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The Role of School Climate in Mitigating the Effects of Neighborhood Socio-Economic Status and Violence on Academic Achievement

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The Role of School Climate in Mitigating the Effects of Neighborhood Socio-Economic Status and Violence on Academic Achievement

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Abstract

In recent years the quality of education available to children has become increasingly dependent on the social and economic demographics of neighborhoods in which the children live. This study assesses the role of community violence in explaining the relation between SES and academic outcomes and the potential of positive school climate to promote academic achievement. With a sample of 297 Chicago public elementary schools, we test the hypotheses that violent crime mediates the relation between SES and academic achievement, and school climate has a direct effect on achievement and moderates the relation between SES and academic achievement. Results support the hypothesized mediation such that lower SES was associated with lower academic achievement and violent crime partially mediated this relation. School climate was positively associated with academic achievement but did not significantly moderate the relation between SES and academic achievement. Implications for theory, research, and interventions are discussed.

Introduction

Academic achievement is a strong predictor of future educational attainment, employment, and earning potential; however, schools located in neighborhoods with fewer socio-economic resources and serving the highest need students tend to underperform academically. Research suggests that neighborhood characteristics influence academic outcomes (Orfield, Kucsera & Siegel-Hawley, 2012; Sirin, 2005), yet some schools perform better than expected, despite high-risk conditions. While school climate has gained interest for its potential to influence academic outcomes at the student level (Thapa, Cohen, Guffey & Higging-D'Alesandro, 2013; Zullig, Koopman, Patton & Ubbes, 2010), few studies have focused on how school climate affects school-level academic outcomes. In this study, we account for broader contextual risk factors commonly faced by urban youth through an examination of neighborhood SES and violent crime, as well as school climate in relation to school-level academic outcomes.

Theoretical Underpinnings

This study draws from multiple complementary theoretical perspectives: Bronfenbrenner's social ecological model (1979), Shaw and McKay's theory of social disorganization (1949), and resilience (Garmezy,1993). The social ecological model and social disorganization theory provide a framework for understanding the mechanisms by which neighborhood disadvantage might translate into maladaptive youth outcomes. Resilience provides a lens for conceptualizing how positive adaptation occurs in the presence of adversity.

Bronfenbrenner (1979) argues that individuals exist within a network of nested systems, each influencing the other. Based on Bronfenbrenner's ecological model, "academic outcomes are seen as a result of the joint function of characteristics representing the individual person and their environment" (Stewart, 2007, p.17). By extension, the performance of a school is

influenced by the cultural, organizational and structural characteristics of the school, as well as the surrounding neighborhood. Social disorganization theory explains crime and delinquency as a product of several domains of collective neighborhood disadvantage, such as socio-economic indications of poverty, unemployment, and low educational achievement (Shaw & McKay, 1949). Furthermore, research grounded in social disorganization theory has found that neighborhood violence may act as a mediator, driving the negative effects of neighborhood disadvantage on youth outcomes, including academic achievement (Harding, 2009). These theories suggest that the socio-economic characteristics of a neighborhood influence the incidence of violent crime, which in turn impacts academic outcomes in neighborhood schools.

Resilience can help to explain how and why better-than-expected academic performance occurs in the context of significant adversity (Luthar & Cicchetti, 2000). Resilience refers to positive adaptation despite a significant threat to well-being (Luthar, Cicchetti & Becker, 2000). Resilience theory posits that promotive factors can facilitate this process by mitigating the negative effects of risk on individuals (Fergus & Zimmerman, 2005). This study will test a protective model of resilience, in which "assets or resources moderate or reduce the effects of a risk on a negative outcome" (Fergus & Zimmerman, 2005, p. 402). School climate is hypothesized to directly influence academic outcomes, as well as serve as a protective factor, moderating the relation between socio-economic status and academic achievement.

Socioeconomic Status (SES) and Academic Outcomes

Children growing up in impoverished communities are confronted with widespread and systemic inequities in comparison to their more economically secure peers. The pervasive negative effects of socio-economic disadvantage on children carry over to academic settings (Evans, 2004). Impoverished children have restricted access to the resources they need to

overcome adversity and thrive academically. Given that school success is a strong predictor of future education, employment, and earning potential, early discrepancies in academic achievement are likely to have long-term consequences for the future trajectory of individual students (Bowen, Bowen & Ware, 2002, Kena et al., 2014).

It has been well established that socioeconomic status is positively associated with academic achievement, such that children from higher SES backgrounds tend to perform better academically (Jencks, 1972; Marjoribanks, 1979; McGaw & Schleicher, 2014; Noel & de Broucker, 2001; Perry & McConney, 2010). The correlation between income and academic achievement has been growing more robust over the past several decades, suggesting achievement and the quality of educational opportunities are increasingly tied to income (Reardon, 2011). A meta-analysis by Sirin (2005) revealed that "family SES sets the stage for student's academic performance both by directly providing resources at home and indirectly providing the social capital that is necessary to succeed in school" (Sirin, 2005, p. 438).

Indicators of SES alone do not fully capture the adversity faced by youth living in disadvantaged neighborhoods. Neighborhoods that are low in social and economic capital are often also high in violence (Evans, 2004; Harding, 2009; Hsieh & Pugh, 1993). Examining the role of community violence in relation to SES and academic outcomes is necessary.

Community Violence and Academic Outcomes

Children from low-income backgrounds are disproportionately more likely to live in violent neighborhoods and either witness or fall victim to acts of violence, especially in urban communities (Benhorin & McMahon, 2008; Cammack, Lambert, Ialongo, 2011; Evans, 2004). It is estimated that the majority of inner city adolescents have been exposed to community violence and up to one-third have been directly victimized (Margolin & Gordis, 2000). This exposure can

start at an early age; a survey of elementary school children in a very low-income community in Chicago found that three quarters of children surveyed had seen someone get robbed, stabbed, or shot (Benhorin & McMahon, 2008).

Exposure to community violence poses a threat to a school-aged child's physical safety as well as his/her psychological development/adjustment. The factors that contribute to violence in community settings are likely to "spillover" to school settings (Astor, Benbenishty & Estrada, 2009; Moilanen, Shaw & Maxwell, 2010). Youth who are victims or witnesses of violence are more likely to act aggressively at school (Brockenbrough, Cornell & Loper, 2002; Cammack, Lambert & Ialongo, 2011; Margolin & Gordis, 2000; McMahon, Todd, Martinez, Coker, Sheu, Shah & Washburn, 2013; Schwartz & Gorman, 2003; Thompson & Massat, 2005). Furthermore, students exposed to more types of violence feel less safe in school and perform less well academically (Henrich, Schwab-Stone, Fanti, Jones & Ruchkin, 2004; Hurd, Stoddard & Zimmerman, 2013; Moilanen, Shaw & Maxwell, 2010). Exposure to violence changes the perceived cost and benefit of attending school: when students' lives are regularly threatened they are less likely to invest in/prioritize schooling and more likely to engage in risky behaviors (Harding, 2009, Margolin & Gordis, 2000). School climate research suggests that the structural, relational, and organization characteristics of schools may buffer the negative effects of high-risk environments on academic outcomes.

School Climate in Relation to Academic Outcomes

A child's performance in school is influenced by neighborhood characteristics like socio-economic status (SES) and community violence. While there is an abundance of evidence to suggest that children living in low SES, highly violent communities tend to perform poorly academically in comparison to children living in more socio-economically secure, safer

communities, there is a lack of research on how to systematically address these educational discrepancies. Research on school climate has garnered a growing interest as a potential avenue for addressing systemic inequalities at the institutional level.

Broadly defined, "school climate is based on patterns of people's experiences with school life and reflects norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures" (Cohen, McCabe, & Michelli, 2009, p. 182). A strongly positive school climate has been shown to be predictive of academic success, violence prevention, healthy child development, and teacher retention (Cohen, McCabe & Michelli, 2009). A positive school climate is also associated with safer learning environments in terms of lower incidence/perception of school violence (Steffgen, Rechia & Viechtbauer, 2013), less student and teacher victimization (Gottfredson, Gottfredson, Payne & Gottfredson, 2005), and improved social/emotional development (Zullig, Koopman, Patton & Ubbes, 2010). Finally, a positive school climate has been shown to mitigate the effects of socio-economic risk factors on academic achievement and act as a protective factor by fostering positive youth development (Astor, Benbenisty & Estrada, 2009). School climate as perceived by students and teachers can have a profound impact on individual and institutional outcomes.

Research on the benefits of a positive school climate at the institutional level has driven an increasing number of schools to incorporate measures of school climate in routine school evaluations (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010). School climate research can shed light on the characteristics of successful schools, especially schools that have an equitable distribution of achievement across students of different racial and socio-economic backgrounds; however, it is still unclear how to utilize this descriptive data on school climate to improve learning conditions for at-risk students and ultimately reduce the achievement gap.

Current Study

The focus of the current study is to better understand the mechanism by which socio-economic status affects academic achievement and the roles of violent crime and school climate in mediating/moderating these relations among elementary school students. A mapping technique was used to visualize patterns of school rankings against a backdrop of neighborhood socio-economic status and violent crime. Additionally a mediation model with a moderated direct effect was tested. As illustrated in Figure 1, we hypothesize that (a) socio-economic status (as indicated by income, years of education and employment status) will be positively associated with academic achievement; (b) violent crime (as indicated by the incidence of homicide, assault, battery and robbery) will mediate the relation between socio-economic status (SES) and academic achievement such that SES will be negatively associated with violent crime, which in turn will be negatively associated with academic achievement; and (c) school climate will have a direct effect on academic achievement as well as moderate the relation between socio-economic status and academic achievement, such that the association between SES and academic achievement is stronger at higher levels of the moderator, school climate.

