

**Longitudinal Associations Linking Elementary and Middle School Contexts with Student Aggression in Early Adolescence**

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ABSTRACT

Growing up in poverty increases youth risk for developing aggressive behavior problems which, in turn, are associated with a host of problematic outcomes, including school drop-out, substance use, mental health problems, and delinquency. In part, this may be due to exposure to adverse school contexts that create socialization influences supporting aggression. In the current study, 356 children from low-income families (58% White, 17% Latinx, 25% Black; 54% girls) were followed from preschool through seventh grade. Longitudinal data included measures of the school-level contexts experienced by study participants during their elementary and middle school years, including school levels of poverty (percentage of students receiving free or reduced-price lunch) and academic achievement (percentage of students scoring below the basic proficiency level on state achievement tests). Regression analyses suggested little impact of these school-level contexts on teacher or parent ratings of aggression in fifth grade, controlling for child baseline aggression and demographics. In contrast, school-level contexts had significant effects on child aggression in seventh grade with unique contributions by school-level achievement, controlling for child fifth grade aggression and elementary school contexts along with baseline covariates. These effects were robust across teacher and parent ratings. Findings are discussed in terms of understanding the school-based socialization of aggressive behavior and implications for educational policy and prevention programming.

**Key Words:** aggression; poverty; academic achievement; school context; longitudinal

### **Longitudinal Associations Linking Elementary and Middle School Contexts with Student Aggression in Early Adolescence**

High levels of aggression in early adolescence are associated with a host of problematic outcomes, including school drop-out, substance use, mental health problems, and delinquency, incurring substantial cost to society (Welsh et al., 2008). Among the multiple factors contributing to the development of aggression, low socioeconomic status (SES) has been studied extensively. The adversities associated with growing up in poverty have negative effects on children's development and adjustment, often undermining family stability and effective parenting, and contributing to elevated aggression (Evans, Chen, Miller, & Seeman, 2012; Shaw & Shelleby, 2014). By school entry, over 20% of children growing up in poverty demonstrate clinically-significant rates of aggressive behavior problems – almost three times the rate of children growing up in more advantageous family circumstances (Mazza et al., 2016).

Researchers have speculated that risks for aggressive behavior development are amplified further when children enter poor-quality schools serving many other disadvantaged children (Marryat, Thompson, Minnis, & Wilson, 2018; Rutter & Maughan, 2002). Negative proximal effects of school contexts on student behavior are well-documented at the elementary classroom level, where poor classroom management practices, conflictual teacher-student relationships, and problematic peer dynamics are linked with increased aggression (Atkins, Capella, Shernoff, Mehta, & Gustafson, 2017; Weyns et al., 2017). Broader effects of school-level context have also been noted on educational outcomes. For example, attending schools that serve many economically disadvantaged students contributes to reduced academic attainment and elevated school drop-out (Reardon, 2018; Willms, 2010; Wood, Kiperman, Esch, Leroux, & Truscott, 2017). These findings have raised deep concerns that aggregating low income students in schools fuels the widening socioeconomic gaps and ethnic/racial disparities evident in U.S. educational

attainment (Fahle, Reardon, Kalogrides, Weathers, & Jang, 2020; Perry, 2012). Concentrated levels of poverty in the student body may also have detrimental effects on the development of aggressive behavior, but research on this topic is sparse and reliant almost exclusively on cross-sectional studies (Midouhas, 2017).

The present study addressed this research gap by following a sample of economically-disadvantaged children from pre-kindergarten through seventh grade, with data collected on the levels of school poverty and school achievement they experienced during elementary school (kindergarten through fifth grade) and in middle school (seventh grade). Analyses evaluated the extent to which elementary school-level contexts accounted for variance in fifth-grade student aggression and then the degree to which middle school-level context incrementally influenced seventh-grade student aggression.

### **The Impact of Disadvantaged Schools on Child Aggression**

In bioecological theory (Bronfenbrenner & Morris, 2006), developmental processes are affected by the microsystems children experience, which include interactions with teachers and peers at school, and also by broader factors that influence those microsystems, including the composition the school student body (mesosystem). Multiple studies conducted at the elementary school level have documented microsystem interactions within classrooms that contribute to increased aggression. These include teacher use of inept and punitive discipline strategies and conflictual teacher-student relationships (Bradshaw, Sawyer, & O'Brennan, 2009; Weyns et al., 2017), as well as the aggressive social norms (Jackson, Cappella, & Neal, 2015) and peer contagion processes (Dishion & Tipsord, 2011) that characterize classrooms containing many aggressive children (Barth, Dunlap, Dane, Lochman & Wells, 2004; Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Rohlf, Krahe, & Busching, 2016).

Although less often studied, the broader composition of the school student body may function as a mesosystem that also influences student aggression. In the United States, children from low-income families often enter schools characterized by a high density of student poverty; 40% enter schools where 75% or more of the students qualify for free or reduced-price lunch, whereas only 6% attend schools where 25% or fewer of the students qualify for free or reduced-price lunch (Jordan, 2015). Educational research has demonstrated negative effects of school-level student poverty on academic achievement (Perry, 2012; Willms, 2010; Wood et al., 2017). Yet only a handful of studies have examined the effects of school-level contexts on the development of aggressive behavior.

