadvantage and various educational outcomes (Ellen and Turner 1997). There is extensive evidence from observational studies that living in a poor or disadvantaged residential environment reduces educational attainment and lowers test scores, with larger effects for children exposed to disadvantaged environments for longer periods of childhood (Harding 2003; Sampson, Sharkey and Raudenbush 2008; Sharkey and Elwert 2011; Wodtke, Harding and Elwert 2011). Evidence from residential mobility programs is less consistent. Research based on the Gautreaux Assisted Housing Program, which began in the 1970s in Chicago, showed that children from low-income families that were assigned residential units in Chicago's suburbs initially had difficulty in their new schools, but ultimately were much more likely to graduate and go on to college than families that were assigned to apartments within Chicago's city limits (Rubinowitz and Rosenbaum 2000). The design of the Gautreaux studies has been criticized, however, as it is not clear that families' residential destinations were entirely exogenous (Mendenhall, DeLuca, and Duncan 2006; Votruba and Kling 2009).

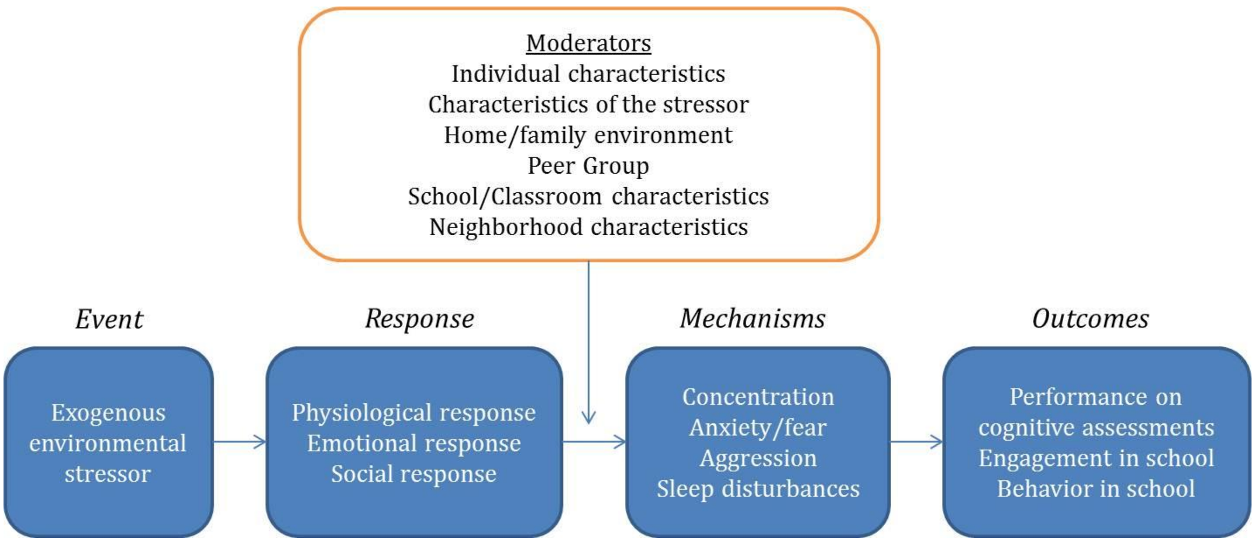
Results from the Moving to Opportunity (MTO) experiment, a randomized study conducted in five cities in the mid-1990s, are more difficult to interpret. An initial study that pooled respondents from all five cities found no overall effect of moving to low-poverty neighborhoods on test scores (Sanbonmatsu et al. 2006). However, subsequent research showed highly divergent patterns across the five cities of the experiment (Burdick-Will et al. 2011). Children from families that moved from the most severely disadvantaged neighborhoods experienced the largest gains in assessments of cognitive skills. These results are consistent with another experimental housing study conducted in Chicago, which showed that moving out of high-poverty housing projects had substantively large effects on standardized test performance (Ludwig et al. 2009).

Although the studies based on experimental evidence are not designed to offer evidence on the mechanisms linking neighborhood poverty and educational outcomes, an exploratory analysis of the divergent findings from MTO provides insights that are highly relevant for the current study. Using the results from the different treatment and control groups in the five cities in MTO, Burdick-Will et al. (2011) examine several different possible reasons why the experiment seemed to generate large impacts in some sites but not others. Their exploratory findings suggest that variation in school quality generated by the experiment does not help explain the divergence in treatment effects across the five cities, but variation in exposure to community violence emerges as a more plausible explanation. Children experienced the largest boost in test scores in the cities where the experiment induced the greatest changes in exposure to community violence.

This conclusion is consistent with both quantitative and ethnographic research focusing attention on the role of violence as a mediator between neighborhood disadvantage and academic outcomes (Harding 2009; 2010). It is a conclusion that also is consistent with a large literature from developmental psychology, which finds evidence that community violence affects a range of developmental outcomes across social-emotional, behavioral, and cognitive domains (Osofsky 1999; Shahinfar, Kupersmidt, and Matza 2001; Margolin and Gordis 2004, Bingenheimer, Brennan et al. 2005). Similar to other traumatic experiences (such as maltreatment), exposure to neighborhood violence and danger are associated with lower performance on assessments of reading, cognitive skills, grade point average and school attendance (Bowen and Bowen 1999; Delaney-Black 2002; Hurt et al. 2001). School-based violence is inversely associated with high school graduation and four year college attendance rates; students in moderately violent schools are 5.1 percentage points less likely to graduate than those in low violence schools while students in seriously violent schools are 15.9 percentage points less likely to attend a four year college (Grogger 1997).

Whereas almost all studies of exposure to violence focus on the long-term consequences of living in a violent neighborhood, recent evidence suggests that specific incidents of extreme violence have a negative impact on children’s cognitive functioning (Sharkey 2010). In a study based on data from children in Chicago, Sharkey (2010) finds that African American children who are given cognitive assessments within a week of a homicide in their block group score substantially lower than other youth in the same neighborhood who are assessed at a different time. Figure 1 elaborates on this finding by presenting a conceptual model of the relationships linking local violence with performance in the school setting. We hypothesize that exposure to acute violence affects performance in the school setting through several possible physiological and social mechanisms. Responses to acute environmental stress may include activation of the stress response system (McEwen & Sapolsky 1995), emotional responses such as fear and anxiety (LeDoux 2000), and "social" responses such as seeking out peers for protection or influential adults, including parents, teachers or coaches, to help deal with the shock of the event.

Figure 1: Conceptual Model



These physiological, emotional, and social responses to acute environmental stress are hypothesized to be linked with outcomes related to cognitive functioning and academic functioning through their impact on symptoms of acute stress disorder (e.g., inability to concentrate, difficulty sleeping), psychosocial effects (e.g., internalizing or externalizing behaviors, aggression), or other coping mechanisms (e.g., substance abuse or dissociation) (Buka et al. 2001; Martinez & Richters 1993; Pynoos et al. 1987). The relationships displayed in Figure 1 represent only a simplified conceptual model of a more elaborate and complex set of processes linking exposure to an incident of violence with performance in school, and these processes are likely to be moderated by characteristics of the child and "proximal" processes within the family, the neighborhood, and the school settings. This study focuses, by necessity, on the first order question of whether exposure to incidents of violent crime affects performance on standardized academic assessments.

Instead of estimating the association between exposure to a violent neighborhood and standardized test performance, we focus on how the occurrence of violent crime on children's residential blockfaces affects their performance on city-wide standardized assessments. In doing so, we acknowledge that our study provides evidence on only one pathway through which a child's residential setting may influence her performance in school, but we believe that what our study lacks in breadth is outweighed by the theoretical precision of the analysis and by the strengths of our identification strategy.

ANALYTIC STRATEGY: AN ACUTE EFFECTS MODEL

Our primary interest in this paper is to obtain unbiased causal estimates of the acute effect of exposure to violent crime on student academic performance on statewide ELA and math exams given in grades 3-8.[2] We do so using a regression discontinuity design in which we identify the impact by comparing the performance of students exposed to crime in the one-week window before the test to the performance of those exposed in the week following the exam. Intuitively, the timing of the test effectively randomly assigns students to a "treatment" group – those exposed just before the exam – and a "control" group – those exposed just after. We treat a student as 'exposed' if a crime has occurred on his or her residential blockface during the specified window of time. Although blockfaces are very small, this measure of exposure contains some error because we do not know for sure whether a student witnesses a crime or

[2] These exams are given over a one to two day period, with some variation in the specific exam date by subject and grade. The testing calendar differs slightly across school years, providing variation in the administration timing over our study period. In the 2004-05 school year, the ELA exam was given to students in 8th grader in mid-January, 4th graders at the end of January, and to students in grades 3, 5, 6, and 7 April. The math exams in the same year were administered in April for most grades, and in May for the "high stakes" grade levels (4 and 8). In the following years, administration dates have been grouped by grade, with 3, 4, and 5th grades taking exams on the same dates, and 6, 7, and 8th grades taking exams on the same dates. In the most recent year, 2009-10, all ELA exams were administered in April, and Math exams were administered in May. Specific exam dates are available from the authors.

even knows about it. This form of measurement error will bias our estimates downward, meaning our results should be interpreted as conservative estimates of the treatment effect. Comparing the performance of these groups will yield an unbiased estimate of the causal effect if the precise timing of the violent crime within the one-week window is not systematically related to student ability or other factors that drive academic performance.