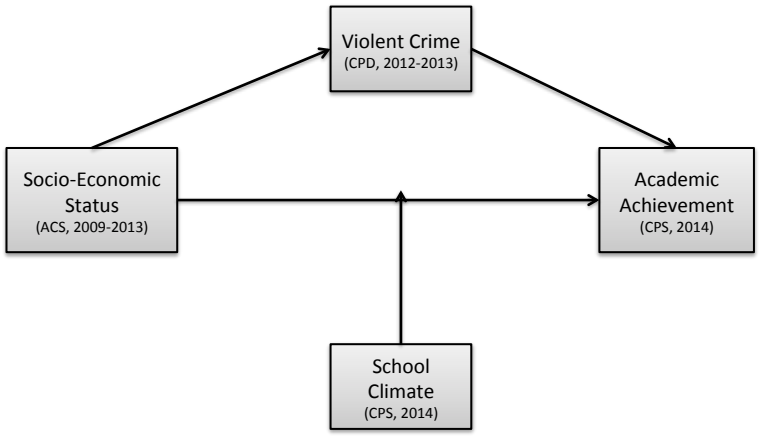

Figure 1. Moderated Mediation Conceptual Diagram. Sources: American Community Survey (ACS), Chicago Police Department (CPD), Chicago Public Schools (CPS).

Method

Participants

This study focuses on elementary schools in the Chicago Public School system. Data collected is at the institutional level; each school represents a single unit of analysis. Elementary schools were selected to participate, as they are more likely than high schools to draw their students from within their defined attendance boundary regions. This is critical given the study aims to draw connections between the academic performance of schools and the characteristics of the neighborhoods in which they are located. Academic data were available for 483 elementary schools. Of these schools, only neighborhood schools were selected for analysis. Neighborhood schools typically enroll students from within the defined attendance boundary regions, though a small number of students from outside the boundaries may apply to enroll (Chicago Public Schools, 2016). A sample of 281 neighborhood elementary schools were included in the analysis, and these schools were 48.2% African American, 37.2% Hispanic, 9.4% White, and 5.2% Other; 88% of the student body was classified as low-income.

Measures

Public sources of information were used to gather data for this study. Education data were gathered from CPS archives, crime data were gathered from the Chicago Police Department database, and socio-economic data was gathered from the Census and the American Community Survey using the National Historic Geographic Information System (NHGIS) database.

Socio-economic status. American Community Survey (ACS) 2009-2013 data was gathered through the National Historical Geographic Information System (NHGIS) database. The U.S. Census Bureau's American Community Survey is a nationwide, continuous survey based on a random sample of the population. Data for Illinois were available at the block-level

and included per capita income, employment status, and educational achievement in years. Income is represented as per capita income over the span of 12 months in 2013 inflation-adjusted dollars per attendance boundary region. Years of educational achievement are represented as the average number of years of educational achievement per boundary region. Finally, employment is represented as the percent of people eligible to be in the workforce who are employed within each elementary school attendance boundary region. Socio-economic status indicators were significantly intercorrelated, which supported a transformation into a composite score (OECD, 2008). Socioeconomic data was normalized and summed to produce a single variable estimate of SES for each attendance boundary region (OECD, 2008). This data is an estimate and all visualizations produced with this data should be considered approximate.

Violent Crimes. Violent crimes are defined as "offenses, which involve force or threat of force" (U.S. Department of Justice, 2011). Based on Federal Bureau of Investigation guidelines homicide, assault, battery, and robbery were identified as indicators of violent crime. Crime data was obtained from the Chicago Police Department's CLEAR (Citizen Law Enforcement Analysis and Reporting) system. Crime estimates reflect incidents of crime that occurred within the city of Chicago over the course of a year. The crime dataset used captures crime from 2012-2013 to align with the available American Community Survey socio-economic data, which spans 2009-2013. Data for each type of violent crime is represented as a per capita average of all crimes per attendance boundary region. When assault, battery, homicide, and robbery were included in a factor analysis a two-factor solution was indicated; homicide, assault, and battery all loaded onto one factor with only robbery loading onto the second factor. Homicide, assault and battery were retained as indicators of violent crime and weighted based on their respective factor loadings; robbery was dropped from subsequent analyses.

Academic Achievement. Academic achievement in Math and Reading portions of the Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) was obtained for the 2014 school year. This NWEA MAP is a standardized measure used by CPS to gauge student learning in elementary school. Achievement refers to "how well the school's end-of-year performance compares to national average performance" (Chicago Public Schools, 2014). Test-retest reliability ranges from r =0.84 - 0.93. The NWEA MAP recently replaced the Illinois Standards Achievement Test (ISAT) as the standardized metric of choice for elementary school students; concurrent validity between the NWEA MAP and the ISAT ranges from r = .79 - .87 (Reliability and Validity Estimates, 2004). CPS releases this data for affiliated neighborhood, charter, classical, magnet and contract elementary schools throughout the city of Chicago (Chicago Data Portal, 2013). Only data for neighborhood 281 elementary schools included in this sample were included. Data is represented at the school level; reading and math scores, which are reported as percent achievement, were averaged to produce an overall estimate of academic achievement for each school.

School Climate. School climate was measured using a questionnaire developed by the University of Chicago Consortium on School Research (UChicago CCSR) called the 5Essentials. Chicago Public Schools in collaboration with the University of Chicago CCSR, identified five essential features of successful schools: effective leaders (4 subscales, 26 items), collaborative teachers (4 subscales, 20 items), involved families (3 subscales, 15 items), supportive environment (5 subscales, 26 items), and ambitious instruction (4 subscales, 20 items). These dimensions are intended to measure the extent to which the climate at each school is conducive to academic success. The survey has an average reliability of 0.72 at the individual ($0.47 < a < 0.84$) and 0.82 at the school level ($0.70 < a < 0.91$). The survey has strong predictive validity as

well as overall school improvement in relation to both math and reading student outcomes (UChicago CCSR, 2012). Research by the CCSR has demonstrated that elementary schools rated as "strong" on three to five of the dimensions of school climate were up to10 times more likely to improve student academic achievement in math and reading and up to 30 times less likely to stagnate than schools rated as "weak" on three or more of the dimensions of school climate (UChicago CCSR, n.d.). School climate estimates are based on teacher and student (grades 6-8) self-report ratings on items within each of the five dimensions. These scores are used to determine to what extent the school is "organized for improvement" and "set up for success." Each school is ultimately assigned an overall "school culture and climate" rating on a 5-point scale, ranging from "not yet organized" to "well organized." These "school culture and climate" ratings of were used in the analysis

Procedure

In order to spatially associate neighborhood demographic variables with academic achievement, Geographic Information Systems (GIS) was utilized. GIS is geospatial software that enables the simultaneous display of several variables with coordinates in order to visualize spatial patterns in data. GIS was used to map indicators of neighborhood socio-economic status (SES) variables and violent crime throughout the city of Chicago. The Chicago map was subdivided into regions based upon elementary school attendance boundaries, which made it possible to estimate relative differences in each SES/crime variable by region. Estimates for each indicator of SES were normalized to allow for direct comparisons between elementary school attendance boundary regions. The normalization procedure included converting all SES indicators into z-scores so that each value could be directly compared on the same scale. Crime estimates were standardized based on attendance boundary region populations. The

standardization process involved estimating the per capita rate for each type of crime in order to account for how differences in population size might influence crime totals within each attendance boundary region. Normalized SES variables and standardized violent crime variables were summed to create overall estimates for SES and violent crime respectively for each attendance boundary region. These estimates were used to generate maps depicting the spatial relationship between high/low performing schools and neighborhood SES/violent crime. These same estimates of SES and violent crime per attendance boundary region, which were generated using the GIS geospatial software, were entered into a regression analysis.

Preliminary Analyses. Preliminary analyses using Geographic Information Systems (GIS) were conducted to visualize spatial relationships between violent crime, socio-economic status (SES) and academic achievement. For the purposes of mapping, academic achievement is represented as elementary schools rankings: level 1 schools are the top performing schools and level 3 schools are the lowest performing schools based on standardized metrics of academic achievement. Violent crime and SES are represented as a color gradient based on z-scores with red areas representing the highest crime/lowest SES and green representing the lowest crime/highest SES (See Figure 2 and 3).

Means, standard deviations and correlations for all study variables are presented in Table 1. The outcome variable, academic achievement, was significantly correlated with all predictor variables (socio-economic status, violent crime, and school climate) in the predicted directions. Additionally, school climate was significantly correlated with socio-economic status (SES), which supported further analysis of school climate as a potential moderator of the association between SES and academic achievement. Finally, violent crime was significantly correlated with SES and

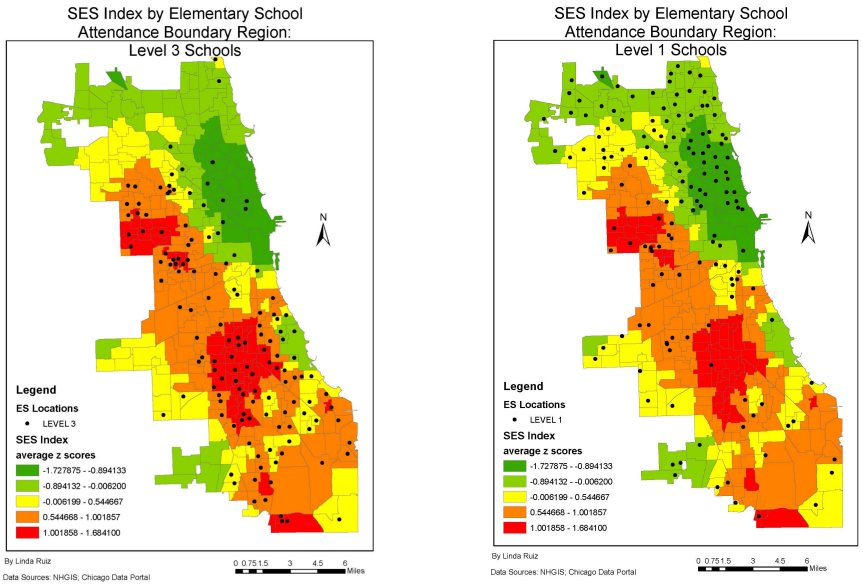

Figure 2. Elementary School Performance Level by SES Index.