Conceptually, mesosystem school-level poverty may affect student aggression by influencing the proximal microsystem interactions children experience in classrooms. For example, large, urban elementary schools that serve many low-income children are especially likely to have classrooms with a high density of aggressive students, creating classroom management challenges and increasing negative peer contagion and deviancy training (Thomas, Bierman, & the Conduct Problems Prevention Research Group [CPPRG], 2006). In addition, high levels of student poverty are associated with multiple school-level organizational characteristics that negatively affect student achievement (Lacour & Tissington, 2011) and may also increase student aggression (Bradshaw et al., 2009; Gottfredson, Gottfredson, Payne, & Gottfredson, 2005). For example, schools serving many low-income families often struggle to attract and keep experienced, high-quality teachers and administrators (Simon, & Johnson, 2015), contributing to administrative instability and disorganization and low levels of positive school climate and school bonding (Berg & Cornell, 2016; Ronfeldt, Loeb, & Wyckoff, 2013). Under these conditions, schools are less likely to promote the kind of student engagement, sense

of community, and motivation for learning that supports growth in the prosocial and self-regulation skills that decrease aggression (Xia, Fosco, & Feinberg, 2016). Supporting social disorganization theory, researchers have documented cross-sectional links between weak social cohesion at schools serving many low-income students (e.g., negative student and staff ratings of school climate, low levels of student attendance) and student aggression, reflected in elevated rates of bullying at the middle school level (Bradshaw et al., 2009) and rule-breaking, violence, and delinquency at the high school level (Gottfredson et al., 2005; Stewart, 2003).

### **Gaps in the Research**

#### ***Need for Longitudinal Designs***

Despite strong conceptual reasons to expect that disadvantaged school-level contexts may contribute to the development of aggression over time, existing research documenting this association is limited in several notable ways. First, most of the research on this topic is cross-sectional, documenting elevations in student aggression in high-poverty schools that could be due to selection effects, with more aggressive youth attending these schools. Only a few studies have followed children longitudinally to determine whether school-level poverty contributes to increases in student aggression over time and the findings of those studies are unclear. One short-term longitudinal study demonstrated a small but significant association between school-level poverty and gains in student aggression over the course of first grade in schools located in urban (but not rural) regions (Thomas, Bierman, Thompson, Powers, & CPPRG, 2008). Another longer-term longitudinal study examined the effect of school-level poverty on trajectories of child behavior through elementary school. Cross-sectionally, school-level poverty was associated with elevated rates of both externalizing and internalizing problems; however longitudinal effects were documented only for internalizing problems and driven primarily by the effects on

girls (Midouhas, 2017). Stronger effects of school context were documented at the high school level by Dudovitz and colleagues (2018) who followed students living in a low-income urban area from grade 9 to grade 11. They found that those who were assigned (by lottery) to schools with higher levels of student achievement exhibited lower levels of substance use, less truancy, and spent more time studying than those assigned to lower-achieving schools, with additional reductions in substance use among boys; however, aggressive behaviors were not measured. Taken together, these studies suggest that school-level contexts may have a greater impact on the behaviors of adolescents relative to elementary school students, although this hypothesis has not yet been tested longitudinally.

### ***Need to Compare School Level Effects at the Elementary and Middle School Level***

There are several reasons to anticipate that the effects of school context on student behavior may increase after children make the transition from elementary to middle school. In most American elementary schools, students spend the majority of their time in one classroom with one peer group and one teacher. In these self-contained contexts, student aggression is likely influenced primarily by the aggression levels of students in the same classroom and their selected friends, as well as by teacher classroom management strategies, rather than by school-level factors (Barth et al., 2004; Kellam et al., 1998; Powers, Bierman, & CPPRG, 2013; Thomas et al., 2006). Indeed, during the elementary years, considerably more inter-dependence in student aggression is accounted for at the classroom level than at the school level, with variation among classrooms within schools much greater than the variation between schools (Kellam et al 1998).

Most children in the United States make a transition between fifth and seventh grades, moving from smaller elementary schools where they are schooled primarily in one classroom to larger middle schools where they interact in multiple classroom settings with many teachers and

a considerably larger set of peers. In this middle school context, teachers have less capacity to monitor and manage student behavior outside of the classroom, and students have more autonomy to select friends from a broader peer group (Ryan, Kuusinen, & Bedoya-Skoog, 2015). Normatively, rates of school engagement decline after this transition (Symonds & Galton, 2014), school climate becomes less favorable (Madjar & Cohen-Malayev, 2016), and bullying increases (Bradshaw et al., 2009). Rates of antisocial behavior also increase, with a notable rise in covert acts and relational aggression (Hemphill et al., 2010). Given these changes in the school structure and the nature of aggression, it is possible that school-level contexts might have a stronger influence on student aggression in middle school relative to elementary school. In one of the few studies to make this comparison, Bradshaw and colleagues (2009) found a higher level of association between school poverty and victimization in a cross-sectional analysis of middle schools relative to elementary schools. The current study followed children longitudinally as they transitioned from elementary and middle school contexts to determine whether the impact of school contexts on aggressive behavior increased after children entered middle school. Given evidence of the differential impact of school contexts on the behavioral adjustment of girls and boys (Dudovitz et al., 2018; Midouhas, 2017), the current study also explored potential moderation of school contexts on aggressive behavior based on student sex.

### ***Considering the Effects of School-Level Student Poverty and Achievement***

Poverty levels co-vary with academic achievement among individuals (Orpinas, Raczynski, Hsieh, Nahapetyan, & Horne, 2018) and at the level of the school context, with school-level poverty and achievement levels highly correlated ( $r = .78$ ; Reardon, 2016). Despite this high correlation, Reardon (2018) found that some high poverty school districts produce high levels of student academic achievement growth over time. Research on high-achieving schools in

high-poverty communities suggest that they are characterized by strong instructional leaders, committed teachers, positive cultures, and safe and disciplined environments (Klar & Brewer, 2014; Murakami, Gurr, & Notman, 2019). The same organizational factors that foster higher academic achievement in the student body may also promote more social coherence and a more positive school climate, thereby potentially reducing the negative effects of school-level poverty on aggression (Bradshaw et al., 2009; Gottfredson et al., 2005). For this reason, school achievement levels may be a more sensitive index of the school context factors associated with student aggression than the more widely-used index of school-level poverty.