To be concrete, we estimate a regression model linking student achievement to individual student characteristics and a measure of exposure to violent crime:

$$(1) \qquad Y_{it} = \alpha_{it} + \beta X_{it} + \gamma EXPOSED_{it} + \theta_g + \varepsilon_{it}$$

where Y_{it} is the test outcome (test taking, z-score, or passing) for student i on a standardized assessment in academic year t; X_{it} is a vector of student socio-demographic variables and program participation characteristics. These include a set of indicator variables for race/ethnicity, gender, eligibility for free/reduced price lunch (measure of poverty), English proficiency, participation in special education programs, and in some models, performance on last year's exam; and θ_g are grade fixed effects. Our primary variable of interest is EXPOSED, which takes a value of one if the student was exposed to a violent crime (homicide or felony assault) in the one-week window prior to the assessment. We limit the sample to students living on blockfaces where violent crimes occurred either one week before or one week after the test, so the coefficient on EXPOSED indicates the regression-controlled difference in test scores of students exposed to violence the week before an exam to those exposed within the week after. To the extent that crime distracts students or otherwise impedes performance on standardized tests, we expect γ to be negative; exposure to crime prior to the test is expected to reduce student achievement ceteris paribus.

We measure three student outcomes. First, we estimate the impact on test-taking using a dichotomous variable that takes a value of one if the student takes the exam as scheduled. If students are exposed to violent crimes immediately prior to the assessment date, they simply may not attend school – due to the psychological toll of the incident or the fear of additional violence. Second, we estimate the impact on students' performance on 3rd-8th grade ELA and math exams, using z-scores.[3] Third, we examine the impact on the likelihood a student passes the scheduled exams using a dichotomous variable that takes a value of one if the student earns a passing score. Performance on mandated tests is an important and commonly used measure of student achievement. Further, these tests form the basis for determining New York City school accountability grades, whether a school meets federal adequate yearly progress standards, and whether a student qualifies for a gifted and talented program (or is required to attend summer school).

The model is estimated using the sample of students exposed to a crime on his/her blockface within one week of the standardized tests. We estimate this model both for annual cross-sections of data and in a pooled model (including year fixed effects). Further, to improve the precision of our estimates, we estimate "value added" models of student performance, including student i's test score in the previous year as a regressor to control for prior performance.[4]

Because the impact of crime may vary with student characteristics and/or neighborhood context, we explore heterogeneity in impacts across subgroups. First, based on findings from previous research suggesting that the impact of local violence is stronger for African Americans than for other racial and ethnic groups (Sharkey 2010), we include interactions by race and ethnicity, estimating different impacts for blacks, whites, Asians, Hispanics, and students who identify as an "other race/ethnicity". Second, because previous research has found significant differences in the impact of neighborhood effects on mental health and risky behaviors between girls and boys (Kling, Liebman, and Katz 2007; Kling, Ludwig, and Katz 2005), we include models stratified by gender. Third, we test for interactions by student grade level. These models are exploratory, as we do not have a clear prior about whether the effects of local violence are

[3] Test scores are measured as Z-scores, standardized across students in that grade citywide to mean zero and standard deviation one.
[4] We explore also specifications including a set of school fixed effects to control for unobserved differences across schools.

likely to be stronger for older versus younger students. For older students, it is possible that incidents of violence may be more salient or that they may know the individuals involved with the incident personally, thus leading to more pronounced effects. It also is also possible that cumulative exposure to incidents of violence over time and/or greater experience with test-taking may lessen the acute effect of exposure on achievement. Finally, because exposure to violence may have a different impact on students who live in higher poverty, lower resource neighborhoods than on students who live in higher income areas, we estimate the impact on students who live in high poverty neighborhoods, which we define as census tracts where the share of population under 18 years old in poverty is above the citywide median in 2000 (21%).[5] Students living in high poverty neighborhoods account for 84% of our full sample. This sample restriction allows us to exclude anomalous sections of New York City like midtown Manhattan, which is a very wealthy area but also contains a high degree of crime simply because of the density of commercial and tourist activity in this section of the city.

DATA

We use point specific crime data from the New York City Police Department (NYPD) and student level data from the New York City Department of Education (DOE) from 2004-2010. A particular advantage of our analysis is that the geographic and temporal detail of the crime data allows us to estimate the impact of crime on a student's blockface – the street segment that he/she lives on between the two closest cross streets –controlling for a host of individual student characteristics.

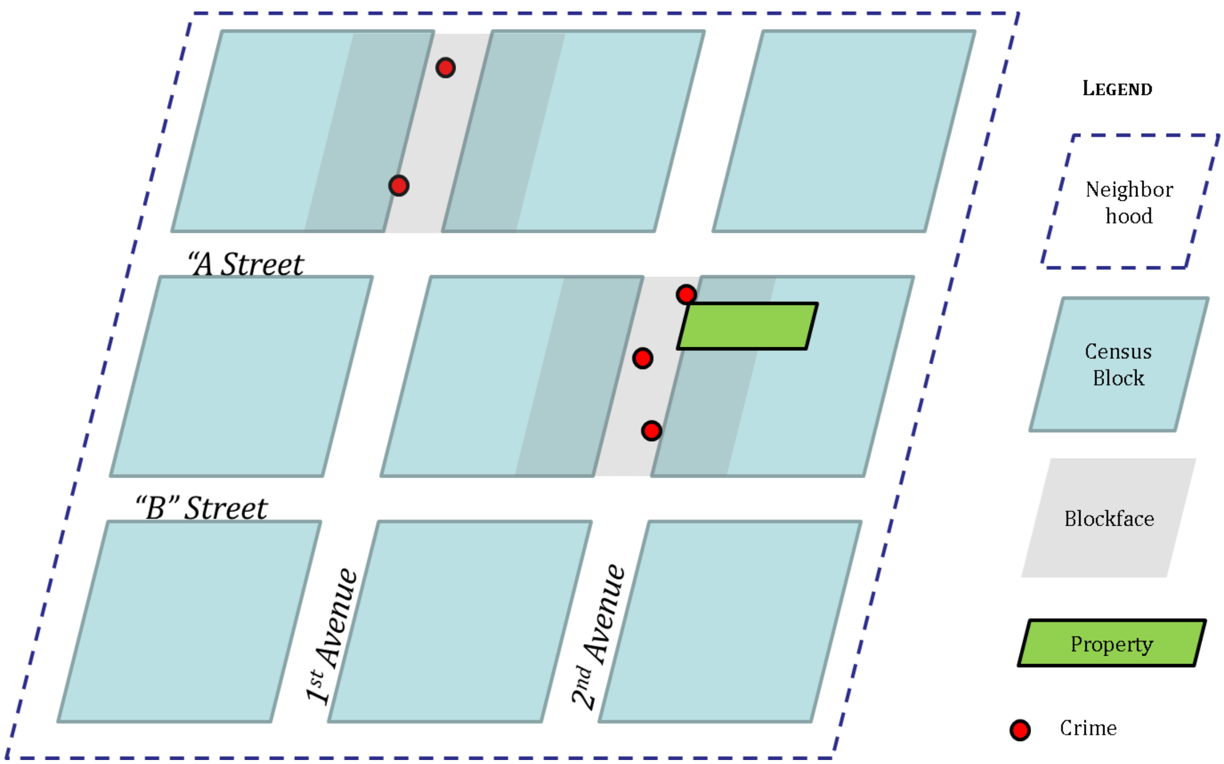
The point-specific data from the NYPD includes all crimes reported in New York City between 2004 and 2010 and the spatial coordinates, date, time, and offense class and description for each crime. Each year, approximately one third of these are property crimes and

[5] "High Poverty Tracts" are census tracts where the share of population under 18 in poverty is above the citywide median in 2000.

roughly eight to nine percent are violent crimes.[6] We focus our analysis on exposure to violent crime. Whereas most students are exposed to some type of non-violent crime near their homes, violent crimes are relatively rare and are likely to be significantly more traumatic.