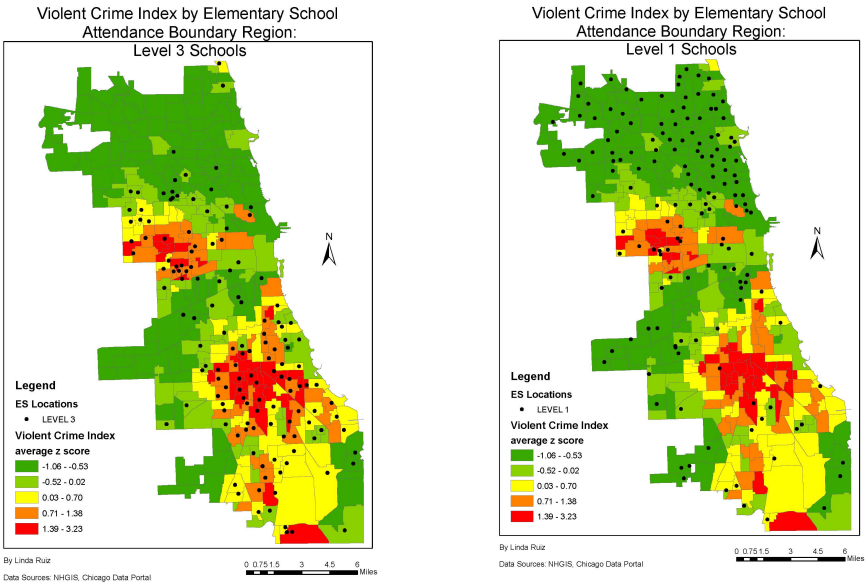

Figure 3. Elementary School Performance Level by Violent Crime Index.

academic achievement supporting analysis of violent crime as a potential mediator of the association between SES and academic achievement.

Socio-economic status. In preparation for the analysis, outliers were trimmed using a univariate outlier identification procedure, where gamma equals 2 to flag "far-out" values (Iglewicz & Banerjee, 2001). Skewness and kurtosis values for income, education, and employment were within acceptable range of plus or minus two (George & Mallery, 2010). Values for income, education, and employment were normalized into z-scores to render variable units comparable. Standardized values were averaged to produce a composite score representing the construct of SES (OECD, 2008).

Table 1. *Descriptives and Pearson Correlations for Study Data*

	M	SD	1	2	3	4	5	6	7	8	9	10
1. Socio economic status	0.01	0.63										
2. Income	-0.10	0.58	0.82**									
3. Education	0.05	0.90	0.85**	0.70**								
4. Employment	0.08	0.87	0.76**	0.41**	0.366**							
5. Violent Crime	21.88	28.39	-0.29**	-0.16**	-0.18**	-0.34**						
6. Homicide	0.56	0.93	-0.30**	-0.20**	-0.20**	-0.33	0.84**					
7. Assault	14.89	18.28	-0.28**	-0.15*	-0.17**	-0.33**	0.99**	0.80**				
8. Battery	6.43	9.70	-0.29**	-0.16**	-0.19**	-0.33**	0.98**	0.85**	0.94**			
9. School Climate Rating	3.46	1.49	0.19**	0.11	0.12	0.22**	-0.11	-0.08	-0.12	-0.81		
10. Academic Achievement	37.52	26.82	0.39**	0.22**	0.25**	0.46**	-0.42**	-0.37**	-0.42**	-0.41**	0.40**	

N = 281. *p < .05, two-tailed. **p < .01, two-tailed.

Violent crime. In order to account for the extent to which each indicator is representative of the construct of violent crime, indicators were weighted based on factor loadings**.** Based on Barlett's test of sphericity ($p = 0.00$, $df = 6$) and the Kaiser-Meyer Olkin measure of sampling adequacy ($KMO = 0.787$) it appears that there are a sufficient number of significant correlations to conduct a factor analysis. Assault, homicide and battery strongly loaded onto one factor; these factors were retained for subsequent analyses. The factor loadings were: Assault (.68), Battery (.74), and Homicide (1.05). Factor loadings were used as multipliers to weight assault, battery and homicide respectively. These weighted values were summed to produce a single estimate of violent crime for each attendance boundary region (OECD, 2008).

Results

Mapping high and low achieving schools against a backdrop of socioeconomic status and violent crime revealed striking spatial trends. A side-by-side comparison of the socio-economic status maps (Figure 2) and the violent crime maps (Figure 3) shows an overlap between areas scoring lowest in terms of socio-economic status indicators and highest in violent crime. It is in these areas of concentrated disadvantage where the lowest performing (Level 3) schools tend to cluster. Conversely, in the areas that score highly on socio-economic status indicators, there tend to be lower levels of violent crime and a greater concentration of the highest achieving (Level 1) schools. There are some outliers on these maps; that is, high performing schools in socio-economically disadvantaged, high crime neighborhoods and low-performing schools in highly resourced, low-crime neighborhoods. This suggests that while neighborhood socio-economic status and violent crime have a clear observable association with school-level academic achievement, these variables do not fully account for the spatial distribution of high and low performing schools.

A mediation model with a moderated direct effect was examined to assess whether (1) violent crime mediates the relation between socio-economic status and academic achievement and whether (2) school climate ratings moderate the relationship between socio-economic status and academic achievement. To test preconditions for mediation, the predictor (SES) was shown to significantly predict the mediator (violent crime), $b = -.27$, $t(330) = -5.06$, $p < .001$, and the outcome variable (academic achievement), $b = .39$, $t(278) = 7.16$, $p < .001$. The results indicate that the mediation model, including a moderated direct effect was significant, $F(4, 276) = 38.95$, $p < .001$, with an R^2 of .36. The relation between socio-economic status and academic achievement is significantly mediated by violent crime. As standardized regression coefficients in Figure 3 illustrate, lower socio-economic status was significantly associated with higher violent crime, which in turn was associated with lower academic achievement. The significance of the indirect effect was tested using bootstrapping procedures (Preacher & Hayes, 2004). Unstandardized indirect effects were computed for each of 1,000 bootstrapped samples, and the 95% confidence interval was computed by determining the effects at the 2.5th and the 97.5th percentiles (Kline, 2011). The bootstrapped unstandardized indirect effect was 1.27, and the 95% confidence interval ranged from .69 to 2.78. The indirect effect was statistically significant as indicated by a confidence interval not containing zero (Preacher & Hayes, 2004).

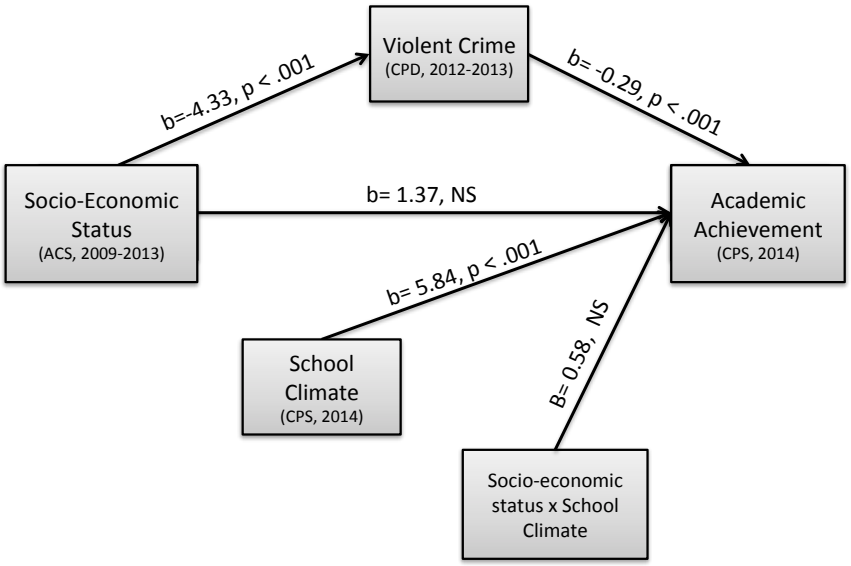

Figure 4. Moderated Mediation Statistical Diagram. Sources and years included: American Community Survey (ACS), Chicago Police Department (CPD), Chicago Public Schools (CPS).

School climate was examined as a predictor of academic achievement and as a moderator of the relation between socio-economic status and academic achievement. School climate significantly predicts academic achievement, $b = 5.84$, $t(276) = 6.60$, $p < .001$. However, the interaction term between school climate and socio-economic status was not significant, $b = .58$, $t(276) = 1.24$, $p > .05$, suggesting that school climate does not act as a moderator in this model.