### **The Present Study**

The present study was designed to address these gaps in the existing research base describing associations between school-level contexts and the development of student aggression. Following a sample of economically-disadvantaged children from pre-kindergarten through seventh grade, the current study examined links between the school contexts they experienced in elementary and middle school, assessing both school-level poverty and school-level achievement. The first aim of this study was to determine the extent to which the elementary school context (school-level poverty and achievement) accounted for variance in fifth-grade student aggression, controlling for baseline aggression and demographics at school entry. The second aim was to determine the extent to which the middle school context accounted for incremental variance in seventh-grade student aggression, controlling for fifth-grade aggression as well as baseline aggression and demographics. It was hypothesized that elementary school context would predict variance in children's aggressive behaviors in fifth grade, and, in addition, the middle school context would predict incremental variance in children's seventh grade aggression. It was further hypothesized that school-level achievement levels would explain

unique variance in child aggression beyond that explained by school-level poverty alone, based upon Reardon's (2018) observation that school achievement (rather than school poverty) provides a more sensitive index of organizational functioning and school climate. In addition, given sex differences found in prior research examining school-level context effects on behavior, sex was explored as a moderator of school context effects.

### **Method**

This study followed the standards for the ethical conduct of research specified by the American Psychological Association and all procedures were approved by the Pennsylvania State University IRB (Head Start REDI – Research-based, Developmentally Informed; PRAMS00028979). Parents and teachers provided informed consent and students provided assent for participation; participants were compensated financially for completing assessments.

### **Participants**

Participants included 356 children (58% White, 17% Latinx, 25% Black; 54% girls; (*M*<sub>age</sub> = 4.49 years old at study entry) originally recruited from 44 Head Start classrooms in three counties in Pennsylvania as part of the [project name masked for review] study (see Bierman et al., 2008). Families were low-income, with a median annual income of \$15,000 and an average income-to-needs ratio of .88 (*SD* = 0.61). About one-third (31%) of the parents had less than a high school education, 60% had graduated from high school or received a GED, 7% had completed some post-high school education, and 2% had completed a college degree.

The [project name masked for review] included the randomization of Head Start classrooms to a preschool intervention. This study began in the kindergarten year when all participants had completed intervention. Although the preschool intervention significantly reduced levels of aggression at kindergarten entry (Bierman et al., 2014), it did not affect the

slope of aggression trajectories through elementary school (Welsh, Bierman, Nix, & Heinrichs, 2020). Consequently, this study used the entire sample, and included kindergarten scores and intervention status as covariates to control for baseline levels of aggression.

Head Start centers served entire counties, and, as a result, children were widely dispersed across schools after leaving Head Start. By first grade, the 356 children were in 82 elementary schools in 33 school districts. Throughout elementary school, children were often the only study participant in their schools (40% in kindergarten increasing to 48% in 5<sup>th</sup> grade). Study participants converged as they matriculated at 73 larger middle schools but remained widely dispersed. Only 13% of children were the sole study participant in their middle school, but only four of the 73 middle schools had more than 10 participants (detail in supplementary Table S1).

Due to attrition (mostly family moves), 62 of 356 (17%) children were missing seventh-grade data. In addition, three children were homeschooled in seventh grade and were excluded from the final analyses. Multiple imputation was used to account for missing data. Data was imputed 40 times using PROC MI (SAS, version 9.3). Each new data set was analyzed separately, and results from each of these analyses were pooled.

## **Measures**

Outcome measures were collected in the spring of children's fifth and seventh grade years and included teacher and parent ratings of aggressive behaviors and conduct problems in fifth and seventh grades, along with teacher ratings of relational aggression in seventh grade. Teacher ratings were obtained primarily from Language Arts teachers (88%) or, when unavailable, from other academic course teachers (Social Studies, 5%; Math, 2%; other academic subject, 5%). Measures of school context were collected from administrative records available in federal and state databases.

**Child behavior outcomes in fifth and seventh grade.** In fifth and seventh grade, teachers and parents rated aggressive behaviors using the Authority Acceptance scale from the *Teacher Observation of Child Adaptation-Revised (TOCA – R; Werthamer-Larsson, Kellam, & Wheeler, 1991)*. This 7-item scale assesses hostile and rule-breaking behaviors (e.g., yells, harms others, stubborn, breaks rules) using a 6-point scale (1 = “never” to 6 = “always”). Item ratings were averaged to create a total aggression score ( $\alpha_{\text{fifth grade}} = .90$  and  $\alpha_{\text{seventh grade}} = .90$  for teachers;  $\alpha_{\text{fifth grade}} = .86$  and  $\alpha_{\text{seventh grade}} = .79$  for parents).

In addition, in seventh grade only, teachers and parents rated conduct problems using the *Strengths and Difficulties Questionnaire (Goodman, 1997)*. The 5-item conduct problems scale described behaviors symptomatic of conduct disorder (e.g., fights, lies, steals). Each item was rated on a 3-point scale (0 = “not true” to 2 = “certainly true”), and ratings were summed to create a total score ( $\alpha = .80$  for teachers,  $\alpha = .71$  for parents).

Teachers also rated relational aggression in seventh grade, using the 7-item subscale from the *Children’s Social Behavior Scale-Teacher Form (Crick, 1996)*. Items such as spreading rumors about others and encouraging peers to exclude others were rated on a 6-point scale, and ratings were summed to create a total score ( $\alpha = 0.96$ ).

**Measures of school context.** Measures of school context were retrieved from administrative records available at the federal and state levels. For each study participant, we identified the percentage of students in his or her school receiving free or reduced-price lunch when the study participant was in kindergarten, first, second, third, fifth, and seventh grade and included it as an individual-level variable. Thus, each participant had school-level context data for five years in elementary school; these scores were averaged to create an estimate of the school-level poverty experienced across the elementary school years. The percentage of children

in the school receiving free or reduced-price lunch in seventh grade was used as a single indicator of the level of school-level poverty experienced in middle school.