One critical advantage of these data is our ability to assign each crime incident to a blockface (Figure 2).[7] This level of geographic detail allows us to estimate the impact of exposure to violent crime on the blockface where each student lives. Although we do not know whether a student is a witness to crime, the use of such a small level of geography makes it likely that the residents on the blockface would be aware that a serious violent offense has taken place. We are able to identify crimes that occur on either side of the blockface in which students live, which is not possible with commonly-used parcel-level data aggregated to the city block level.

Figure 2: Blockface Geography



[6] Uniform Crime Reports (UCR) part I violent crimes include: murder, manslaughter, robbery, and aggravated assault (forcible rape is omitted from the analysis). UCR part I property crimes include: burglary, larceny, motor vehicle theft, and arson.
[7] A blockface is a street segment bounded by the two closest cross-streets and incorporates buildings on both sides of the street, thus allowing us to capture every crime that occurs on the street, regardless of which side of the street it occurs. We assign the roughly 20% of crimes that are reported at intersections to multiple blockfaces.

We use information on the date of the crime, the date of the standardized exam, the spatial coordinates of the crime, and student residential addresses to identify the set of students living on a blockface where a violent crime occurred within a short period before the assessment date (7 days) and the set of students living on a blockface where a violent crime occurred within the same time interval after the exam. More technically, our measure of exposure to violent crime is an indicator variable taking the value of one if student *i* lives on a blockface on which a violent crime occurred within seven days prior to the standardized exam. We label these students as 'exposed' to violent crime in the week before the exam. We focus on a 7-day window of exposure because previous research has found that the acute effect of exposure to incidents of violence appears to fade away within 7 to 10 days following the incident (Sharkey 2010; Sharkey et al. 2012).

Our analysis also draws on a rich longitudinal database from the New York City Department of Education (NYCDOE), containing individual level data for a complete census of students attending NYC public schools from the 2003-04 through 2009-10 academic years. Each student record contains detailed demographic, program and academic information including birthplace, race, gender, language ability, poverty, overage for grade, participation in special education and language programs, and performance on standardized ELA and math exams. Importantly, these data also include each student's address of residence, which we geocode to a blockface, with a 99% success rate. From this population, we limit our sample to students taking standardized exams in ELA or math in grades 3-8[8] who appear in our data for at least three years.[9] The NYCDOE student records also include information on test taking and test performance on annual statewide assessments in Math and English Language Arts (ELA),

[8] We omit high school students from this analysis because they take a different suite of exams. Further, we might expect exposure to violence to affect older youth differently, because they are more likely to be on the street when violence occurs, or to know victims and/or offenders.

[9] Of the total 691,159 students who appear in the educational records for 3 or more years between 2005-2010, 22% are observed for 3 years, 27% are observed for 4 years, 32% are observed for 5 years, and 19% are observed for 6 years.

which we use as our outcome measures.

Table 1 shows the total number of students from each racial and ethnic group who are exposed to an incident of violent crime within the week prior to or after the standardized assessments over the full period of the study. Although there is some representation of each of the major racial and ethnic groups in New York City, the sample for the analysis includes a disproportionate number of African American and Hispanic students. Of the students exposed to an incident of violent crime within a week of the assessment, most are only exposed to a single incident. The mean number of exposures is very close to 1, even though there are students exposed to as many as 7 incidents within a week of the assessment.

Table 1: Violent Crime Exposures within 7 Day Window, by Race/Ethnicity

A. Full Sample

		ELA EXAM					MATH EXAM			
		Obs	Min	Max	Mean		Obs	Min	Max	Mean
Black	*Bef*	9,868	1	7	1.17	*Bef*	9,695	1	4	1.10
	Aft	9,010	1	5	1.11	*Aft*	10,500	1	6	1.12
Hispanic	*Bef*	12,732	1	6	1.16	*Bef*	11,613	1	6	1.11
	Aft	10,554	1	6	1.13	*Aft*	12,717	1	6	1.12
Asian	*Bef*	1,472	1	4	1.17	*Bef*	1,581	1	5	1.17
	Aft	1,567	1	4	1.10	*Aft*	1,695	1	5	1.12
White	*Bef*	1,109	1	4	1.10	*Bef*	947	1	5	1.10
	Aft	987	1	5	1.09	*Aft*	1,073	1	5	1.09
Other Race	*Bef*	137	1	4	1.13	*Bef*	128	1	3	1.11
	Aft	126	1	5	1.15	*Aft*	141	1	3	1.13

B. High Poverty Tracts

		ELA EXAM					MATH EXAM			
		Obs	Min	Max	Mean		Obs	Min	Max	Mean
Black	*Bef*	8,975	1	7	1.18	*Bef*	8,554	1	4	1.11
	Aft	7,835	1	5	1.12	*Aft*	9,546	1	6	1.13
Hispanic	*Bef*	11,969	1	6	1.16	*Bef*	10,846	1	6	1.12
	Aft	9,748	1	6	1.13	*Aft*	11,998	1	6	1.12
Asian	*Bef*	1,091	1	4	1.17	*Bef*	1,265	1	5	1.18
	Aft	1,152	1	4	1.11	*Aft*	1,268	1	5	1.13
White	*Bef*	615	1	4	1.11	*Bef*	624	1	4	1.09
	Aft	603	1	5	1.11	*Aft*	669	1	5	1.08
Other Race	*Bef*	122	1	4	1.13	*Bef*	109	1	3	1.13
	Aft	107	1	5	1.17	*Aft*	121	1	3	1.15

RESULTS

Balance between treatment and control groups

Recall that our identification strategy rests on the assumption that within a small window, exposure to violence before the exam rather than after the exam is essentially random. Empirically, this assumption suggests there should be no systematic differences between students exposed before and after the exam. Table 2 compares the mean individual characteristics of students in the treatment (exposed the exam) and control groups (exposed the week after the exam) to provide evidence on this assumption. Panels A and B include the full sample of students, and Panels C and D focus on students living in high poverty neighborhoods.

In Panels A and B, we see some small differences in the characteristics of students exposed before and after the exams, but there is no evidence that would lead one to worry that those exposed before the exam are systematically disadvantaged or otherwise distinct from those exposed after the exam. The geographic distribution of violent crimes across the city is slightly uneven and there are small differences in the residential borough of students exposed before and after the exams. These differences are not systematic across exams. Important individual characteristics that are highly correlated with academic performance appear to be balanced between the treatment and control groups, including free and reduced price lunch, special education status, immigrant status and home language, and whether the student is over age for grade.[10] Overall, differences are small and substantively unimportant. We include these individual student characteristics in our regressions to control for any random differences in students exposed to violence during the two time windows.

[10] As an additional test, we predict treatment (exposure before the exam) among the students exposed before or after the exam, as a function of individual student characteristics for ELA and math. Joint-F tests on the primary characteristics (prior year test score, black, Hispanic, Asian, other, female, free lunch, reduced price lunch, special education, foreign-born, and English as a second language) show that these predictors are not significantly different than zero. See Appendix Table A.

Table 2: Mean Differences in Characteristics of Students Exposed to Violent Crime Before & After Exam