Discussion

A model combining mediation with moderation of the direct effect of the predictor on the outcome variable was tested. In this model, it was hypothesized that socioeconomic status would exert its effect on academic achievement indirectly through violent crime, independently of other variables, but also directly, with the magnitude of the direct effect being dependent on school climate ratings (Preacher, Rucker & Hayes, 2007). Findings from this study support the hypothesis that violent crime mediates the association between socio-economic status and

academic achievement at the school-level. While school climate significantly predicts academic achievement, based on these data, it does not significantly moderate the direct effect of socio-economic status on academic achievement as hypothesized.

The results from this study are consistent with Bronfenbrenner's socio-ecological model, in that school level academic achievement is influenced by broader contextual factors (neighborhood-level socio-economic status and violent crime). This study demonstrates that neighborhood-level characteristics significantly influence institutions located within those neighborhoods. This study confirmed that a model based in social disorganization theory can be applied to school-level outcomes and still fit within a social-ecological framework. Figures 4 and 5 help to illuminate the extent to which neighborhood schools are negatively affected by poverty/violence in the city of Chicago by visually demonstrating the overlap of high crime/low SES and poor school performance using Geographic Information Systems (GIS). The use of GIS in this study to demonstrates the potential utility of this tool for future studies in that it enables researchers to account for larger systemic variables that may influence outcomes of interest.

Additionally, findings from this study are consistent with, and add to, the extant literature in several ways. Research demonstrates a significant association between socio-economic status and academic achievement at the individual level, such that greater access to resources typically predicts higher achievement for individual students (Jencks, 1972; Marjoribanks, 1979; McGaw & Schleicher, 2014; Noel & de Broucker, 2001; Perry & McConney, 2010). Results from this study extend this body of research by showing a similarly strong association between academic achievement and socio-economic status at the institutional level. Further, research shows that exposure to violent crime has a negative impact on several domains of youth development including academic achievement (Henrich, Schwab-Stone, Fanti, Jones & Ruchkin, 2004; Hurd,

Stoddard & Zimmerman, 2013; Moilanen, Shaw & Maxwell, 2010) and that children from lower income backgrounds are disproportionately affected by community violence (Benhorin & McMahon, 2008; Cammack, Lambert, Ialongo, 2011; Evans, 2004). This study ties together these threads of research by revealing violent crime as a mechanism by which socio-economic status influences youth outcomes. Though school climate did not function as a protective factor as hypothesized, school climate does play an important role in school level academic success, which is consistent with the literature (Gottfredson, Gottfredson, Payne & Gottfredson, 2005; Steffgen, Rechia & Viechtbauer, 2013; Zullig, Koopman, Patton & Ubbes, 2010.)

Implications for Theory, Research, and Intervention

Theory. The socio-ecological model is a useful framework for conceptualizing the interplay between variables within larger nested systems, however, it lacks sufficient specificity to make meaningful predictions (Jason et al., 2016). Bronfenbrenner's social-ecological model was more useful in this study when examined in conjunction with a more structured theory, Shaw and McKay's theory of social disorganization. Social disorganization theory describes a mechanism by which neighborhood disadvantage is associated with violence. In concordance with Shaw and McKay's social disorganization theory, indicators of neighborhood disadvantage (poverty, low educational attainment, and high unemployment) were strongly associated with crime. Studies that seek to incorporate the socio-ecological model may improve the predictive power of their hypotheses by using the socio-ecological model as a framework for interpreting additional theoretical perspectives. Further development of theories that guide research in our field, specify relationships and mechanisms, and allow for predictions is also needed. Consistency in terms of how we define and measure constructs will help the field in testing existing theory and developing new theory (Jason et al., 2016).

Research. The findings in this study illuminate several avenues for future research. To date, there has been little research examining the role of violence as a mediator between aspects of neighborhood disadvantage and student outcomes. There is research to suggest community violence mediates the relation between indicators of SES and high school student outcomes like drop-out rates and teen pregnancy rates (Harding, 2009). Research that examines changes across time and developmental differences among primary school versus secondary school students is needed.

Within the literature there is significant variability in how community violence is conceptualized and measured. There is a wealth of self-report measures for assessing violent behaviors among students but usage of police reports of community violence is less common. When utilizing crime databases, it is important to consider whether weighting crimes is necessary and how this might influence data interpretation. For example, though murder and robbery are both violent crimes, they are not equal in severity, frequency, or distribution so they likely have different implications when it comes to influencing student outcomes. Future research may further parse out which types of violent crime are particularly important to consider when it comes to predicting student outcomes like academic achievement.

School climate research has yet to clearly demonstrate a causal, longitudinal relationship between improved school climate and improved academic, socio-emotional and behavioral outcomes, while simultaneously accounting for the significant effects of school funding and other contextual risk factors. School climate plays a role in promoting academic achievement, yet the extent to which it may mediate or moderate contextual effects on academic achievement requires additional investigation. Further, school climate is a multifaceted concept representing a heterogeneous cluster of factors. Research is needed to parse out which domains to target in

order to promote academic achievement specifically for at-risk students. Additionally, measures that are reliable and valid across contexts and that assess agreed upon dimensions to promote more consistency across studies is also needed.

Geographic Information Systems is a useful tool that it underutilized in psychology research. It can help to visualize, organize, interpret, and share data efficiently. Maps can visually demonstrate the overlap between contextual factors and individual or group level outcomes. With a few key pieces of information, visuals communicate complex data in a format that is easily accessible to academic audiences across disciplines as well as lay audiences. If well-utilized this tool may help translate research to action by facilitating inter-disciplinary collaboration and community engagement.

Intervention. Findings from this study suggest that academic achievement is significantly influenced by contextual factors like neighborhood level indicators of socio-economic status and violent crime as well as school climate. There are several points within this model where intervention may lead to improved outcomes for at-risk students. When it comes to academic achievement, how and where do we intervene to have the greatest impact?

It is well established in the literature, and supported by findings in this study, that the lowest performing schools typically serve the highest need children, many of whom face a multitude of environmental challenges that threaten their well-being and hinder their ability to perform well academically. The academic failure of schools serving high-need children is often met with state mandated sanctions including, school closure, mass teacher/administrator lay-offs, vouchers for students to attend higher performing schools, and the introduction of intervention teams to restructure the learning environment. These sanctions often do not address the underlying contextual factors contributing to academic failure: under-privileged children and the

teachers/administrators serving them need additional support and resources. Schools located in impoverished neighborhoods are not helpless when faced with limited funding, as they can play a significant role in helping connect students to existing community resources.

Children who have their basic needs met are more likely to engage academically (Finn & Rock, 1997). School-Based Health Centers have been shown to improve not only the health of students who utilize services but also boost graduation rates, reduce absences, increase student educational aspirations and credit accumulation (Geierstanger, Amaral, Mansour & Walters, 2004). These partnerships demonstrate how schools can act as a bridge to much needed resources for the at-risk students by building partnerships with existing community organizations. For schools that don't have health centers, they can link students and their family with local community agencies to receive a variety of different types of support. Improvements in student outcomes may in turn influence funding.

There is an expanding literature on violence prevention interventions that aim to increase coping strategies among school aged children in order to reduce violence in schools (Boyce, Robinson, Richards, 2011; Tandon, Dariotis, Tucker, and Sonenstein, 2013). Interventions that are culturally tailored to specific student groups are particularly effective in improving coping skills and reducing delinquent behavior in the study cohorts (Griner & Smith, 2006). Violence prevention programs may be a means for improving school climate in schools with high rates of student delinquency. Given that school climate is a strong predictor of academic achievement, violence prevention may also indirectly improve academic outcomes.

Limitations and Strengths. There are several limitations of this study. First, using neighborhood-level and school-level data to assess SES, violent crime, school climate, and academic achievement did not allow examination of individual-level variables. Ideally, both

individual and contextual factors could be examined together. Second, although the design of this study accounts for time by using data from successive time points (SES data drawn from 2009-2013, crime data drawn from 2012-2013, and academic/school climate data drawn from 2014-2015), this study did not control for achievement from a previous time point, thus it was not possible to account for change over time in the dependent variable, academic achievement. Third, the data used in this study was collected from public sources including the Census' American Community Survey, the Chicago Police Department, and Chicago Public Schools archive. Because this data is not collected from a primary source there are more unknowns regarding the rigor of the data collection process and systemic measurement issues for which this study cannot account. Fourth, this study collapsed socio-economic and crime data from several indicators into composite scores; whereas future studies may benefit from structural equation modeling methods to assess the model fit with indicators of latent constructs.

Despite limitations, this study had several strengths. This study demonstrated relationships between contextual factors and school-level academic achievement both spatially, using Geographic Information Systems, and statistically, using multiple regression. Time was accounted for by collecting from successive time points in order to better demonstrate a directional association from earlier predictor variables to later outcome variables. While there are several drawbacks to using public data, it can still be useful and informative. There is a wealth of publically available, easily accessible, and comprehensive data at the city, state, and national levels available for researchers. Furthermore, the data used in this study represents the work of 3 institutions (Chicago Police Department, Chicago Public Schools and the Census American Community Survey), spans 5 years, and covers the entire city of Chicago. The scope of this project is larger and the data more complete than individual data collection would have allowed.

While individual level predictions cannot be made based on these data, it is possible to observe and demonstrate larger, city-wide trends.