Administrative records also provided the percentage of children in each school who scored below the basic level (i.e., state levels of proficiency) of achievement on state tests, averaged across the subjects of reading and math. Parallel to the school-level poverty data, school achievement levels experienced by participants during each year of elementary school were averaged to represent elementary school-level achievement. The percentage of children in the school scoring below the basic level on seventh grade achievement tests was used as a single indicator of the school-level achievement experienced in middle school.

**Baseline control variables.** Baseline aggression was measured in kindergarten using teacher and parent ratings of aggression on the *TOCA – R* (Werthamer-Larsson et al., 1991). Demographic variables (child age, sex, race, and family income-to-needs ratio) were reported by primary caregivers at study enrollment and included as covariates.

### **Plan of Analyses**

The analyses for this study were conducted in three phases. First, descriptive analyses were conducted to explore associations among child outcomes and school contexts. Second, regressions were conducted to predict each measure of fifth-grade aggression. After entering demographics (age, sex, race, family income-to-needs ratio), intervention status, and baseline aggression, the two elementary school context measures (school-level poverty and achievement) were entered as a block. Interaction terms were then added to evaluate any moderation of school context effects by child sex. Third, these regression models were expanded to predict each measure of seventh-grade aggression. Fifth grade child aggression and seventh grade school context (school-level poverty and achievement at seventh grade) were added to determine the

extent to which middle school context accounted for incremental changes in student aggression in seventh grade, controlling for baseline covariates, elementary school context, and fifth grade student aggression. Interaction terms were added to the analysis to determine whether child sex interacted with school context when explaining variance in seventh-grade aggression. Results of a power analysis (G\*Power 3.1, Faul, Erdfelder, Buchner, & Lang, 2009) revealed that we had the power of .80 to detect effects of  $R^2 = .03$  and higher at an alpha level of  $p < .05$ .

It should be noted that multilevel models (MLM) were considered but their accuracy is controversial in conditions like this in which children are widely dispersed across schools and the number of children in each school is very unbalanced and often very low (McNeish & Stapleton, 2016). As an alternative, we used fixed effects modeling, including a dummy-code variable to represent any middle school with eight or more study participants (see Huang, 2016). To determine the robustness of these findings, multilevel models were also run nesting children in their seventh-grade middle schools. The intraclass correlations (ICCs) for the seventh-grade outcome variables and the MLM findings, which are similar to the findings from the linear regressions presented here, are provided in the supplementary materials (Tables S2, S3, and S4).

## Results

### Descriptive Analyses

Table 1 presents descriptive statistics for the study variables. Measure raw scores are presented in the table, but standardized scores ( $M = 0$ ,  $SD = 1$ ) were used in all analyses. Simple correlations among study variables are presented in Table 2. Correlations among student experiences with school-level poverty and achievement are shown in the top rows of the table. Levels of school poverty and school achievement experienced by students were significantly correlated,  $r = .75$  in elementary school, and  $r = .81$  in middle school. Student experiences were

also correlated across development, with school levels experienced in elementary and middle school correlated  $r = .69$  for poverty and  $r = .69$  for achievement. Correlations among teacher and parent ratings of aggressive behavior problems are shown in the lower rows of the table. At each time point, correlations between teacher and parent ratings of youth aggression were low to moderate in value ( $r = .25$  to  $.35$ ). Across time, aggression ratings were moderately stable from fifth to seventh grade ( $r = .53$  to  $.54$  for teachers,  $r = .49$  to  $.52$  for parents). Elementary school-level poverty and achievement were not significantly associated with fifth-grade aggression but were significantly associated with some seventh-grade ratings (teacher-rated aggression,  $r = .12$  to  $.15$ ; parent-rated conduct problems,  $r = .13$  to  $.19$ ). Middle school contexts were significantly associated with seventh-grade teacher-rated aggression, conduct problems, and relational aggression ( $r = .13$  to  $.24$ ) and parent-rated conduct problems ( $r = .17$  to  $.19$ ).

### **Regression Analyses**

Results of stepwise regressions that were calculated to predict fifth-grade aggression as rated separately by teachers and parents are presented in Table 3. As shown in the column labeled Model 1, baseline aggression (in kindergarten), demographic characteristics, and family SES together accounted for 21% of the variance in teacher-rated fifth-grade aggression and 32% of the variance in parent-rated fifth-grade aggression. As shown in the column labeled Model 2, the addition of elementary school-level poverty and achievement accounted for non-significant amounts of incremental variance in teacher- and parent- rated fifth-grade aggression ( $ps > .05$ ).

Results of stepwise regressions predicting child aggression and conduct problems in seventh grade are presented in Table 4. As shown in the column labeled Model 1, baseline aggression, demographics, and family SES together accounted for significant amounts of variance in teacher-rated aggression (11%), relational aggression (5%), and conduct problems

(9%) and parent-rated aggression (23%) and conduct problems (19%). As shown in the column labeled Model 2, adding fifth-grade aggression and elementary-school context accounted for significant incremental variance in teacher-rated seventh-grade aggression (23%), relational aggression (19%), and conduct problems (22%) and parent-rated aggression (12%) and conduct problems (13%). As shown in the column labeled Model 3, adding the middle school-level context variables accounted for significant incremental variance in teacher-rated aggression (4%), relational aggression (3%), and conduct problems (4%), and parent-rated aggression (3%) and conduct problems (3%). In each case, except for parent-rated conduct problems, the fixed effect of school-level low achievement (but not school-level poverty) made a unique, significant contribution to the prediction of student aggression (standardized  $\beta$ s = .27 to .36). No significant sex by context interactions emerged for any of the outcome variables, so they were not reported.