A. ELA	**Total**		**Asian**		**Black**		**Hispanic**		**White**		**Other**	
Full Sample	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*
Observations	25,318	22,244	1,472	1,567	9,868	9,010	12,732	10,554	1,109	987	137	126
MN	0.18	0.19	0.16	0.19	0.13	0.12	0.22	0.24	0.22	0.19	0.10	0.13
BX	0.35	0.27	0.14	0.09	0.25	0.21	0.46	0.37	0.10	0.10	0.37	0.35
BK	0.35	0.40	0.32	0.34	0.53	0.57	0.21	0.25	0.47	0.45	0.44	0.43
QN	0.11	0.13	0.37	0.36	0.07	0.08	0.10	0.13	0.16	0.21	0.07	0.09
SI	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.04	0.06	0.02	0.00
Female	0.51	0.51	0.48	0.49	0.53	0.52	0.51	0.51	0.48	0.47	0.47	0.48
Free Lunch	0.88	0.88	0.85	0.87	0.87	0.86	0.92	0.92	0.64	0.69	0.80	0.88
Reduced Price Lunch	0.06	0.06	0.08	0.07	0.06	0.07	0.05	0.04	0.06	0.06	0.10	0.05
Special Ed.	0.11	0.11	0.05	0.05	0.10	0.11	0.12	0.12	0.12	0.13	0.16	0.17
Home Lang. not Eng.	0.42	0.42	0.73	0.77	0.06	0.06	0.67	0.68	0.36	0.40	0.16	0.14
Foreign-Born	0.13	0.14	0.34	0.35	0.08	0.10	0.14	0.15	0.17	0.21	0.18	0.09
English Second Lang.	0.14	0.14	0.17	0.16	0.02	0.02	0.24	0.24	0.10	0.09	0.09	0.04
Overage for grade	0.14	0.13	0.06	0.06	0.15	0.14	0.15	0.14	0.06	0.06	0.20	0.13
Took ELA Exam	0.96	0.96	0.94	0.94	0.98	0.98	0.94	0.94	0.95	0.95	0.96	0.99
B. MATH	**Total**		**Asian**		**Black**		**Hispanic**		**White**		**Other**	
Full Sample	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*
Observations	23,964	26,126	1,581	1,695	9,695	10,500	11,613	12,717	947	1073	128	141
MN	0.18	0.20	0.20	0.14	0.13	0.16	0.23	0.24	0.18	0.19	0.16	0.17
BX	0.30	0.30	0.11	0.13	0.24	0.20	0.40	0.41	0.11	0.10	0.36	0.35
BK	0.37	0.39	0.35	0.33	0.52	0.57	0.24	0.24	0.48	0.51	0.38	0.33
QN	0.13	0.10	0.33	0.39	0.09	0.05	0.13	0.10	0.20	0.15	0.08	0.11
SI	0.02	0.02	0.01	0.01	0.03	0.03	0.01	0.01	0.04	0.05	0.03	0.04
Female	0.52	0.52	0.48	0.48	0.53	0.53	0.51	0.51	0.49	0.50	0.47	0.45
Free Lunch	0.88	0.89	0.86	0.85	0.86	0.87	0.92	0.92	0.73	0.69	0.87	0.87
Reduced Price Lunch	0.06	0.06	0.08	0.07	0.07	0.07	0.05	0.04	0.06	0.08	0.06	0.09
Special Ed.	0.11	0.11	0.05	0.05	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.15
Home Lang. not Eng.	0.42	0.42	0.73	0.71	0.06	0.06	0.68	0.67	0.46	0.46	0.15	0.18
Foreign-Born	0.14	0.14	0.34	0.37	0.09	0.09	0.14	0.14	0.23	0.23	0.11	0.14
English Second Lang.	0.14	0.15	0.15	0.16	0.02	0.03	0.24	0.25	0.11	0.10	0.06	0.06
Overage for grade	0.14	0.13	0.06	0.06	0.15	0.14	0.14	0.14	0.06	0.06	0.19	0.16
Took Math Exam	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00	0.98	0.98

In the full sample, the majority of exposed students live in Brooklyn and the Bronx (~70%), with some in Manhattan (~18%), and fewer in Queens (11%), and very few in Staten Island (1%). The exposed sample is high poverty – 88 percent of students are eligible for free lunch and 6 percent for reduced price lunch. Many students in the exposed sample face other hurdles to academic success – over 40 percent speak a language at home other than English, 14 percent are enrolled in English as a Second Language services, and 14 percent are over age for grade. Unsurprisingly, educational disadvantage is more common among students living in higher poverty neighborhoods (Panels C and D). A larger share of students in this sample qualifies for free or reduced price lunch (95%).

Table 2 also reveals important differences in student characteristics by racial and ethnic group. In the full sample (Panels A and B), over eighty percent of exposed Asian, black, and Hispanic students qualify for free lunch compared to just over sixty percent of exposed white students. Black, Hispanic, and white students are more likely to qualify for special education than Asian students in the exposed sample, and a larger share of Black and Hispanic students in the exposed sample are over age for grade. The sample of students living in high poverty neighborhoods (Panels C and D) looks fairly similar, although the students are consistently higher-poverty across all racial and ethnic groups, as measured by qualification for free lunch.

The effect of exposure to violent crime on test-taking

Exposure to acute neighborhood violence may affect whether a student takes the standardized exam, the score on that exam, and whether or not the student passes the exam. We examine each of these outcomes in turn. All of the reported results are for the sample of students living in high poverty neighborhoods, but results are highly similar when examining the full set of students. Table 3 presents the results from linear probability models of the impact of exposure to violent crime on the probability that a student takes the math or ELA exam. There is no significant impact of exposure to violent crime before the exam on the probability of taking either the math or ELA exams (columns 1 and 3), compared to exposure after the exam, and the point estimates are small and statistically insignificant. Further, there is little evidence of differential impacts of exposure by race and ethnicity: the coefficients on the interaction terms included in the models in columns 2 and 4 are almost all insignificant, with one exception. Asian students who are exposed to violent crime in the week prior to the ELA exam are 1.5 percentage points less likely to take the ELA exam, compared to Asian students who are exposed to violent crime in the week directly following the exam, although the estimated effect is only marginally significant. Overall, it is not surprising that we find little impact of exposure on test-taking behavior given the extremely high rates of test-taking within the sample (between 95 and 99 percent, see Table 2).

Table 3: Take Exam Models

Impact of Exposure to Violent Crime [a], High Poverty Sample [b] (School Years 2004-05 to 2009-10)

7 Day Window	Take ELA		Take Math	
	Before	*Interaction*	*Before*	*Interaction*
	(1)	(2)	(3)	(4)
Exposed Before	-0.000569		0.000111	
	(0.00188)		(0.00107)	
Exposed*Black		0.000670		0.000352
		(0.00296)		(0.00169)
Exposed*Hispanic		0.000296		-0.000138
		(0.00262)		(0.00149)
Exposed*Asian		-0.0152*		0.00566
		(0.00801)		(0.00448)
Exposed*White		0.00112		-0.00633
		(0.0110)		(0.00624)
Exposed*Other		-0.0359		-0.0185
		(0.0251)		(0.0148)
Constant	0.906***	0.905***	1.002***	1.005***
	(0.00738)	(0.00925)	(0.00430)	(0.00527)
Observations	41,241	41,241	43,596	43,596
R-squared	0.201	0.201	0.013	0.013
Grade FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1
[a] Controlling for Race and ethnicity, Female, Free Lunch, Reduced Price Lunch, Special Education, Home language not English, Foreign-born, Limited English Proficient, and Over-age-for-Grade.
[b] The sample includes all students living in high poverty tracts who were exposed within 7 days before or after the exam. High Poverty defined as residing in a Census Tract with a child poverty rate at or above the median.

The effect of exposure to violent crime on test scores

Although exposure to violence does not affect whether or not students sit for exams, it does appear to influence how they fare on the exams. Results from the models of the impact of exposure to violent crime on standardized test scores are presented in Table 4. Overall, exposure to violent crime in the seven days prior to the ELA exam decreases test scores by 0.026 standard deviations, on average, compared to exposure in the week following the exam (column 1). Exposure to violent crime appears to have no effect on math performance, however (column 4). Allowing for differential effects by race (column 2), black students who are exposed to violent crime prior to the ELA exam perform 0.0582 standard deviations below their black peers who are exposed in the week after the exam. The effect of exposure to violence is equivalent to roughly 13 percent of the estimated black-white test score gap.[11] There are no statistically significant effects on ELA performance for any of the other racial or ethnic groups, and no effects for any of the groups on math. Controlling for prior performance in the subject dampens the main results somewhat (column 3), but the negative impact of exposure to violent crime on black students persists and remains statistically significant. In this specification, the impact of exposure to violent crime on ELA test scores for black students is equivalent to 18 percent of the estimated black-white test score gap. In contrast to the ELA results, we see no effects on math test scores.

[11] The point estimate on the interaction term (0.0582) is 12.9% of the point estimate on “black” (0.452), which represents the black-white gap in performance in this sample because “white” is the reference category.