Conclusion

All children, regardless of family demographics, should have access to a high quality education. Children from higher SES communities typically attend higher performing schools, and children from poor communities with high levels of violent crime are overrepresented among the lowest performing schools. Our findings support and extend the literature regarding the mechanism through which neighborhood SES influences school-level academic achievement and illustrate the role of school climate in relation to school-level achievement. Our study also uses innovative mapping strategies to illustrate patterns of school performance in the context of neighborhood SES and violent crime. While school climate is gaining attention for its potential to improve academic outcomes, more evidence is needed to explore potential complex relations that incorporate multiple dimensions across contexts. Interventions geared toward improving academic achievement should acknowledge and address individual and contextual risk factors to enable all students, regardless of neighborhood SES and violent crime, to succeed. Insufficient funding is a major issue facing chronically underperforming schools and the state of federal funding for education has historically been insecure. However, schools and the communities they serve are not helpless. Despite scarce resources schools in partnership with community organizations can leverage existing resources to better meet the needs of students and in turn improve academic achievement. High performing schools do exist in low-income, high crime communities. This speaks to the importance of strengths based research. When vulnerable populations are viewed and treated as resourceful and resilient in the face of adversity, they are no longer victims of circumstance but agents of change.

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Appendix A

The Original Proposal

Abstract

The association between academic performance and socio-economic status has been growing in recent years, which suggests the quality of education available to any given student is increasingly dependent on the social and economic demographics of their neighborhood. Furthermore, there is evidence to suggest that the influence of socio-economic disadvantage on youth outcomes is driven by exposure to community violence. Despite exposure to adverse conditions (socio-economic disadvantage and community violence) some schools perform better than expected. School factors, such as a positive school climate may explain this academic resilience. The proposed study seeks to better understand the mechanism by which socio-economic disadvantage affects academic outcomes, the role of community violence in driving these effects, as well as the potential of positive school climate to promote academic resilience in neighborhood settings characterized by socio-economic disadvantage and violence. A sample of 420 district elementary schools in Chicago will be included in the analysis. The elementary schools, which serve approximately 205,000 students in grades one through eight, are the primary unit of analysis. A model is proposed in which exposure to violent crime mediates the relation between socio-economic disadvantage and academic outcomes; more specifically, school climate will have a direct positive effect on academic outcomes counteracting the negative influence of socio-economic disadvantage and exposure to violence on academic outcomes. Structural equation modeling will be used to test that hypothesis that the data adequately fits the proposed model. This study may also inform policy regarding the allocation

of resources to measuring, evaluating and fostering a positive school climate and reducing neighborhood risk factors.

Introduction

The literature on neighborhood disadvantage suggests that there is an association between poverty, exposure to violence and poor academic outcomes (Evans, 2004; Harding, 2009; Hsieh & Pugh, 1993). Many schools that are located in impoverished neighborhoods and serve disadvantaged students tend to underperform academically, which suggests that neighborhood characteristics influence academic outcomes (Orfield, Kucsera & Siegel-Hawley, 2012; Sirin, 2005). However, schools have the potential to perform better than expected, despite operating in high risk conditions. In other words, they can be academically resilient. In recent years school climate has gained interest for its potential to foster academic resilience at the student level (Thapa, Cohen, Guffey & Higging-D'Alesandro, 2013; Zullig, Koopman, Patton & Ubbes, 2010). However, few studies have focused on how school climate affects school-level outcomes by acting in opposition to broader contextual risk factors commonly faced by urban youth. The proposed study aims to focus on the extent to which a positive school climate mitigates the effects of contextual risk factors, specifically socio-economic risk and exposure to violence, on academic outcomes.

Theoretical Underpinning

The proposed study draws from multiple complementary theoretical perspectives: Bronfenbrenner's social ecological model (1979), Shaw and McKay's theory of social disorganization (1949), and the construct of resilience pioneered by Garmezy (1973). The social ecological model and social disorganization theory provide a framework for understanding the mechanisms by which neighborhood disadvantage might translate into maladaptive youth outcomes. The construct of resilience provides a framework for conceptualizing how positive adaptation is possible in the presence of adversity.

Bronfenbrenner (1979) argues that each person is at the epicenter of a complex network of nested systems, each of which has a certain degree of influence on the others. Based on Bronfenbrenner's ecological model, "academic outcomes are seen as a result of the joint function of characteristics representing the individual person and their environment" (Stewart, 2007, p.17). Here we consider academic outcomes at the level of the school rather than the individual student. The performance of a school, which is based on the aggregated performance of its students, is influenced by the cultural, organizational and structural characteristics of the school, as well as the surrounding neighborhood.

Shaw and McKay's social disorganization theory is grounded in an ecological perspective similar to that of Bronfenbrenner's ecological framework. Social disorganization theory seeks to explain crime and delinquency in terms of neighborhood contextual factors. Specifically Shaw and McKay posit that neighborhood characteristics like high poverty, population turnover, racial heterogeneity, and unemployment contribute to the dissolution of collective efficacy and in turn, lead to an increase in disorganization and crime (Shaw & McKay, 1949). In the proposed study we focus on an important component of neighborhood disadvantage: the collective individual socio-economic disadvantage of those living within a discrete geographic area. Socio-economic disadvantage includes poverty, unemployment and educational attainment.

Research grounded in social disorganization theory has found that neighborhood violence may act as a mediator, driving the negative effects of neighborhood disadvantage on youth outcomes, including academic outcomes (Harding, 2009). We hypothesize that exposure to neighborhood violence will similarly mediate the association between socio-economic disadvantage and academic outcomes. However, it is possible for schools serving disadvantaged

students to perform better than expected. Resilience research aims to explain how and why positive adaptation occurs in the presence of significant adversity (Luthar & Cicchetti, 2000).

The presence of resilience is contingent on two conditions: 1) a significant threat to well-being, and 2) positive adaptation despite this threat (Luthar, Cicchetti & Becker, 2000). As defined by Fergus and Zimmerman, "resilience refers to the process of overcoming the negative effects of risk exposure, coping successfully with traumatic experiences, and avoiding the negative trajectories associated with risks" (2005, p. 399). Resilience theory posits that promotive factors can help to mitigate the negative effects of risk on individuals (Fergus & Zimmerman, 2005). Further, resilience is a "dynamic developmental process," not a static, dichotomous trait, meaning resilience is likely to change over time, is domain-specific and thus may be amenable to change through intervention (Luthar et al., 2000). Resilience is also domain specific; the focus of the proposed study is on academic resilience. There are several models of resilience that explain how promotive factors can alter expected negative trajectories. The proposed study will test a compensatory model, which is "defined when a promotive factor counteracts or operates in an opposite direction of a risk factor…This effect is independent of the effect of the risk factor" (Fergus & Zimmerman, 2005, p. 401). In this study, the "risk factor" is the pathway from socio-economic risk to academic outcomes, mediated by exposure to violence. The "promotive factor" is a positive school climate.

Given that many basic metrics of normative child development are based on performance and behavior in school, there is value in examining the school level factors that might contribute to students' academic functioning, especially in high-risk settings. Additionally, schools are often ranked based on aggregated standardized metrics of student achievement; these rankings factors into funding as well as "turn-around" and closure decisions. Given the high value placed

on standardized testing achievement in the ranking process as well as the serious consequences of chronic underperformance, it is important to investigate the extent to which it is possible to foster academic resilience on a school-wide level and whether this translates into higher standardized test scores. The present study focuses on exploring the role of positive school climate as a protective factor that may promote institutional academic resilience in neighborhoods characterized by varying degrees of socio-economic disadvantage and violent crime.

Neighborhood Disadvantage in Relation to Academic Outcomes

To be disadvantaged is to be in an unfavorable circumstance or condition; it is the deprivation of advantage or equality. A disadvantaged neighborhood is an area of concentrated deprivation typically characterized by a dearth of social and economic capital. "The combination of few economic resources, little human capital and weak control generates a threatening and disordered environment characterized by incivility and crime" (Ross & Mirkowsky, 2001, p. 259). Those who live in highly disordered neighborhoods are often disadvantaged themselves: on average they are more likely to be impoverished, unemployed and have lower educational attainment (Ross & Mirkowsky, 2001). To the extent that a neighborhood is composed of individuals who are disadvantaged, in that they lack social and economic resources, disadvantage becomes characteristic of that neighborhood (Massey, 1996). However, it is important to account for neighborhood violence in addition to socio-economic indicators of disadvantage as there is evidence to suggest that violent crime may drive the negative effects of disadvantage on youth outcomes (Astor, Benbenishty, Estrada, 2009; Bowen, Bowen & Ware, 2002; Harding, 2009; Ross & Mirkowsky, 2001). Below, we review a large body of literature that explores the effects of socio-economic status on youth outcomes, particularly academic achievement.

SES and Academic Outcomes. Children growing up in impoverished communities are confronted with widespread and often systemic inequities in comparison to their more economically secure peers. Research by Evans and Kim (2007) suggests that the greater proportion of childhood spent in poverty the more likely a child is to suffer the detrimental effects of cumulative risk exposure such that an "increasing number of concurrent risk factors (yields) a cascading, deleterious effect on later developmental outcomes" (Appleyard, Egeland, Van Dulmen & Sroufe, 2005, p. 235). Additionally, children living in poverty have restricted access to the resources they need to overcome adversity and thrive. The cumulative effect of socio-economic risk on the development of children has widespread deleterious effects that carry over to academic settings and have a negative impact on achievement (Evans, 2004). Given that school success is a strong predictor of future education, employment opportunities, and earning potential, early discrepancies in academic achievement are likely to have long-term consequences for the future trajectory of individual students (Bowen, Bowen & Ware, 2002, Kena et al., 2014).