### **Discussion**

Attending schools characterized by high levels of student poverty and low levels of student achievement had little impact on the development of aggression assessed in fifth grade, controlling for kindergarten aggression, but promoted incremental gains in aggression in seventh grade, controlling for fifth-grade aggression and elementary school contexts as well as baseline covariates. The effect was robust, evident across both teacher and parent ratings, consistent for boys and girls and across different forms of aggression. School achievement levels made a unique contribution to seventh-grade aggression beyond that made by school poverty levels.

These findings are descriptive and do not necessarily reflect a causal influence. However, the findings reinforce cross-sectional studies that revealed correlations between school-level student poverty and middle school and high school rates of bullying, rule-breaking, and violence (Bradshaw et al., 2009; Stewart, 2003). The findings add confidence to prior studies by including

a longitudinal design with controls for students' prior aggression levels and documenting an increase in school context effects on aggression after students transitioned from elementary to middle schools. The findings validate the importance of attending to school-level poverty and achievement in models of adolescent aggression, with implications for educational policy and preventive interventions designed to reduce adolescent risk.

### **School-level Effects on Student Aggression**

Educational researchers have raised concerns about aggregating students from low-income families in schools based on documented associations between school-level poverty and student underachievement, truancy, and drop-out (Reardon, 2018; Perry, 2012; Willms, 2010; Wood et al., 2017). In his landmark study, Reardon (2016) found that the negative educational impact of attending high-poverty schools was the single most powerful predictor of the racial achievement gap in America. Based on social disorganization theory, criminologists and public health researchers have argued that the diminished social cohesion that characterizes high-poverty schools undermines social control, fueling increases in antisocial behaviors including aggression, truancy, and substance use (Bradshaw et al., 2009; Gottfredson et al., 2005). The present findings are consistent with this interpretation, with school context effects on aggression emerging in middle school as students gain autonomy and begin to navigate the school context more broadly.

**School effects in elementary school versus middle school.** In this study, the middle school context explained a statistically significant 3% to 4% of the variance across parent and teacher ratings of seventh-grade aggression and conduct problems. In contrast, the elementary school context explained a non-significant 2% of the variance in teacher-rated student aggression and negligible variance in parent-rated student aggression in fifth grade. Prior research suggests

that, at the elementary school level, microsystem classroom effects significantly outweigh school-level effects on aggression (Kellam et al., 1998). School-level effects are likely larger in middle school because students began to switch classes and interact more freely with the larger school peer group, and also perhaps because rates of antisocial activity and deviant peer affiliations increase (Hemphill et al., 2010).

To date, research examining school effects on aggressive behavioral development has focused extensively on interpersonal dynamics operating in classrooms, including teacher classroom management practices, teacher-student relationships, and the attitudinal and behavioral effects of aggregating aggressive children in classrooms (Barth et al., 2004; Jackson et al., 2015; Weyns et al., 2017); these are important and well-documented microsystem influences on developing aggression. Understanding the impact of mesosystem effects, including the impact of school-level context, is also important for refining developmental models and guiding prevention and intervention strategies, especially after children leave elementary schools and move into middle and high schools.

Prior research and theory provide a basis for speculation regarding the mechanisms by which school-level contexts affect student aggression. Conceptually, schools serving high concentrations of students living in poverty are challenged to address high levels of student need for educational and behavioral support which emerge as a function of exposure to the elevated adversities and diminished resources that accompany poverty (Atkins et al., 2017; Evans et al., 2012; Mazza et al., 2016; Shaw & Shelleby, 2014). Yet, these schools are often underfunded and lacking in the necessary resources to meet these student needs, contributing to demoralizing working conditions and subpar instructional quality (Mickelson, 2018; Simon, & Johnson, 2015). These organizational conditions represent a school ecosystem (Atkins et al., 2017;

Bronfenbrenner & Morris, 2006) that negatively affects school administrators, teachers, and students and undermines their relationships, producing a negative school climate and feelings of alienation among teachers and students (Berg & Cornell, 2016; Ronfeldt et al., 2013). Under these conditions, the positive attitudes that motivate school engagement and support self-regulation (e.g., strong school attachment to school, commitment to schooling, belief in school rules) are eroded (Stewart, 2003). These are attitudes that not only support academic engagement, but also may deter adolescents from rule-breaking and aggressive behaviors (Bradshaw et al., 2009; Gottfredson et al., 2005). Additional research is needed to explore the characteristics of school systems that may account for or may moderate the negative impact of school-level contexts on student aggression.

**School-level poverty versus achievement as an index of increased adolescent risk.**

School-level poverty and achievement are often considered comparable indices of school adversity, and in this study of student experiences, they were highly correlated ( $r = .75$  in elementary school,  $r = .81$  in middle school). Despite these high levels of association, Reardon (2018) found school-level achievement (rather than school-level poverty) to be the primary predictor of student academic progress. The current study suggests that school-level achievement may also be the aspect of school-level context that most effectively identifies school-level contexts associated with increased aggression. This may be because low school achievement levels reflect important aspects of school functioning more precisely than high student poverty. Even in the context of elevated student economic disadvantage and limited economic resources, some schools succeed in providing students with the developmental supports they need to perform effectively academically (Reardon, 2018), and these same factors appear to benefit student's behavioral adjustment as well. Factors such as administrative stability, high-quality

teaching and student-teacher relationships, and positive school climate that characterize high-achieving schools may also promote regulatory capabilities that allow children to succeed academically and behaviorally.