Table 4: Covariate Models

Impact of Exposure to Violent Crime[a], High Poverty Sample[b] (School years 2004-05 to 2009-10)

7 Day Window	ELA			MATH		
	Before	*Interactions*	*Lagged Z Score*	*Before*	*Interactions*	*Lagged Z Score*
DV: ELA Z Score	(1)	(2)	(3)	(4)	(5)	(6)
Exposed Before	-0.0262***			-0.00283		
	(0.00800)			(0.00789)		
Exposed*Black		-0.0582***	-0.0335***		0.0126	0.0146
		(0.0124)	(0.0104)		(0.0125)	(0.00974)
Exposed*Hispanic		-0.00168	-0.0105		-0.0126	-0.00379
		(0.0113)	(0.00957)		(0.0111)	(0.00867)
Exposed*Asian		0.00330	0.0156		-0.0349	-0.00863
		(0.0343)	(0.0292)		(0.0331)	(0.0260)
Exposed*White		-0.0513	-0.0119		0.0287	-0.0223
		(0.0469)	(0.0402)		(0.0460)	(0.0360)
Exposed*Other		-0.0154	-0.128		-0.0546	-0.0584
		(0.106)	(0.0914)		(0.110)	(0.0887)
Z Score (t-1)			0.581***			0.683***
			(0.00422)			(0.00387)
Black	-0.457***	-0.452***	-0.189***	-0.476***	-0.468***	-0.201***
	(0.0247)	(0.0352)	(0.0296)	(0.0244)	(0.0338)	(0.0262)
Hispanic	-0.417***	-0.444***	-0.178***	-0.379***	-0.359***	-0.162***
	(0.0244)	(0.0349)	(0.0293)	(0.0239)	(0.0333)	(0.0258)
Asian	0.0419	0.0146	0.00981	0.312***	0.344***	0.107***
	(0.0293)	(0.0415)	(0.0349)	(0.0285)	(0.0401)	(0.0312)
Other Race	-0.429***	-0.447***	-0.161**	-0.455***	-0.415***	-0.109*
	(0.0579)	(0.0843)	(0.0717)	(0.0597)	(0.0826)	(0.0640)
Constant	0.461***	0.474***	0.539***	0.446***	0.431***	0.786***
	(0.0315)	(0.0394)	(0.0456)	(0.0317)	(0.0388)	(0.0423)
Observations	39,322	39,322	32,707	43,043	43,043	36,719
R-squared	0.176	0.177	0.474	0.172	0.172	0.554
Grade FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

[a] Controlling for Female, Free Lunch, Reduced Price Lunch, Special Education, Home language not English, Foreign-born, Limited English Proficient, and Over-age-for-Grade.
[b] The sample includes all students in high poverty tracts who were exposed within 7 days before or after the exam, and who took the exam in that year. High Poverty defined as residing in a Census Tract with a child poverty rate at or above the median.

Based on prior research suggesting that girls and boys may respond differently to environmental and neighborhood factors, we present additional results testing for gender interactions in Table 5. The results of models stratified by gender show negative and significant effects of exposure to violent crime on ELA test scores for both boys and girls, and the difference in the effects by gender is not statistically significant. Boys exposed to violent crime in the week prior to the exam score 0.0178 standard deviations below boys who are exposed in the week following the exam, and girls exposed before score 0.0208 standard deviations lower than girls exposed the following week. Consistent with our previous findings, there are no effects on math scores, and the models including interaction terms by race and ethnicity show that the effects are largest for black boys and girls. Exposure to violent crime results in black boys scoring 0.0340 standard deviations below black boys who are exposed after the exam, and black girls score 0.0317 standard deviations lower than black girls exposed in the following week. These score deficits are equal to17 percent of the black-white test score gap for both boys and girls.

Differences in student age and grade may also affect the magnitude of the impact of exposure to violence on achievement. Table 6 presents results of the models stratified by grade level, grouping elementary grades 3, 4, 5, and middle school grades 6, 7, and 8. The results clearly show that students in the elementary grades experience a large and significant decrease in ELA test scores following exposure to violent crime on the blockface. Students in the elementary grades who are exposed to violent crime prior to the exam score 0.0323 standard deviations lower on the ELA exam compared to elementary school students exposed in the week following the exam. Again, the effect is largest for black elementary school students – exposed black elementary school students score 0.0598 standard deviations below black elementary school students exposed in the week after the exam. This effect is equal to over 30 percent of the black-white test score gap among elementary school students. However, there is no acute effect of exposure to violent crime on ELA test scores for middle school students, with the exception of those who identify as belonging to an 'other' race/ethnicity. This may be because older students have more schooling and test-taking experience, and are less affected by outside factors compared to younger students. Alternatively, this finding may suggest that acute stress caused by exposure to violence in the days prior to an exam is less for older students, who may be routinely exposed to violence and crime in their daily lives. There are no effects of exposure to violence on math test scores by student grade level.

Table 5: Test Score Models, by Gender

Impact of Exposure to Violent Crime [a], High Poverty Sample [b]
(School Years 2004-05 to 2009-10)

	Males		Females	
VARIABLES	(1)	(2)	(3)	(4)
Exposed Before	-0.0178*		-0.0208**	
	(0.00966)		(0.00944)	
Exposed*Black		-0.0340**		-0.0317**
		(0.0150)		(0.0144)
Exposed*Hispanic		-0.0111		-0.0109
		(0.0136)		(0.0135)
Exposed*Asian		0.0325		0.00133
		(0.0405)		(0.0420)
Exposed*White		0.0307		-0.0590
		(0.0562)		(0.0575)
Exposed*Other		-0.172		-0.0801
		(0.124)		(0.136)
Z Score (t-1)	0.567***	0.567***	0.594***	0.594***
	(0.00608)	(0.00608)	(0.00586)	(0.00586)
Black	-0.230***	-0.197***	-0.170***	-0.184***
	(0.0297)	(0.0410)	(0.0303)	(0.0427)
Hispanic	-0.189***	-0.170***	-0.162***	-0.187***
	(0.0293)	(0.0405)	(0.0300)	(0.0425)
Asian	-0.0123	-0.0130	0.0624*	0.0320
	(0.0349)	(0.0481)	(0.0359)	(0.0507)
Other Race	-0.294***	-0.189*	-0.131*	-0.120
	(0.0679)	(0.0979)	(0.0739)	(0.105)
Constant	0.618***	0.595***	0.504***	0.523***
	(0.0568)	(0.0626)	(0.0601)	(0.0663)
Observations	15,942	15,942	16,765	16,765
R-squared	0.463	0.463	0.479	0.479
Grade FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] Controlling for Free Lunch, Reduced Price Lunch, Special Education, Home language not English, Foreign-born, Limited English Proficient, and Over-age-for-Grade.

[b] The sample includes all students in high poverty tracts who were exposed within 7 days before or after the exam, and who took the exam in that year. High Poverty defined as residing in a Census Tract with a child poverty rate at or above the median.

Table 6. Test Score Models, by Grade

Impact of Exposure to Violent Crime [a], High Poverty Sample [b]
(School Years 2004-05 to 2009-10)

	Elementary (Grades 3,4,5)		Middle (Grades 6,7,8)	
VARIABLES	(1)	(2)	(3)	(4)
Exposed Before	-0.0323***		-0.0123	
	(0.0111)		(0.00852)	
Exposed*Black		-0.0598***		-0.0162
		(0.0166)		(0.0134)
Exposed*Hispanic		-0.0204		-0.00492
		(0.0159)		(0.0119)
Exposed*Asian		0.0415		4.38e-05
		(0.0459)		(0.0378)
Exposed*White		0.0404		-0.0696
		(0.0649)		(0.0515)
Exposed*Other		0.0216		-0.294**
		(0.138)		(0.124)
Z Score (t-1)	0.590***	0.589***	0.575***	0.575***
	(0.00668)	(0.00668)	(0.00543)	(0.00543)
Black	-0.249***	-0.194***	-0.168***	-0.191***
	(0.0340)	(0.0504)	(0.0270)	(0.0363)
Hispanic	-0.215***	-0.181***	-0.150***	-0.180***
	(0.0337)	(0.0502)	(0.0266)	(0.0358)
Asian	-0.0501	-0.0455	0.0749**	0.0435
	(0.0400)	(0.0585)	(0.0320)	(0.0434)
Other Race	-0.304***	-0.287***	-0.149**	-0.0104
	(0.0762)	(0.105)	(0.0665)	(0.101)
Constant	0.574***	0.534***	0.172***	0.197***
	(0.0539)	(0.0645)	(0.0335)	(0.0403)
Observations	13,450	13,450	19,257	19,257
R-squared	0.455	0.455	0.490	0.490
Grade FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[a] Controlling for Female, Free Lunch, Reduced Price Lunch, Special Education, Home language not English, Foreign-born, Limited English Proficient, and Over-age-for-Grade.
[b] The sample includes all students in high poverty tracts who were exposed within 7 days before or after the exam, and who took the exam in that year. High Poverty defined as residing in a Census Tract with a child poverty rate at or above the median.

The effect of exposure to violent crime on test failure

Perhaps the most telling measure of student success is whether the student's test score represents a pass or a fail. Table 7 presents the results from linear probability models of passing both the ELA and math exams. Overall, exposure to violent crime in the week before the ELA exam decreases the probability of passing that exam by 1.13 percentage points, compared to peers who are exposed in the week after the exam (column 1). Results from specifications including race/ethnic group interactions shown in column 2 indicate much stronger effects for black students. There is no effect of exposure to violent crime on any of the racial/ethnic groups other than blacks. Black students who are exposed to violent crime in the week prior to the exam are 2.85 percentage points less likely to pass the exam than black students exposed to violent crime in the week following the exam, an effect size equivalent to 18 percent of the black-white gap in ELA passing rates.[12] Consistent with the previous results, there is no significant effect of exposure to violent crime on the probability of passing the math exam.