It has been well established that socioeconomic status is positively associated with academic achievement, such that children from higher SES backgrounds tend to perform better academically (Jencks et al., 1972; Marjoribanks, 1979; McGaw & Schleicher, 2014; Noel & de Broucker, 2001; Perry & McConney, 2010). In fact, the correlation between income and academic achievement has been growing more robust over the past several decades suggesting that achievement and the quality of educational opportunities are increasingly tied to income (Reardon, 2011). Several studies have found that family level socio-economic status has an impact on academic achievement (Bradley & Corwyn, 2002; Davis-Kean, 2005; Leventhal & Brooks-Gunn, 2000; Sirin, 2005). A meta-analysis by Sirin (2005) revealed that "family SES sets

the stage for student's academic performance both by directly providing resources at home and indirectly providing the social capital that is necessary to succeed in school" (Sirin, 2005, p. 438). The most consistent finding from among these studies is that living in a high SES family or neighborhood is strongly correlated with academic success.

The mean socio-economic status of a school may be more influential to the academic achievement of individual students than the SES of their own family (Perry & McConney, 2010). These findings suggest that students would benefit academically from attending schools that serve students from diverse socio-economic backgrounds. However, African American and Latino students are especially likely to attend schools that are segregated in terms of both race and income. The typical African American or Latino student attends school where nearly two thirds of his or her peers are low-income (Orfield, Kucsera & Siegel-Hawley, 2012). These schools that serve predominantly low-income minority youth are typically the lowest performing schools (Coley & Baker, 2013; Orfield, Kucsera, Siegel-Hawley, 2012). Taken together, these findings suggest there is a differential level of both social and economic resource investment in schools based on the SES profile of the students in attendance and the demographics of the surrounding community.

As the middle class attenuates and the economic divide between high and low SES widens, more American families and their children are struggling to cope with socio-economic deprivation. Urban minority youth in particular are at risk for experiencing periods of poverty (Copeland-Linder & Nation, 2011; Hurd, Stoddard & Zimmerman, 2013; Mello & Swanson, 2007; Murry, Berkel, Gaylord-Harden, 2011). According to the most recent Census estimates, over 30% of the U.S. population was in poverty for at least 2 months between 2009 and 2011. "While children made up 25.2% of the population, they represented 32.4 percent of those who

were poor for at least 2 months and 42.4 percent of those who were poor for the entire 36-month period between 2009 and 2011" (Edwards, 2014, p. 10). Strikingly, historical trends in the academic outcomes of children seem to mirror trends in SES where low SES children tend to perform poorly and high SES children tend to perform well with a dwindling middle ground (Reardon, 2011). Reardon compared average math and reading standardized test scores between students from families in the 90th percentile of the income distribution range and those in the 10th percentile. He found that the average discrepancy between high and low income students grew from about 0.6 standard deviations in the 1940's to 1.25 standard deviations in the early 2000s. (Reardon, 2011).

In sum, socioeconomic status matters for academic achievement. Both family SES and mean institutional SES are strongly linked to individual level academic achievement, such that children who attend schools serving predominantly low SES students or whose families live in poverty, are more likely to underperform academically. Furthermore, youth living in poverty often attend schools that are homogenous in terms of race and socioeconomic background, which is indicative of income inequality/segregation. The issue of differential academic outcomes based on SES is especially problematic given that the number of children who face poverty is increasing and that children of color are disproportionately affected. While academic success is only one of a number of important benchmarks for normative child development, its association with positive indicators of future trajectory (i.e. post-secondary schooling, employment, income, etc.) makes academic achievement especially important for at-risk youth.

Indicators of SES alone do not fully capture the adversity faced by youth living in disadvantaged neighborhoods. Exposure to one type of ecological risk may exacerbate the effects of other types of ecological risk resulting in compounding and multiplicative effects

(Bronfenbrenner, 1979; Elliot, Wilson, Huizinga, Sampson, Elliot & Rankin, 1996). Accordingly, neighborhoods that are low in social and economic capital are often also high in violence (Evans, 2004; Harding, 2009; Hsieh & Pugh, 1993). Furthermore, exposure to violence has been shown to strongly mediate the relation between neighborhood disadvantage and youth outcomes (Harding, 2009). Hence it is important to consider the effects of exposure to violence on youth outcomes in order to better understand how neighborhood disadvantage, as indicated by collective socio-economic disadvantage, might influence academic achievement.

Community Violence and Academic Outcomes. The presence of violent crime in a neighborhood is threatening to all members of the community, particularly to school-aged children. The higher the concentration of violent crime, the more residents are likely to feel their physical safety is threatened (Leventhal, Brooks-Gunn, 2000). This, in turn, has social consequences in that high rates of violent crime may lead to a reduction in trust and collective efficacy within the community (Lederman, Loayza & Menedez, 2002; Morenoff, Sampson & Raudenbush, 2001). Typically, neighborhoods that are low in social and economic capital are also high in violence (Evans, 2004; Harding, 2009; Hsieh & Pugh, 1993). The co-occurrence of violent crime, specifically homicide, and socioeconomic disadvantage has previously been demonstrated in the city of Chicago (Morenoff & Sampson, 1997).

The ways in which exposure to community violence may affect school-aged children are multifaceted, however the cumulative risk conferred by socio-economic disadvantage and exposure to violent crime is strongly associated with poor academic outcomes for at-risk youth (Margolin & Gordis, 2000). The contextual factors that contribute to community violence are also likely to "spillover" and contribute to violence in school settings (Astor, Benbenishty & Estrada, 2009; Moilanen, Shaw & Maxwell, 2010). Exposure to violence threatens a child's

psychological development/adjustment, which can lead to maladaptive changes in cognition and behavior. Youth who are exposed to community violence as victims or witnesses are more likely to act aggressively at school (Brockenbrough, Cornell & Loper, 2002; Cammack, Lambert & Ialongo, 2011; Margolin & Gordis, 2000; Schwartz & Gorman, 2003; Thompson & Massat, 2005) and more likely to develop internalizing and externalizing disorders. These maladaptive changes in turn are associated with poor academic performance in children (Henrich, Schwab-Stone, Fanti, Jones & Ruchkin, 2004; Hurd, Stoddard & Zimmerman, 2013; Moilanen, Shaw & Maxwell, 2010).

Exposure to violence also threatens children's sense of safety: students who have been exposed to more types of violence, feel less safe in school, and perform less well academically (Henrich, Schwab-Stone, Fanti, Jones & Ruchkin, 2004). Low-SES students report feeling more unsafe than their Caucasian and high-SES peers, respectively (Schwab-Stone et al., 1995). This aligns with findings that the incidence of violence is higher in schools serving predominantly low-income students (Evans, 2004). Additionally, exposure to violence changes the perceived cost and benefit of attending school: "when individuals feel that their lives may be cut short, they are less likely to invest in schooling and more likely to engage in risky behaviors" (Harding, 2009, p. 4). It follows that a child who is concerned for his or her safety is less likely to focus on and prioritize academic achievement (Margolin & Gordis, 2000).

The Intersection of SES, Violence and Academic Outcomes. Children from low-income backgrounds are disproportionately more likely to live in violent neighborhoods and either witness or fall victim to acts of violence (Benhorin & McMahon, 2008; Cammack, Lambert, Ialongo, 2011; Evans, 2004). Urban, minority youth in particular are exposed to high levels of community violence (Margolin & Gordis, 2000; McDonald & Richmond, 2008;

Henrich, Schwab-Stone, Fanti, Jones & Ruchkin, 2004). It is estimated that the majority of inner city adolescents have been exposed to community violence and up to one-third have been directly victimized (Margolin & Gordis, 2000). This exposure can start at a very early age as demonstrated by a 1993 survey of elementary school children on the south side of Chicago: Bell and Jenkins found that three quarters of children surveyed had seen someone get robbed, stabbed, shot or killed (1993).

The fact that schools serving predominantly low-income minority students have the highest incidence of violence and are the most likely to underperform illustrates the proliferation of systemic inequities that appear to be concentrated an entrenched in disadvantaged neighborhoods. "To the extent that disadvantaged neighborhoods structure the life chances of youth…. neighborhood violence plays a role in the intergenerational transmission of economic and social disadvantage" (Harding, 2009, p. 11). Given the systemic nature of the problem, the exploration of systemic solutions seems appropriate. School climate research suggests that the structural, relational and organization characteristics of schools may work to counteract the negative effects of high-risk environments on academic outcomes.

School Climate in Relation to Academic Outcomes

A child's performance in school is influenced by structural indicators of neighborhood disadvantage like SES as well as exposure to violence. While there is an abundance of evidence to support the hypothesis that children living in low SES, violent communities tend to perform poorly in comparison to their higher SES peers, there is a lack of research on how to address these educational discrepancies at a systems level. Research on school climate has garnered a growing interest among school reformers as a potential avenue for addressing systemic inequalities at the institutional level.

School climate is defined in the following way:

> A sustainable, positive school climate is one that fosters youth development and learning necessary for a productive, contributing and satisfying life in a democratic society. Such a climate includes: (1) norms, values and expectations that support people feeling socially, emotionally and physically safe; (2) members of the school community who are engaged and respected; (3) students, families, and educators that work together to develop, and contribute to a shared school vision; (4) educators who model and nurture an attitude that emphasizes the benefits and satisfaction that can be gained from learning; and (5) members of the school community who contribute to the operations of the schools and the care of its physical environment. (National School Climate Council, 2007, p. 2)

These broadly defined factors of school climate tap into safety, teaching, learning, relationships and the structural/organizational characteristics of schools (Cohen, McCabe & Michelli, 2009). While this definition does not explicitly touch on academic achievement, research suggests that schools with a strongly positive school climate are more conducive to academic success (Lee & Bryk, 1989; Cohen, McCabe & Michelli, 2009). In addition to fostering individual academic achievement, positive school climate has also been shown to be predictive of "school success, effective violence prevention, students' healthy development, and teacher retention" (Cohen, McCabe & Michelli, 2009, p. 187).