When schools serving many economically-disadvantaged students have access to strong instructional leaders and committed teachers, they can create positive school cultures characterized by safe and disciplined environments that support student achievement (Klar & Brewer, 2014; Murakami, Gurr, & Notman, 2019). These same factors that support student achievement may be associated with the adult supports and peer behaviors that foster student learning engagement and promote the development of self-regulatory skills that divert children from aggression development. That is, higher student achievement may reflect well-structured, caring classroom and school environments (Thomas et al., 2008), low levels of coercive teacher control or punitive discipline practices and overall positive student-teacher relationships (Rucinski, Brown, & Downer, 2018). In these contexts, where the prevailing social norms support school liking and the inhibition of aggression, peers model and reinforce self-regulated behavior, reducing opportunities for the kinds of negative peer contagion and peer deviancy training that are associated with student aggression (e.g., Powers, Bierman, & CPPRG, 2013) and other risky behaviors (Dudovitz et al., 2018) and increasing school bonding and positive peer contagion with high-achieving peers (Palacios et al., 2019).

### **Implications for Prevention**

Recognizing school-level contexts that influence aggressive behavioral development has implications for the design of prevention and intervention approaches. The present results suggest that, particularly at the middle school level, the impact of prevention efforts that target classroom or peer group dynamics in isolation may be attenuated if the school-level effects that

instigate and sustain those maladaptive dynamics are not considered and addressed (Mickelson, 2018; Willms, 2010). Atkins and colleagues (2017) have called for the use of broader school-community partnerships in urban settings where the concentration of student poverty and low achievement overwhelm the capacity of schools to serve as the sole provider of critical intervention supports. The present findings also suggest that interventions designed to improve student learning engagement and academic attainment may have the additional benefits of reducing student aggression and antisocial behavior.

In addition, the present findings supplement prior educational research in suggesting that aggregating children from low-income families in schools is deleterious to their behavioral and educational outcomes. These findings reinforce the importance of efforts to change state and school district policies regarding the way that children are assigned to middle schools in order to create more socio-economically heterogeneous student bodies (Willms, 2010). Research documenting negative effects of high-poverty schools on behavioral adjustment as well as educational attainment supports calls to reduce the aggregation of low-income and low-achieving students in schools (or in academic tracks within schools) in order to address the wide educational disparities affecting low-income and ethnic/racial minority groups in the U.S. (Mickelson, 2018; Fahle et al., 2020).

### **Study Strengths and Limitations**

An important strength of this study was the longitudinal framework, following a sample of low-income children attending Head Start preschool forward through elementary and into middle school. After leaving Head Start, children dispersed into a large number of schools, so the effects documented here are not limited to any particular school or school district but represent effects that emerged across a large sample of schools and school districts.

An additional strength of the study was the inclusion of multi-method measurement, including independent ratings by teachers and parents. The present findings suggest that the effects of school achievement on student aggression are not limited to student behavior in the school setting but also generalize and affect student aggressive behavioral development outside of the school context. At the same time, the addition of youth self-reports of aggression would have strengthened the study, especially for assessing covert antisocial behavior and relational aggression that are not overtly evident to teachers and parents.

It is worth noting that the middle school context effects found in this study are relatively small, accounting for 3% to 4% of the variance in teacher and parent ratings of seventh grade aggression. At the same time, these effects are comparable to those documented in meta-analyses of school context effects on academic attainment (Rutter & Maughan, 2002). At a population level, these small effects can become quite important, reflecting educational disparities that may be affecting both academic attainment and aggressive behavioral development.

The study has several additional limitations worth noting. First, discussion of the mechanisms of action that may account for the school-level effects on aggression is speculative; this study did not include any direct assessments of the hypothesized mechanisms of action. A more complete understanding of the mechanisms of action linking school-level contexts with student aggression would be helpful in informing intervention design.

In addition, the sample consisted primarily of schools in Pennsylvania in small urban and rural locations. It remains unclear whether these findings will generalize to other areas of the country and to schools in large urban settings.

Another limitation of the current study is that the contexts examined were limited to poverty and achievement. While school-level poverty and achievement can certainly reflect the

surrounding neighborhoods and communities and serve as a proxy for related risk factors (e.g., McCoy, Roy, & Sirkman, 2013), they do not account for the complex longitudinal transactions that occur between individual- and community-level risk factors that also contribute to the development of aggression apart from school influences (Beauchaine, Shader, & Hinshaw, 2016). Lin and colleagues (2020) assessed community violence and found its effect on adolescent aggression was mediated by diminished school engagement and subsequent deviant peer affiliation, which lends support to the importance of understanding links between community-level and school-level factors associated with aggression and antisocial behavioral development. In addition, additional characteristics of the school context, such as student ethnic/racial composition (Wright & Wachs, 2019) and rural/urban location (Thomas et al., 2006) also warrant study to better understand school-level context features that contribute to or reduce aggression.

Additionally, this study did not include measures of school levels of aggression (i.e., aggregate individual-level student aggression scores up to the school-level), which may explain a substantial proportion of incremental variance in contemporaneous aggressive behavior as seen in studies focusing on classroom contexts and aggression in elementary school (e.g., Barth et al., 2004). Researchers often aggregate the aggression scores of study participants to index school-level or classroom-level aggression rates. This was not possible in the current study because students were widely dispersed across schools (49% of the middle schools in this sample had only one study participant) making it impossible to use aggregated student scores to represent the broader school characteristics. Future studies should examine the degree to which school-wide levels of aggression may account for the impact of high-poverty, low-achieving middle schools on student aggression.

Another limitation of this study was that the nature of the dispersion of children across schools from kindergarten to seventh grade resulted in unbalanced school-level data and many small cells (e.g. half of the middle schools with only one study participant). Although multilevel models are a useful way to assess school-level effects, their application is controversial in a situation in which cells are very unbalanced and many level-2 cells lack multiple nested observations (Huang, 2016; McNeish & Stapleton, 2016). At the same time, the fact that similar effects emerged when the present study data were analyzed using regressions with standard errors adjusted to account for children nested in schools and when multilevel models were used (presented in supplementary Table S3) adds confidence in the findings.