Robustness tests

The results reported above are robust to multiple sensitivity analyses. First, the main effect of exposure to violence in the seven days prior to the exam on ELA test scores is robust to exposure windows of 2, 3, 4, 5, 6, 14, and 28 days in length. The effects for black students are also robust to each of these exposure windows. We prefer the seven day measure both because prior research has found that the acute effects of local violence persist for roughly 7 to 10 days following the incident (Sharkey 2010; Sharkey et al. 2012), and because crime patterns tend to vary by the day of the week. The 7 day window includes one weekend and all week days in the period prior to and after the exam. The results reported above focus on the sample of students who reside in neighborhoods that have child poverty rates higher than the median city-wide level. We selected this sample to facilitate a comparison between students who live in similarly disadvantaged neighborhoods. However, our results are robust to estimation of all of the models on the full sample of exposed students.

[12] Models limiting the sample to students who took the exam show the same pattern of results, and slightly larger effect sizes. See Appendix Table B.

Table 7: Pass Exam Models

Impact of Exposure to Violent Crime [a], High Poverty Sample [b c] (School Years 2004-05 to 2009-10)

7 Day Window	Pass ELA		Pass Math	
	Before	*Interaction*	*Before*	*Interaction*
	(1)	(2)	(3)	(4)
Exposed Before	-0.0113**		0.00156	
	(0.00449)		(0.00422)	
Exposed*Black		-0.0285***		0.00508
		(0.00706)		(0.00667)
Exposed*Hispanic		-0.00237		-0.00579
		(0.00626)		(0.00592)
Exposed*Asian		0.0288		0.0294*
		(0.0191)		(0.0177)
Exposed*White		-0.000234		0.0311
		(0.0261)		(0.0247)
Exposed*Other		-0.0423		-0.0163
		(0.0600)		(0.0586)
Constant	0.761***	0.755***	0.888***	0.874***
	(0.0176)	(0.0221)	(0.0170)	(0.0209)
Observations	41,241	41,241	43,596	43,596
R-squared	0.187	0.187	0.193	0.193
Grade FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[a] Controlling for Female, Free Lunch, Reduced Price Lunch, Special Education, Home language not English, Foreign-born, Limited English Proficient, and Over-age-for-Grade.
[b] The sample includes all students in high poverty tracts who were exposed within 7 days before or after the exam. High Poverty defined as residing in a Census Tract with a child poverty rate at or above the median.
[c] Models limited to students who took the exam show the same pattern of results, but larger effect sizes (see Appendix Table B).

Discussion

The central finding is that acute exposure to very localized violent crime decreases standardized test scores in English language arts, but not in math. This conclusion is based on comparisons of students who are exposed to one or more incidents of violent crime on their residential blockface in the week prior to the exam to students exposed in the week following the exam. The magnitude of the estimated impact of exposure to violent crime is substantively small in the overall model. However, models including race/ethnicity interactions show that the estimated effects are much larger for black students, and are null for other groups. Black students exposed to a violent crime in the week prior to the ELA exam score .06 standard deviations lower than those exposed in the week after the exam, an effect size that is 13 percent of the black/white gap in test score performance in our sample. Black students exposed to violent crime are three percentage points less likely to pass the ELA exam, an effect size that is equal to 18 percent of the black/white gap in passing rates. Elementary school students exposed to violent crime experience a large decrease in ELA test scores, compared to elementary school students exposed after the exam. For black elementary school students, this reduction in test scores is equivalent to over 30 percent of the black/white test score gap. Thus, while the overall effect size is small in magnitude, the impact for specific subgroups is substantial.

The robust identification strategy – which relies on variation in the timing of violent crime incidents relative to test dates – strengthens the internal validity of the estimates and provides confidence in the interpretation of these estimated effects as causal. This approach does not allow for tests of the mechanisms, however, and thus leaves several questions unanswered. The first issue concerns why we find consistent, negative effects of exposure on ELA exam test scores and exam passage, but no effects on math. The strong effects on English language arts assessments are consistent with a strand of research on neighborhood effects which finds that neighborhood disadvantage, and community violence in particular, seems to impede the development of language and reading skills and impair performance on tests of verbal or reading skills (Burdick-Will et al 2010; Kling, Liebman and Katz 2007:; Ludwig et al. 2010; Sharkey 2010; Sampson, Sharkey, and Raudenbush 2008). Researchers have proposed several possible explanations for the long-term effects of exposure to violent or severely disadvantaged environments on development of verbal and language skills, focusing on the importance of verbal interactions within the home or in public space as potential explanations (Sampson, Sharkey, and Raudenbush 2008). However, these explanations are less applicable for understanding why the acute effects of exposure to violent crime are limited to assessments of English or language skills. Potential explanations may involve the interaction of the physiological responses to stress that arises from exposure to violence and the types of skills that are required to perform well in tests of English or language arts as opposed to tests of math achievement. We are unable to provide evidence on these possible mechanisms, but we consider this a central question for future research.

A second unresolved question is why we find the largest effects for black students, even though Hispanic students are exposed to violent crime in their neighborhoods at similarly high rates. It is notable that several recent studies analyzing neighborhood effects on test scores are either based on samples composed primarily of African Americans or else show the most pronounced effects for African Americans (Kling, Liebman and Katz 2007; Ludwig et al. 2010; Sharkey 2010; Sampson, Sharkey, and Raudenbush 2008). We propose two potential explanations for the race/ethnicity interaction. The first is that violence may be particularly salient for African Americans relative to other groups if the victims of violent crimes are disproportionately black (Sharkey 2010). Because we do not know the race/ethnicity of victims in the data, this mechanism is not possible to test. The second potential explanation is that the systems of support for blacks, particularly in the form of counseling and support systems in the school setting, may be different for blacks compared to Hispanics, Asian Americans, or white students. We intend to explore this hypothesis in future research.

A third question is why we find significant, negative effects for elementary school students (in grades 3, 4, and 5) and no effect on middle school students (grades 6, 7, and 8). We have two hypotheses about this finding. The first is that it reflects responses to the school setting – and in particular, the testing setting – that change over time. Younger students with less experience taking tests may be more sensitive to factors outside the classroom when taking exams. The acute effect of exposure to violence, therefore, would have a larger effect for these students, than for older students who have more experience with testing. The second hypothesis centers on accumulated exposure to violence. Older students may be less sensitive to the acute effect of exposure to violence if they have had multiple exposures over their lifetimes, or regularly in their everyday lives. Therefore, an exposure that might have had large effects when a student was younger may have less of an effect after years living in a neighborhood where crime is common. However, existing research suggests that older students are more likely to be involved in disorderly or criminal behaviors, making them more likely to be personally exposed to crime either through witnessing it firsthand or participating in the crime. Even though older students are more likely to be exposed, these exposures to not appear to translate into decreases in test scores in the short run.

In addition to these unresolved questions there are a few limitations of the analysis that are important to acknowledge. The first is that the identification strategy is based on the assumption that there are no unobserved characteristics that distinguish students who are exposed to violent crimes before and after the administration of the exams. It is not possible to provide definitive proof that the assumption is valid, but it is difficult to come up with plausible stories as to why students living in streets where violence occurred before the exam might differ from students living on streets where violence occurred after the exam. The evidence available suggests that there are not systematic differences between the treatment and control groups, providing support for this assumption.

The analysis could be critiqued on the basis of external validity as well, as it is based on data from New York City only. Although we acknowledge the unique features of New York City, we argue that size and diversity of New York's public school system provides lessons that are useful for all urban school systems. New York City is home to the largest school district in the U.S., with over one million students and more than 1,600 schools. The sheer size of the public school population enables nuanced analyses of students in various underrepresented subgroups that would be impossible to conduct elsewhere. Still, the findings from the analysis are not generalizable to cities other than New York, and additional research should be conducted in other cities to determine whether the findings presented are replicated in cities of different sizes and with different student populations.

With these limitations and unresolved questions in mind, what are the implications of the findings for educational inequality? In the introductory sections of the article we described a longstanding debate in the field of education on the role that schools can play in overcoming the disadvantages and burdens associated with student poverty. One perspective in this debate is that the school setting should be viewed as something of a sanctuary, a place where students are separated from the burdens associated with daily life in poor families or in poor communities. This article provides evidence that complicates this perspective.

What this debate lacks is a strong base of evidence identifying what it is about growing up in a disadvantaged family setting or a disadvantaged community setting that affects the performance of children when they enter the school. This article offers evidence about one specific, concrete way in which disadvantage in students' residential environments makes its way into the school setting to affect academic performance. In this way, the analysis moves from the abstract argument that something about growing up in a poor neighborhood setting affects children's performance in school, to a more tangible argument that specific incidents occurring on the residential blockfaces of students have a measurable impact on assessments that carry tremendous importance for the student, for his or her teacher, and for the school which he or she attends.

In addition to being more tangible and concrete than previous research on neighborhood poverty and academic performance, we argue that the analysis generates more convincing causal estimates than much of the empirical research in the literature. Research on the relationship between neighborhood conditions and academic success typically relies on variation among students living in different neighborhood environments that offer unique sets of risks and resources. The common critique of this literature is that unobserved characteristics of families may affect where families reside and may also affect how students perform in school, thus generating bias due to classic confounding (Kling, Liebman and Katz 2007). Alternatively, the evidence from residential mobility experiments like Moving to Opportunity overcomes the problem of selection bias, but generates estimates that are difficult to interpret because they conflate the effect of changing neighborhoods with the effect of residential mobility. Several studies find that moving itself is linked with poor academic outcomes, suggesting that this is not a trivial problem for the experimental literature from mobility programs (Pribesh and Downey 1999; Scanlon and Devine 2001; Swanson and Schneider 1999).

This study exploits variation in the timing of violent crime, rather than in exposure to violent crime. In this way, the approach overcomes the problem of selection bias and allows for more convincing causal inferences. Because we focus on a very specific "treatment" of interest, exposure to an incident of violent crime, the interpretation of the meaning of the treatment effect under study is precise. Unlike much of the literature on neighborhood effects or exposure to violence, our empirical approach does not allow for estimates of the long-term consequences of exposure to violent environments. However, by focusing on the acute effects of exposure to local violence we hope to shed light on an additional way in which living in a violent environment becomes salient in the lives of young people. In demonstrating the consequences of violent crime on students' performance on high-stakes standardized assessments, this article reveals the potentially long-term consequences of exposure to acute stressors in a child's environment.

The implications of our findings are diverse. One set of implications pertains to the weight given to standardized assessments as a means of evaluating not only students, but also teachers and schools. Evaluations of New York City teachers, which are based on students' test scores, are published and are used to assess the performance of teachers. The performance of students is an important factor in the grades assigned to schools and in decisions about whether schools require new leadership or whether they should be closed. The finding showing that students' scores are affected by even a single incident of violent crime that occurs close to home reinforces the idea that a tremendous amount of attention is being placed on the performance of students during a single examination taken at a single point in time in a specific setting. Violent crimes are only one type of environmental stressor that that may generate bias in the performance of students in a manner that systematically affects students, teachers and administrators in more disadvantaged, violent communities across the city.

This research also highlights the importance of interventions that focus on younger students. Not only do we find the largest impacts on elementary school students, and in particular, black elementary school students, but we find no impact of exposure on middle school students. Given the high correlation between student test scores from one year to the next, lower test scores at an early age may chart a negative course for future years of schooling and achievement. Further, test scores in the "high stakes" years of fourth and seventh grade – which influence school placements in the following years – may further derail students from academic success.

Beyond the question of evaluation, by focusing our attention on a very specific type of environmental stressor we are able to provide a more targeted discussion of policy implications pertaining to students' exposure to violence and other environmental stressors. Policy responses might include training for teachers to expand awareness of the burdens that students may carry into the classroom and to respond effectively, or added resources for counselors to provide the support necessary for students from intensely violent residential environments.

Additional research should be conducted to determine whether school climate or school safety policies moderate the effects of exposure to violence. Lastly, it is important to note that this article focuses only on the effects of localized violence occurring in the period prior to standardized assessments, but there is no reason to think that the consequences of exposure to violent crime are limited to standardized test performance. Similar incidents of violence occur on a regular basis and have the potential to alter students' experience in school, making them fearful of attending school or making it difficult for them to concentrate on routine tasks in the classroom setting. The results should provoke a broader recognition of the burdens that students from violent or chaotic environments bring with them to the classroom, and add urgency for school officials and policy makers to address the consequences of community violence for students' academic progress.

REFERENCES

Alexander, Karl, Doris Entwisle, and Linda S. Olson. 2001. "Schools, Achievement, and Inequality: A Seasonal Perspective." *Educational Evaluation and Policy Analysis* 23(2): 171-191.

Bingenheimer, Jeffrey. B., Robert T. Brennan, and Felton J. Earls. 2005. "Firearm Violence Exposure and Serious Violent Behavior." *Science* 308(5726): 1323-1326.

Bowen, Natasha K., and Gary L. Bowen. 1999. "Effects of Crime and Violence in Neighborhoods and Schools on the School Behavior and Performance of Adolescents." *Journal of Adolescent Research* 14(3): 319-342.

Bryk, Anthony S., Penny Bender Sebring, Elaine Allensworth, Stuart Luppescu, and John O. Easton. 2010. *Organizing Schools for Improvement. Lessons from Chicago*. Chicago: University of Chicago Press.

Buka, Stephen L., Theresa L. Stichick, Isolde Birdthistle, and Felton J. Earls. 2001. "Youth Exposure to Violence: Prevalence, Risks and Consequences." *American Journal of Orthopsychiatry* 71: 298-310.

Burdick-Will, Julia, Jens Ludwig, Stephen Raudenbush, Robert Sampson, Lisa Sanbonmatsu, and Patrick Sharkey. (2011). "Converging Evidence for Neighborhood Effects on Children's Test Scores: An Experimental, Quasi-experimental, and Observational Comparison." Pp. 255-276 in *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*, Greg Duncan and Richard Murnane, eds. New York: Russell Sage.

Chenoweth, Karin. 2007. *It's Being Done: Academic Success in Unexpected Schools.* Cambridge, MA: Harvard Education Press.

Coleman, James, Ernest Campbell, Carol Hobson, James McPartland, Alexander Mood, Frederic Weinfeld, and Robert York. 1966. *Equality of Educational Opportunity*. Washington, DC: U.S. Government Printing Office.

Delaney-Black, Virginia, Chandice Covington, Steven J. Ondersma, BethNordstrom-Klee, Thomas Templin, Joel Ager, James Janisse, and Robert J. Sokol. 2002. "Violence exposure, trauma, and IQ and/or reading deficits among urban children." *Archives of pediatrics & adolescent medicine* 156(3): 280.

Dobbie, Will and Fryer, Roland. 2009. "Are High-Quality Schools Enough to Increase Achievement Among the Poor? Evidence from the Harlem Children's Zone." *American Economic Journal: Applied Economics* 3(3): 158-187.

Downey, Douglas B., Paul T. Voh Hippel, and Beckett A Broh. 2004. "Are Schools the Great Equalizer? Cognitive Inequality during the Summer Months and the School Year." *American Sociological Review* 69(5): 613-635.

Ellen, Ingrid Gould, and Margery Austin Turner. 1997. "Does Neighborhood Matter? Assessing Recent Evidence." *Housing Policy Debate* 8(4): 833-866.

Entwisle, Doris R. and Karl L. Alexander. 1992. "Summer Setback: Race, Poverty, School Composition and Math Achievement in the First Two Years of School." *American Sociological Review* 57:72-84.

Finkelhor, David, Heather Turner, Richard Ormrod, Sherry Hamby, and Kristen Kracke. 2009. "Children's Exposure to Violence: A Comprehensive National Survey." Juvenile Justice Bulletin, Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice.

Grogger, Jeff. 1997. "Local Violence and Educational Attainment." *Journal of Human Resources* 32(4): 659-682.

Harding, David J. 2003. "Counterfactual Models of Neighborhood Effects: The Effect of Neighborhood Poverty on Dropping Out and Teenage Pregnancy." *American Journal of Sociology* 109(3): 676-719.

Harding, David J. 2009. "Collateral Consequences of Violence in Disadvantaged Neighborhoods." *Social Forces* 88(2): 757-782.

Harding, David J. 2010. *Living the Drama: Community, Conflict, and Culture among Inner-City Boys.* Chicago: University of Chicago Press.

Hart, Betty and Todd R. Risley. 1995. *Meaningful Differences in the Everyday Experiences of Young American Children*. The University of Kansas: Paul H. Brookes Publishing Co.

Hurt, Hallam, Elsa Malmud, Nancy L. Brodsky, and Joan Giannetta. 2001. "Exposure to Violence: Psychological and Academic Correlates in Child Witnesses." *Archives of pediatrics & adolescent medicine* 155(12): 1351-1356.

Kling, Jeffrey R., Jeffrey B. Liebman, and Lawrence F. Katz. 2007. "Experimental Analysis of Neighborhood Effects." *Econometrica* 75(1): 83-119.

Kling, Jeffrey R., Jens Ludwig, and Lawrence F. Katz. 2005. "Neighborhood Effects on Crime for Female and Male Youth: Evidence from a Randomized Housing Voucher Experiment." *Quarterly Journal of Economics* 120(1): 87-130.

Kotlowitz, Alex. (1992). *There are no children here: The story of two boys growing up in the other America*. Anchor.

Lareau, Annette. 2000. *Home Advantage: Social Class and Parental Intervention in Elementary Education.* Oxford: Rowman and Littlefield.

LeDoux, Joseph E. 2000. "Emotion Circuits in the Brain." *Annual review of neuroscience* 23(1): 155-184.

Ludwig, Jens, Brian A. Jacob, Michael Johnson, Greg J. Duncan, and James E. Rosenbaum. 2009. "Neighborhood Effects on Low-Income Families: Evidence from a Randomized Housing Voucher Lottery." University of Chicago Working Paper, Chicago, IL.

Margolin, Gayla, and Elana B. Gordis. 2004. "Children's Exposure to Violence in the Family and Community." *Current Directions in Psychological Science* 13(4): 152-155.

McEwen, Bruce S., and Robert M. Sapolsky. 1995. "Stress and Cognitive Function." *Current opinion in neurobiology* 5(2): 205-216.

Mendenhall, Ruby, Stefanie DeLuca, and Greg Duncan. 2006. "Neighborhood Resources, Racial Segregation, and Economic Mobility: Results from the Gautreaux Program." *Social Science Research* 35:892-923.

Osofsky, Joy D. 1999. "The Impact of Violence on Children." *The Future of Children*: 33-49.

Pribesh, Shana, and Douglas B. Downey. 1999. "Why are Residential and School Moves Associated with Poor School Performance?" *Demography* 36:521-534.

Pynoos, Robert S., Calvin Frederick, Kathi Nader, William Arroyo, Allan Steinberg, Spencer Eth, Francisco Nunez, and Lynn Fairbanks. 1987. "Life Threat and Posttraumatic Stress in School-Age Children." *Archives of general psychiatry* 44(12): 1057.

Richters, John E., and Pedro Martinez. 1993. "The NIMH Community Violence Project: I. Children as Victims of and Witnesses to Violence." *Psychiatry* 56(1): 7-21.

Rivkin, Steven G., Eric A. Hanushek, and John F. Kain. 2005. "Teachers, Schools, and Academic Achievement." *Econometrica* 73(2): 417-458.

Rothstein, Richard. 2004. *Class and schools: Using Social, Economic, and Educational Reform to Close the Achievement Gap.* Washington, DC: Economic Policy Institute.

Rubinowitz, Leonard S. and James E. Rosenbaum. 2000. *Crossing the Class and Color Lines: From Public Housing to White Suburbia*. Chicago: University of Chicago Press.

Sampson, Robert J., Patrick Sharkey, and Stephen Raudenbush. 2008. "Durable Effects of Concentrated Disadvantage on Verbal Ability among African-American Children." *Proceedings of the National Academy of Sciences* 105:845-852.

Sanbonmatsu, Lisa, Jeffrey Kling, Greg Duncan and Jeanne Brooks-Gunn. 2006. "Neighborhoods and Academic Achievement: Results from the Moving to Opportunity Experiment." *Journal of Human Resources* 41(4): 649 – 691.

Scanlon, Edward, and Kevin Devine. 2001. "Residential Mobility and Youth Well-Being: Research, Policy, and Practice Issues." *Journal of Sociology and Social Welfare* 28: 119.

Shahinfar, Ariana, Janis B. Kupersmidt, and Louis S. Matza. 2001. "The Relation between Exposure to Violence and Social Information Processing among Incarcerated Adolescents." *Journal of Abnormal Psychology* 110:136.

Sharkey, Patrick. 2010. "The Acute Effect of Local Homicides on Children's Cognitive Performance." *Proceedings of the National Academy of Sciences* 107:11733-11738.

Sharkey, Patrick and Felix Elwert. 2011. "The Legacy of Disadvantage: Multigenerational Neighborhood Effects on Cognitive Ability." *American Journal of Sociology* 116: 1934-1981.

Sharkey, Patrick, Nicole Strayer, Andrew Papachristos, and Cybele Raver. 2012. “The Effect of Local Violence on Children’s Attention and Impulse Control.” *American Journal of Public Health* (in press).

Swanson, Christopher.B. and Barbara Schneider. 1999. “Students on the Move: Residential and Educational Mobility in America's Schools.” *Sociology of Education*: 54-67.

Thernstrom, Abigail and Thernstrom, Stephen. 2003. *No Excuses: Closing the Racial Gap in Learning*. New York: Simon and Schuster.

Tyson, Karolyn. 2011. *Integration Interrupted: Tracking, Black Students, and Acting White after Brown: Tracking, Black Students, and Acting White after Brown*. New York: Oxford University Press.

Votruba, Mark E. and Jeffrey Kling. 2009. “Effects of Neighborhood Characteristics on the Mortality of Black Male Youth: Evidence from Gautreaux, Chicago.” *Social Science & Medicine* 68:814-823.

Wodtke, Geoffrey, David J. Harding, and Felix Elwert. 2011. “Neighborhood Effects in Temporal Perspective.” *American Sociological Review* 76(5): 713-736.

APPENDIX

Table A. Predicting Treatment (Exposure Before Exam vs. After Exam)

VARIABLES	(1) ELA B	(1) ELA S.E.	(2) MATH B	(2) MATH S.E.
Lagged Test Score	-0.00267	(0.00311)	-0.00544*	(0.00300)
Black	-0.0112	(0.0135)	0.0329**	(0.0133)
Hispanic	0.00221	(0.0135)	0.0252*	(0.0131)
Asian	-0.0153	(0.0164)	0.0211	(0.0157)
Other Race	-0.0189	(0.0372)	-0.0337	(0.0367)
Female	0.000723	(0.00513)	0.000186	(0.00493)
Free Lunch	-0.0101	(0.0107)	0.000803	(0.0106)
Reduced Price Lunch	-0.00615	(0.0147)	0.00292	(0.0145)
Special Education	-0.0175**	(0.00833)	0.00583	(0.00796)
Home Lang. not English.	-0.00860	(0.00704)	0.00115	(0.00691)
Foreign-born	-0.0303***	(0.00857)	-0.0137*	(0.00776)
English Second Lang.	0.00793	(0.0104)	0.00178	(0.00882)
Bronx	0.0675***	(0.00761)	0.0216***	(0.00728)
Brooklyn	-0.0320***	(0.00755)	0.0125*	(0.00720)
Queens	-0.0676***	(0.00962)	0.0754***	(0.00932)
Staten Island	-0.000244	(0.0237)	0.0371**	(0.0189)
Constant	0.477***	(0.0179)	0.453***	(0.0177)
Observations	37,342		41,315	
R-squared	0.026		0.006	
F test	2.174		1.820	
Prob > F	0.0104		0.0393	
Grade & Year FE	Yes		Yes	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

F-test column 1: zread_lag1, black, hispa, Asian, other, female, free, reducedpr, sped, noneng, foreign, esl

F-test column 2: Lagged Test Score, Black, Hispanic, Asian, Other Race, Female, Free Lunch, Reduced Price Lunch, Special Education, Home Language not English, , Foreign-born, English as a Second Language

Table B. Pass Exam Models (Sample Limited to Students who Took Exam)

Impact of Exposure to Violent Crime [a], High Poverty Sample [b] (School Years 2004-05 to 2009-10)

7 Day Window	Pass ELA		Pass Math	
	Before	*Interaction*	*Before*	*Interaction*
	(1)	(2)	(3)	(4)
Exposed Before	-0.0113**		0.00167	
	(0.00465)		(0.00424)	
Exposed*Black		-0.0291***		0.00532
		(0.00722)		(0.00670)
Exposed*Hispanic		-0.00249		-0.00565
		(0.00656)		(0.00593)
Exposed*Asian		0.0388*		0.0252
		(0.0199)		(0.0177)
Exposed*White		0.00119		0.0355
		(0.0273)		(0.0247)
Exposed*Other		-0.0312		-0.0106
		(0.0615)		(0.0589)
Constant	0.796***	0.790***	0.889***	0.872***
	(0.0183)	(0.0229)	(0.0170)	(0.0208)
Observations	39,322	39,322	43,043	43,043
R-squared	0.171	0.171	0.194	0.194
Grade FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] Controlling for Female, Free Lunch, Reduced Price Lunch, Special Education, Home language not English, Foreign-born, Limited English Proficient, and Over-age-for-Grade.

[b] The sample includes all students in high poverty tracts who were exposed within 7 days before or after the exam. High Poverty defined as residing in a Census Tract with a child poverty rate at or above the median.