A proliferation of research on the importance of contextual factors on individual outcomes and the benefits of a positive school climate at the institutional level has driven an increasing number of schools to incorporate measures of school climate as part of routine school evaluations (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010). The Chicago Public School system for example has implemented a teacher, parent and student report school climate

survey as part of the year end school evaluation in every public school (Bryk et al., 2010). Despite the current momentum behind school climate research and the fact that the literature spans more than a century, there are several limitations present in the current body of literature. The constructs that compose school climate are not necessarily easily quantifiable because operational definitions tend to be vague or too broad. Additionally, there is a lack of standardization in terms of how to measure elements of school climate. Furthermore, there is a lack of agreement on what elements of school climate are essential. There is also disagreement regarding the basic definition of school climate. As a result it is difficult to generalize school climate research findings, which in turn makes it difficult to advocate for policy changes to support the evaluation of school climate. Due to these historic methodological inconsistencies, the School Climate Counsel was founded in order to standardize operational definitions and set guidelines for the measurement of school climate (National School Climate Council, 2007).

One of the primary goals of school climate research is to better understand the characteristics of successful schools, especially schools that have an equitable distribution of achievement across students of different races and socio-economic backgrounds. There is some evidence to suggest that school climate may mitigate the effects of contextual risk factors on academic success (Thapa, Cohen, Guffy, Higging-D'Alessandro, 2013). For example, Astor and colleagues found that the leadership of the school principal was a key factor in differentiating between schools with high and low rates of school violence among schools serving students of similar demographic backgrounds living in highly violent communities (Astor, Benbenishty & Estrada, 2009). While the outcome of interest in this study was student violence rather than academic achievement, the results still demonstrate that certain positive school climate features can counteract the negative effects of high-risk milieus on student outcomes. This suggests that

school climate might act as a compensatory protective factor that enhances resilience in the face of significant environmental risk and adversity. Research has yet to demonstrate that a positive school climate can counteracts the negative effects of contextual risk factors on academic achievement. Further research is needed to understand whether school climate may play a role in reducing the achievement gap between low and high SES students.

Rationale

The focus of the current study is to better understand the mechanism by which socio-economic disadvantage affects academic outcomes, the role of community violence in driving those effects, as well as the potential of positive school climate to promote academic resilience in neighborhood settings characterized by socio-economic disadvantage and violence. The primary goal is to explore whether school climate, as measured by Chicago Public Schools, acts as a compensatory protective factor in high-risk settings by counteracting the negative effect of neighborhood level risk factors (specifically socio-economic disadvantage and violent crime) on student's academic achievement. Additionally, because the data will be geographically located, this study offers the opportunity to examine spatial relationships between risk and resilience at the institutional level on a city-wide scale.

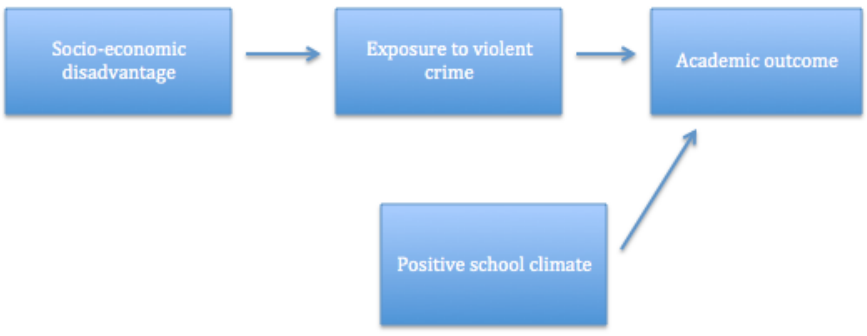

Figure 1

Compensatory Model of Academic Resilience

Hypotheses

As illustrated in Figure 2, the primary hypothesis is that the proposed model will be a good fit for the data. Specifically (a) socio-economic disadvantage (as indicated by income, years of education and employment status) will lead to an elevated risk for exposure to violent crime. In turn (b) risk for violent crime exposure, will have direct negative effect on academic outcomes. Finally, (c) positive school climate will have a direct positive effect on academic outcomes. While school climate may not affect the magnitude of the negative association between socio-economic disadvantage, exposure to violence and academic outcomes, it will act in opposition to it.

Method

Participants

This study will focus on elementary schools in the Chicago Public School system. Data collected will be at the institutional level, meaning each school will represent a single unit of analysis. Elementary schools as opposed to high schools will be chosen as the unit of analysis because they are more likely than high schools to draw their students from within their defined attendance boundary regions. This is critical because the study aims to draw connections between the academic performance of school and the characteristics of the neighborhoods in which they are located. There are a total of 483 elementary schools for which academic data are available. Charter schools and middle schools were eliminated: charter schools may have selective enrollment and are thus more likely to admit students from a wider geographic area and middle schools serve a more limited range of grades. There are 421 remaining elementary schools that draw their students primarily from within their defined attendance boundary region. These data are publicly available through the Chicago Public School website (cps.edu).

Procedure

In order to spatially associate neighborhood risk with academic performance, Geographic Information Systems (GIS) will be utilized. GIS is geospatial software that enables users to simultaneously display spatially located variables in order to visualize patterns and trends in the data. Geographic Information Systems (GIS) will be used to map each of these indicators (income, years of education, employment status, homicide, assault and robbery) within Elementary School attendance boundary regions. Based on the GIS estimates, each region will have an associated score for each indicator of socio-economic disadvantage. These scores will be normalized based on the population and then transformed into z-scores so that regions can be directly compared in the same units. The eventual aim is to generate scores for each attendance boundary region that are indicative of the relative socioeconomic risk and risk for exposure to violent crime likely experienced by students living there.

Measures

In the present study, multiple sources of information will be used but all information will be retrieved from public sources. Education data will be gathered from CPS, Crime data will be gathered from the Chicago Police Department database and demographic/socio-economic data will be gathered from the Census and the American Community Survey. Socio-economic disadvantage will be further separated into three indicators: income, employment status and years of education. Similarly, violent crime will be separated into 4 indicators: assault, sexual assault, homicide and robbery. This is based on the Federal Bureau of Investigation's definition of violent crime as "those offenses which involve force or threat of force" (U.S. Department of Justice, 2011).

SES. SES data will be drawn from the National Historical Geographic Information System (NHGIS), which serves as a database for current and historic census data. The Census is designed to capture data for every person living in the United States however it only occurs once per decade. Therefore, data will most likely be drawn from the U.S. Census Bureau's American Community Survey which is a nationwide, continuous survey based on a random sample of the population. Every dataset drawn from the American Community Survey has a Margin of Error reported which describes the precision of the estimated data at a 90 percent confidence level. The margin of error varies by dataset. Income data will be represented as the average per capita income of individuals within each elementary school attendance boundary region. Education will be represented as the percentage of individuals 25 years and older who have achieved post-secondary school degrees within each attendance boundary region. Finally, employment will be represented as the percent of people eligible to be in the workforce who are unemployed within each elementary school attendance boundary region.

Violent Crimes. Violent crimes are defined in the UCR (Uniform Crime Reporting) Program as those offenses which involve force or threat of force" (U.S. Department of Justice, 2011). Based on guideline publicized by the Federal Bureau of Investigation, homicide, assault (including sexual assault) and robbery were included as indicators of violent crime. Crime data will be obtained from Chicago Data Portal, which makes available government data specific to the city of Chicago. Crime estimates will be based on a dataset which reflects incidents of crime that have occurred within the city of Chicago over the past year with the exception of one week prior to the date accessed (Chicago Data Portal, 2014). The original source of this data is the Chicago Police Department's CLEAR (Citizen Law Enforcement Analysis and Reporting) system. This dataset can be filtered to reflect only the types of violent crime that are relevant to

my analyses. This dataset it updated daily Tuesday through Sunday each week and it contains over 65,000 records. This data is an estimate and all visualizations produced with this data should be considered approximate.

Academic Outcome Data. Academic outcomes will be based on growth and attainment in Math and Reading portions of the Northwest Evaluation Association Measure of Academic Progress (NWEA MAP). This NWEA MAP is a standardized measure used by CPS to gauge student learning in elementary school. Each year schools are ranked in part based on student performance on the NWEA MAP which includes metrics of growth and attainment. Growth refers to "the school's average fall-to-spring growth" on the NWEA MAP. This number is reported as a percentile which represents how the individual school ranks in comparison to other schools at the national level. The national average is set at the 50th percentile for both math and reading. Attainment refers to "how well the school's end-of-year performance compares to national average performance" (Chicago Public Schools, 2014). Test-retest reliability ranges from *r* =.84 - .93. The NWEA MAP recently replaced the Illinois Standards Achievement Test (ISAT) as the standardized metric of choice for elementary school students; concurrent validity between the NEWA MAP and the ISAT ranges from r = .79 - .87 (Reliability and Validity Estimates, 2004). CPS releases this data for affiliated neighborhood, charter, classical, magnet and contract elementary schools throughout the city of Chicago (Chicago Data Portal, 2013).

School Climate Data. School climate will be measured using a questionnaire developed by the Chicago Consortium on School Research called the 5Essentials. Chicago Public Schools in collaboration with the University of Chicago Consortium on Chicago School Research (CCSR), has identified five essential features of successful schools: effective leaders, collaborative teachers, involved families, supportive environment, and ambitious instruction.

"Effective leaders" taps into principals' ability to effectively work with teachers and staff to implement a clear plan for academic success. "Collaborative teachers" refers to the commitment of teachers to work together to improve the school in addition to capitalizing on opportunities for professional development. "Involved families" refers to staff/teacher willingness to build relationships with the families of students and the surrounding community. "Supportive environment" indicates the extent to which the school is safe and orderly as well as the willingness of teachers to actively support students. Finally, "ambitious instruction" taps into the whether classes are challenging and engaging to students. Overall the *5Essentials* is a measure of the extent to which the school climate is conducive to academic success. The *5Essentials* survey, developed by the University of Chicago CCSR, is part of a new system for evaluating school performance, which will be officially implemented starting the summer of 2014. The 5Essentials is based on over 10 years of research conducted in Chicago Public Schools. The survey is said to be reliable at the individual and school level. It is also said to have strong predictive validity regarding student outcomes and school improvement. Research by the CCSR has demonstrated that "elementary schools that were strong on three to five of the *5Essentials* were 10 times more likely to improve student learning gains in math and reading- and 30 times less likely to stagnate- than schools weak on three or more of the *5Essentials*" (5Essentials: Background, Predictive Validity and Reliability).

Analysis

Data for each indicator of socio-economic risk and violent crime exposure with be standardized and averaged to form a composite score. Preliminary analyses through zero-order correlations will be conducted between all variables to determine the descriptive statistics for each of the variables. To examine the influence of neighborhood disadvantage (as indicated by SES risk and

risk for exposure to violent crime) on academic outcomes at the institutional level, structural equation modeling will be used to test the hypothesis that the data in the present study adequately fit the proposed model (Kline, 2011).

Maximum Likelihood analysis will be used to determine the overall fit of the model to the data in LISREL. To evaluate the model the following model fit indices will be considered: the comparative fit index (CFI), the chi-square statistic, the root- mean-square residual error of approximation (RMSEA), and the standardized root-mean-squared residual (SRMR). The CFI is an index that compares the specified model with a baseline model to assess the extent of relative improvement in fit. The CFI ranges from 0 to 1 and values greater than .95 are considered indicative of adequate fit. The chi-square is a statistical test of "badness of fit," which is influenced by the model's degrees of freedom. The RMSEA is a fit index that is adjusted for parsimony. A value of .08 or less will be consistent with acceptable model fit. The SRMR is a measure of the mean absolute correlation residual. Values of .10 or lower are indicative of acceptable fit. In addition to the aforementioned indices, degrees of freedom and p-values will be reported to assess the extent to which the proposed model is an adequate fit. The proposed model is a compensatory model in which a protective factor counteracts the effects of risk factors on the outcome by operating in the opposite direction. In order to more closely examine the effects of school climate scores on the model as a whole, the model fit will be compared between schools that are "high" on positive school climate and versus schools that are "low" on positive school climate. Schools will be classified as "high" or "low" on positive school climate using a median split. The results from this comparison will shed light on whether a positive school climate does indeed have a compensatory effect on academic outcomes.

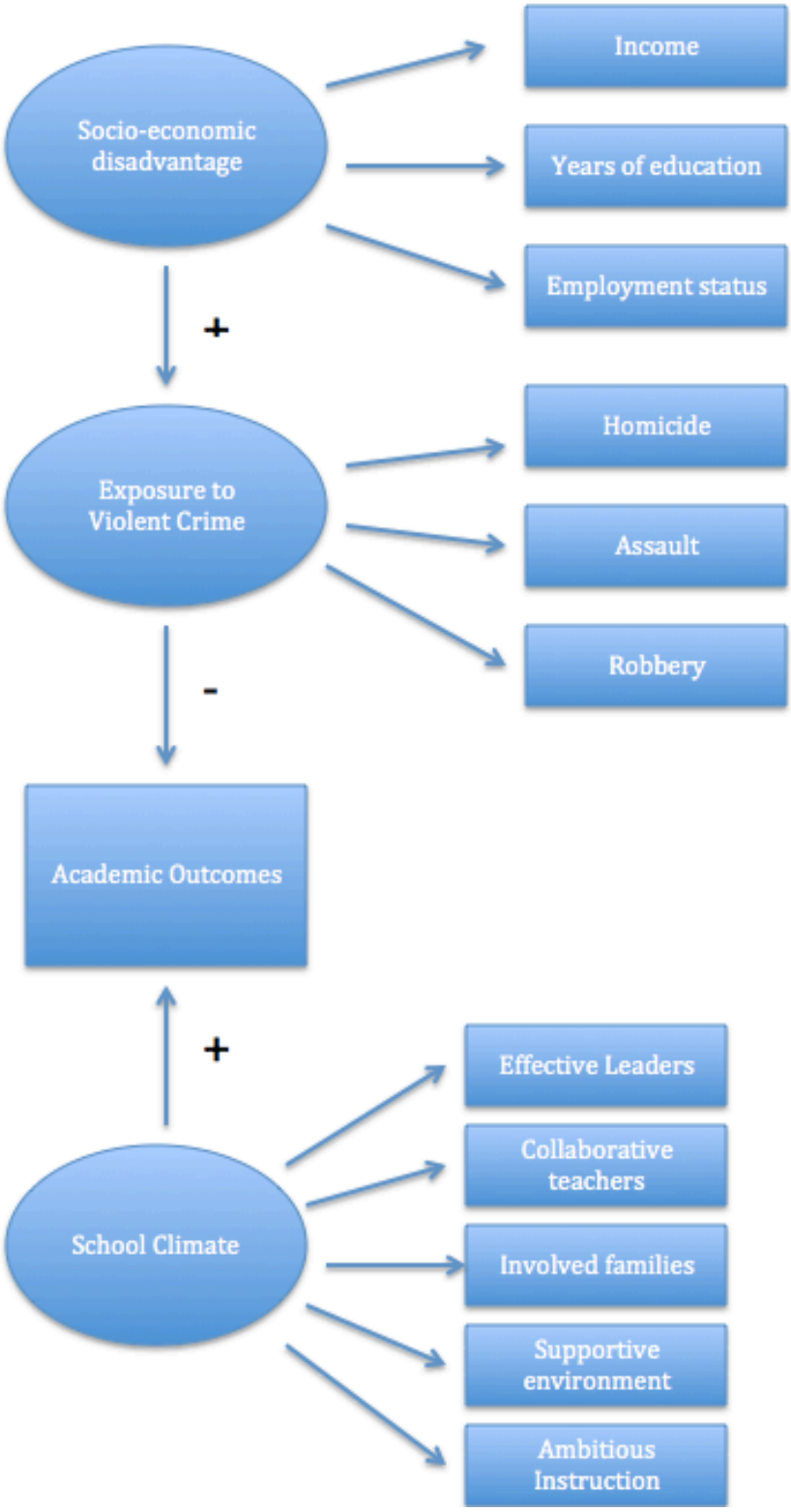

Figure 2

Full Model

Discussion of Changes

Initially, a structural equation model was proposed in which Maximum Likelihood analysis would be used to determine the overall fit of the model to the data in LISREL. This model offers the advantage of including violent crime and socio-economic status as latent constructs with all of their corresponding indicators. Additionally, this model allows for all variables to be analyzed simultaneously, which makes it possible to test the model as a whole rather than as individual pathways.

Ultimately the data was not appropriate for structural equation modeling for several reasons. The model as it was proposed did not have a sufficient n size to support an analysis; there were too many variables and pathways for the model to successfully converge on a solution. An attempt was made to trim the number of variables while maintaining the structure of the proposed model, however, the fit indices did not meet the predetermined cutoffs which suggested the data was a poor fit for the model (x^2 (32) = 410.27, $p < .01$; RMSEA = 0.18 [90% CI = 0.16, 0.20]; CFI = 0.74). Several further iterations of the model were examined in which more variables were trimmed and the structure of the model was changed in order to find a version with acceptable fit indices; however, given these changes were not theory-driven, it was decided to use a multiple regression approach to test the proposed pathways that were derived from the literature. It is not possible to examine several latent constructs using hierarchical regression so the indicators making up each latent construct were transformed into index scores to facilitate this analysis.

Given the non-significant findings for the structural equation model, what are the implications in terms of the data? It is possible that with a larger n size a structural equation model would have been appropriate for the data. The findings from this study support the model

structure as it was originally proposed, with school climate specified as a predictor rather than a moderator. Despite the seemingly appropriate model specification and the use of a bootstrapping technique, the program did no converge on a solution. A follow-up study might further specify the model by differentially weighting the indicators of violent crime as was done in the hierarchical regression analysis.

This study captures a large amount of data in an open, dynamic system. There are many factors that affect academic achievement at the school level that are not captured by this study. The amount of error within the variables that are accounted for in this study is difficult to estimate given the nature of the data and the fact that it is drawn from multiple sources and different time periods. Given all of this variability, constructing a model that is sufficiently specified for SEM analysis would be very difficult with this type of data. Though SEM allows for a more comprehensive examination of multiple pathways simultaneously and inclusion of latent constructs, a multiple regression technique allowed for the examination of individual theory-driven pathways as well as a moderator.

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