### **Conclusions and Future Directions**

In the future, additional studies aimed at uncovering mechanisms of action underlying the observed effects in the current study would be helpful in determining how exactly school-level achievement and school-level poverty operate to influence children's aggressive behavior development. Specifically, it is imperative that studies examine more closely the characteristics of schools that contribute to the higher levels of achievement attained by some schools serving many low-SES children as a way of decreasing disparities in both academic attainment and behavioral adjustment. This study suggests that this dimension of school context might be especially important after children transition into middle schools, affecting levels of aggressive behavior as well as academic achievement. While individual and familial factors have a proximal and substantial influence on children's aggression, this study shows that school-level factors cannot be overlooked as socialization contexts when allocating resources and designing interventions to reduce aggression.

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**Table 1***Descriptive Statistics for Study Variables*

Variable	<i>n</i>	Mean	<i>SD</i>	Min	Max
<b>Aggression</b>					
Teacher-Rated (K)	355	1.92	0.88	1.00	5.00
Parent-Rated (K)	355	2.90	0.98	1.00	6.00
Teacher-Rated (5)	264	1.78	0.84	1.00	5.14
Parent-Rated (5)	275	2.48	0.88	1.00	5.71
Teacher-Rated (7)	257	1.94	1.04	1.00	6.00
Parent-Rated (7)	293	2.24	0.85	1.00	6.00
<b>Relational</b>					
Teacher-Rated (7)	255	1.85	1.00	1.00	6.0
<b>Conduct Problems</b>					
Teacher-Rated (7)	257	1.67	2.19	0.00	10.00
Parent-Rated (7)	293	1.86	1.83	0.00	8.00
<b>School Contexts</b>					
% Poverty (5)	331	54.42	21.87	0.00	97.97
% Low Achievement (5)	329	12.20	6.93	0.75	34.83
% Poverty (7)	264	53.91	19.52	0.00	96.57
% Low Achievement (7)	244	13.30	11.59	0.25	52.70

*Note:* In this table, “% Poverty” is the percentage of students in a study participant’s school receiving free or reduced-price lunch. Likewise, “% Low Achievement” is the percentage of students in a study participant’s school who scored below state levels of proficiency in achievement testing. K = kindergarten, 5 = fifth grade, 7 = seventh grade.

**Table 2***Simple Correlations for School Contexts and Behavioral Outcomes*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Poverty - K5	-									
2. Low Achievement - K5	.75**	-								
3. Poverty - 7	.69**	.66**	-							
4. Low Achievement - 7	.53**	.69**	.81**	-						
5. Aggression - 5 (T)	.06	.11	.08	.11	-					
6. Aggression - 5 (P)	.03	-.09	-.07	-.09	.25**	-				
7. Aggression - 7 (T)	.12*	.15*	.23**	.29**	.54**	.16*	-			
8. Conduct Problems - 7 (T)	.08	.07	.13*	.20**	.53**	.15*	.88**	-		
9. Relational - 7 (T)	.07	.07	.14*	.24**	.40**	.05	.70**	.71**	-	
10. Aggression - 7 (P)	.11	-.01	.08	.09	.30**	.52**	.31**	.33**	.23**	-
11. Conduct Problems - 7 (P)	.19**	.13*	.17**	.19**	.32**	.49**	.38**	.35**	.22**	.77**

*Note:* K5 = kindergarten to fifth grade; 5 = fifth grade; 7 = seventh grade; T = teacher-rated, P = parent-rated.

\*  $p < .05$ , \*\*  $p < .01$ .

**Table 3***Results of Regressions Predicting 5th Grade Aggression with School Contexts*

Predictors	Model 1		Model 2		
	F	R <sup>2</sup>	ΔF	ΔR <sup>2</sup>	β (SE)
Aggression (T)	13.12***	.21	4.39	.02	
Poverty K5					-.04 (.08)
Low Achievement K5					.16 (.10)
Aggression (P)	23.50***	.32	1.66	.01	
Poverty K5					.09 (.07)
Low Achievement K5					-.10 (.08)

*Note:* Model 1 includes child sex, age, race, family income-to-needs ratio, baseline aggression, and intervention. Model 2 adds elementary school contexts. T = teacher-rated, P = parent-rated.

\*\*\*  $p < .001$ .

**Table 4***Results of Regressions Predicting Seventh Grade Outcomes with School Contexts*

	Model 1		Model 2			Model 3		
	F	R <sup>2</sup>	ΔF	ΔR <sup>2</sup>	β (SE)	ΔF	ΔR <sup>2</sup>	β (SE)
Aggression (T)	5.82***	.11	39.17***	.23		11.91**	.04	
Poverty K5					.06 (.08)			.01 (.10)
Low Achievement K5					-.01 (.09)			-.13 (.11)
Poverty 7								-.01 (.14)
Low Achievement 7								.32* (.14)
Relational (T)	2.40 <sup>†</sup>	.05	28.40***	.19		8.62*	.03	
Poverty K5					.11 (.09)			.15 (.11)
Low Achievement K5					-.17 (.10)			-.33** (.12)
Poverty 7								-.11 (.15)
Low Achievement 7								.34* (.16)
Conduct Problems (T)	4.69***	.09	37.05***	.22		9.60**	.04	
Poverty K5					.11 (.08)			.10 (.10)
Low Achievement K5					-.13 (.10)			-.22 (.12)
Poverty 7								-.15 (.14)
Low Achievement 7								.36* (.15)
Aggression (P)	14.67***	.23	20.85***	.12		8.79**	.03	
Poverty K5					.14 (.08)			.08 (.10)
Low Achievement K5					-.01 (.09)			-.07 (.11)
Poverty 7								.00 (.13)
Low Achievement 7								.27* (.12)
Conduct Problems (P)	11.80***	.19	22.35***	.13		7.85**	.03	
Poverty K5					.09 (.08)			.04 (.10)
Low Achievement K5					.16 (.09)			.06 (.10)
Poverty 7								.03 (.15)
Low Achievement 7								.24 (.13)

*Note:* Model 1 includes child sex, age, race, family income-to-needs ratio, baseline aggression, and intervention status. Model 2 adds elementary school contexts and fifth grade aggression.

Model 3 adds seventh grade school contexts. T = teacher-rated; P = parent-rated.

\* $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Electronic Supplemental Materials**

Longitudinal Associations Linking Elementary and Middle School Contexts with Student  
Aggression in Early Adolescence

*Journal of Abnormal Child Psychology*

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**Table S1***Sample Dispersion and School Clustering in Fifth and Seventh Grades*

Number of Study Participants <sup>a</sup>	Frequency <sup>b</sup>	Percent (%)
5 <sup>th</sup> Grade Schools ( <i>M</i> = 3.14 children/school)		
1	41	48.8
2	11	13.1
3	8	9.5
4	5	6.0
5	5	6.0
6	3	3.6
7	2	2.4
8	1	1.2
10	4	4.8
12	3	3.6
16	1	1.2
Total	84	100
7 <sup>th</sup> Grade Schools ( <i>M</i> = 3.75 children/school)		
1	36	49.3
2	8	11.0
3	4	5.5
4	5	6.8
5	6	8.2
6	6	8.2
8	2	2.7
9	2	2.7
11	2	2.7
12	1	1.4
56	1	1.4
Total	73	100

<sup>a</sup>Number of study participants in a given school. <sup>b</sup>Number of schools with the identified number of study participants.

**Table S2***Intraclass Correlations (ICCs) for Each Dependent Variable in Seventh Grade*

Dependent Variable	Intercept Variance <sup>a</sup>	Residual Variance <sup>b</sup>	ICC
<b>Teacher-Rated</b>			
Aggression	.048	.949	.049
Conduct Problems	.085	.920	.084
Relational	.264	.796	.249
<b>Parent-Rated</b>			
Aggression	.132	.882	.130
Conduct Problems	.010	.987	.010

*Note:* ICCs were calculated using a null model that included only the dependent variable and a school-code grouping variable; data was drawn from the pooled imputation dataset with data for all 353 children in the analyses.

<sup>a</sup>“Intercept Variance” refers to the amount of variance explained by being a member of a given group. <sup>b</sup>“Residual Variance” refers to the remaining unexplained variance after accounting for clustering.

**Table S3***Results of Multilevel Models Predicting Seventh-Grade Aggression with School Contexts*

	Model 1 (vs. a null model)		Model 2 (vs. Model 1)			Model 3 (vs. Model 2)		
	$\chi^2$	R <sup>2</sup>	$\chi^2$	$\Delta R^2$	$\gamma$ (SE)	$\chi^2$	$\Delta R^2$	$\gamma$ (SE)
Aggression (T)	77.29***	.11	214.31***	.25		46.34***	.08	
Poverty K5					.07 (.09)			.01 (.09)
Low Achievement K5					-.02 (.10)			-.14 (.11)
Poverty 7								.02 (.13)
Low Achievement 7								.29* (.12)
Aggression (P)	176.65***	.24	116.60***	.15		25.34***	.03	
Poverty K5					.14 (.09)			.10 (.09)
Low Achievement K5					-.01 (.10)			-.11 (.10)
Poverty 7								-.03 (.11)
Low Achievement 7								.24* (.12)
Relational (T)	24.29**	.05	172.70***	.18		29.10***	.08	
Poverty K5					.15 (.10)			.13 (.10)
Low Achievement K5					-.23* (.11)			-.32** (.11)
Poverty 7								-.07 (.15)
Low Achievement 7								.30 (.16)

*Note:* Analyses control for child sex, age, race, family income-to-needs ratio, baseline aggression, and intervention. Model 1 includes a random intercept for school, baseline aggression, and demographic control variables and was compared to a null model with only a random intercept for schools; Model 2 adds elementary school contexts and fifth grade aggression; and Model 3 adds seventh grade school contexts. T = teacher-rated; P = parent-rated;  $\chi^2$  = chi-squared statistic for likelihood ratio test;  $\gamma$  = fixed effect in multilevel model.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Table S4**

*Results of Multilevel Models Predicting Seventh-Grade Conduct Problems with School Contexts*

	Model 1		Model 2			Model 3		
	(vs. a null model)		(vs. Model 1)			(vs. Model 2)		
	$\chi^2$	R <sup>2</sup>	$\chi^2$	$\Delta R^2$	$\gamma$ (SE)	$\chi^2$	$\Delta R^2$	$\gamma$ (SE)
Conduct Problems (T)	62.93***	.08	207.96***	.23		31.00***	.07	
Poverty K5					.13 (.09)			.11 (.10)
Low Achievement K5					-.15 (.10)			-.24* (.11)
Poverty 7								-.09 (.13)
Low Achievement 7								.31* (.14)
Conduct Problems (P)	151.42***	.19	126.14***	.16		27.45***	.04	
Poverty K5					.09 (.08)			.07 (.09)
Low Achievement K5					.16 (.09)			.05 (.10)
Poverty 7								.01 (.11)
Low Achievement 7								.22* (.11)

*Note:* Analyses control for child sex, age, race, family income-to-needs ratio, baseline

aggression, and intervention. Model 1 includes a random intercept for school, baseline

aggression, and demographic control variables and was compared to a null model with only a

random intercept for schools; Model 2 adds elementary school contexts and fifth grade

aggression; and Model 3 adds seventh grade school contexts. T = teacher-rated; P = parent-rated;

$\chi^2$  = chi-squared statistic for likelihood ratio test;  $\gamma$  = fixed effect in multilevel model.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .