

# The Effect of High School Socioeconomic, Racial, and Linguistic Segregation on Academic Performance and School Behaviors

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**Background/Context:** *The 1954 U.S. Supreme Court decision on Brown v. Board of Education concluded that segregated schools were inherently unequal and therefore unlawful. That decision was not based solely upon the notion that segregated black schools were inferior in terms of academic instruction, curricular rigor, resources, etc., but also on research that showed segregating black children had negative social-emotional and behavioral consequences. However, the vast majority of the research on school segregation over the past 50 years, has focused on its effects on academic achievement and opportunity to learn. As a result, little is known about the effects of school segregation on social-emotional and behavioral outcomes. This is a critical gap in the literature because other research indicates that school behaviors are as strong or stronger predictors of long-term educational, social, and employment outcomes as academic achievement.*

**Objectives:** *The purpose of this study is to examine the effects of three forms of school segregation—socioeconomic, ethnic/racial, and linguistic—on school behaviors (i.e., attendance, grade retention, and suspension) and academic performance (reading and math achievement test scores and GPA) in high school. The study also examines the degree to which each of three school mechanisms (school inputs, peer influences, and school practices) mediates the effects of segregation on student outcomes.*

**Research Design:** *The study uses survey data from the Educational Longitudinal Study of 2002 (ELS:02). A sequence of multilevel models are fit to the data to address the research objectives.*

**Conclusions:** American high schools are highly segregated by race/ethnicity, socioeconomic status, and English language status. Racial/ethnic and socioeconomic segregation are strongly associated with school behaviors and academic performance. The negative effects of racial/ethnic and socioeconomic segregation on school behaviors and academic performance inordinately effect black, Hispanic, and low SES adolescents because they are far more likely to attend segregated schools. School practices that reduce disorder and disruption and emphasize academics strongly mediate the effects of segregation as does having friends at school with an academic focus. Adopting positive behavioral practices to reduce behaviors that interfere with learning without increasing suspension and expulsion are likely most critical for ameliorating the effects of segregation. Reducing academic tracking is also recommended, given that it likely contributes to negative within-school peer influences among low SES and minority adolescents. However, greater integration is likely necessary to fully address the consequences of segregation.

## INTRODUCTION

One persistent feature of the U.S. educational system is segregation. During most of the first two centuries of this country's existence black children living in the South attended separate schools. By 1950, 17 Southern states and the District of Columbia continued to enforce *de jure* school segregation of black children.<sup>1</sup> In other states *de facto* school segregation was common due to structural barriers such as neighborhood segregation and the placement of district and school catchment boundaries. The landmark 1954 *Brown v. Board of Education* U.S. Supreme Court decision declared, "In the field of public education, the doctrine of 'separate but equal' has no place," and noted that segregated schools were inherently unequal and therefore unlawful under the Fourteenth Amendment of the U.S. Constitution (*Brown v. Board of Education*, 1954).<sup>2</sup> The decision was not based solely on the notion that segregated black schools were inferior in terms of academic instruction, curricular rigor, or educational resources. The Supreme Court's decision explicitly stated that segregating children in schools "generates a feeling of inferiority as to their status in the community that may affect their hearts and minds in a way unlikely to ever be undone" (*Brown v. Board of Education*, 1954).<sup>3</sup> This conclusion was based largely on the results of the Clark doll experiments. Clark and Clark (1947) found that black children attending segregated black schools, compared with black children attending integrated schools, considered white dolls to be relatively more desirable to play with, friendlier, and more attractive than black dolls that were identical other than color. Hence, the Supreme Court's decision was based on the potential negative consequences of school segregation to *both* academic performance and social-emotional and behavioral outcomes. Yet, the vast majority of the educational research on the effects of school segregation conducted over the past 50 years focuses

on opportunity to learn and academic achievement. As a result, little is known about the effects of segregation on behavioral outcomes.

It was not until the 1964 Civil Rights Act that the federal government begin requiring districts to desegregate schools either through voluntary means, such as establishing magnet schools, or through involuntary means, mostly busing. Subsequent federal court rulings were designed to address de facto segregation in some large Eastern cities. This legislation and court rulings had an initial impact that was profound: from 1964 to the late 1980s the proportion of blacks attending white-majority schools in the Southern states jumped from 2% to 44% with the South becoming the most integrated region in the United States (Orfield & Lee, 2007, Table 8). However, challenges to the federal legislation and rulings led to restrictions and limitations on interventions. Three Supreme Court decisions in the early 1990s limited the previous desegregation orders. As a result, U.S. schools have been resegregating steadily over the past two decades. The percentage of blacks attending white-majority schools in the Southern states declined to 30% in 2005, while the segregation of Hispanic students has grown the most since the civil rights period and now surpasses that of black students (Orfield & Lee, 2007, p. 218).

Although the legal issue of school segregation and most research on the impact of school segregation has historically focused on race, in recent years research has increasingly focused on socioeconomic segregation.<sup>4</sup> The two forms of segregation are correlated, particularly at the elementary school level. In 2009, 47% of black fourth graders and 52% of Hispanic fourth graders attended schools where more than 75% of the students were poor (defined as eligible for free or reduced-price lunch based on federal poverty guidelines), compared to 13% of Asian/Pacific Islander fourth graders and 7% of white fourth graders (Aud, Fox, & KewalRamani, 2010, Table 7.5b).<sup>5</sup> Furthermore, recent research suggests that socioeconomic achievement gaps are now larger than racial achievement gaps and that socioeconomic segregation has a stronger detrimental impact on student learning and attainment (high school graduation and college enrollment) than does racial segregation (Palardy, 2013; Reardon, 2011; Rumberger & Palardy, 2005a). Consistent with this research, a substantial number of school districts in the United State now use some measure related to socioeconomic status when assigning students to schools in an effort to minimize the negative consequences of segregation (Kahlenberg, 2012). The most notable example is Wake County Public Schools in North Carolina, which for most of the past several years has used a system of assigning students to schools that ensures all schools have fewer than 40% of their student body below the federal poverty level.<sup>6</sup>

Although the Supreme Court ended legal segregation because of its

negative consequences to the “hearts and minds” of black students, much of the research on the effects of segregation has focused on its effects on student achievement (Orfield, 1978; Wells, 1995). Yet, almost 50 years ago, noted sociologist James Coleman found that the most important school factor influencing student achievement was the socioeconomic composition of the student body (Coleman et al., 1966). In one specific example, Coleman found that poor black sixth graders in middle class schools were, on average, 20 months ahead of poor black sixth graders in low SES schools. Research since that time, including recent reanalyses of Coleman’s data using more sophisticated statistical models, has confirmed the powerful effect of socioeconomic composition of the student body on student achievement and found that it has as much or more impact on students’ achievement than their own socioeconomic background (Borman & Dowling, 2010; Konstantopoulos & Borman, 2011; Palardy, 2013; Rumberger & Palardy, 2005a).

While a body of research on the relationship between school segregation and achievement has accumulated, fewer studies examine the association between segregation and other educational outcomes. Some research has found that racial integration benefits near-term outcomes such as intergroup relations and occupational aspirations for minority students as well as longer term outcomes including minority social mobility, occupational attainment, and adult social networks (Wells, 1995). In addition, a handful of studies have focused on the association between high school social composition and college going behaviors (Alexander & Eckland, 1977; Marsh, 1991; McDonough, 1997; Palardy, 2013). For example, McDonough (1997) found that high socioeconomic composition schools tend to have an *organizational habitus* that promotes attendance at selective 4-year colleges above and beyond that predicted by the academic and family backgrounds of the students. More recent research has also linked high school socioeconomic composition with 4-year college attendance (Engberg & Wolniak, 2010; Palardy, 2013, 2015).

One potential outcome of school segregation that has received little attention in the research literature is problem school behaviors such as poor attendance, suspension, probation, and grade retention. Understanding the role schools play in the development and incidence of school behaviors is important because recent research shows school behaviors are predictive of a number of future educational, social, and employment outcomes such as achievement, high school dropout, college attendance, receiving public assistance, criminal conduct, and employment earnings (Bowles & Gintis, 1976; Christle, Jolivet, & Nelson, 2007; Farkas, 2003; Jackson, 2013; Ou & Reynolds, 2010). The research literature suggests that school socialization plays a role in the

development and incidence of school behaviors, which may perpetuate social reproduction (Bowles & Gintis, 1976, chapter 5). For example, schools serving low SES students tend to put a greater emphasis on obedience to authority and conforming to rules and procedures, whereas schools serving middle- and high SES students put a greater emphasis on student initiative and creativity, whereby promoting differential behavioral expectations that may have long-term consequences on future educational and career success prospects (Bowles & Gintis, 1976; Farkas, 2003). Indeed, Bowles and Gintis (1976) contend that, as a result of school socialization, schooling impacts labor market opportunity and success more due to its effects on behavioral outcomes than on its effect on academic outcomes. While this line of research has never explicitly examined the role of school segregation, it does suggest that segregating students by SES will inhibit the development of social and behavioral skills among low SES students and, as a result, undermine postsecondary educational and labor market success.

Correlational studies documenting the associations between school segregation and student outcomes often do not provide clear insight into the mechanisms through which the effects of school segregation are transmitted. An understanding of these mechanisms provides important insights for developing effective policies and practices to ameliorate the negative consequences of segregation. The two leading theories are peer influences and school effects (i.e., differences in school resources, structures, and practices). School peers may influence each other's attitudes and values, motivations and behaviors, and even academic achievement and performance (Coleman et al., 1966; Dreeben & Barr, 1988; Jencks & Mayer, 1990; Palardy, 2013). Similarly, access to school resources such as effective teachers, school structures (i.e., small classes), and school practices such as a robust college preparatory curriculum may impact student outcomes (Coleman, 1966; Dreeben & Barr, 1988; Greenwald, Hedges, & Laine, 1996; Rumberger & Palardy, 2005a). If the primary mechanism is school effects, the negative consequences of attending a segregated school may be addressed by altering school resources, structures, and practices. However, if peer influences play a substantial role, addressing the effects of segregation may require altering the student body to minimize socioeconomic and forms of school segregation driving negative peer influences.

The present study uses data from the Educational Longitudinal Study of 2002 (ELS: 2002), a national database of 2002 10th graders and the high schools they attended, to examine the association between school segregation and two student outcomes: academic performance and school behaviors. Specifically, this study addresses the following research questions:

1. What is the extent of racial, socioeconomic, and linguistic segregation among public high schools?
2. To what degree are students' academic performance and school behaviors due to school effects as opposed to individual differences among students?
3. What are the relative magnitudes of the effects of socioeconomic, racial, and linguistic segregation in schools on academic performance and school behaviors compared with the effects of student socioeconomic status, ethnic background, and English language status? This question addresses whether student composition or individual background matter more.
4. To what degree does each of three school mechanisms (school inputs, peer influences, and school practices) mediate the effects of school segregation? Note that while school inputs (i.e., resources and structures) and practices may be altered through reforms that do not require redistributing students among schools, addressing peer influences likely requires altering student bodies among schools to minimize detrimental forms of school segregation.

## REVIEW OF THE RESEARCH LITERATURE

### SOCIOECONOMIC AND ETHNIC SEGREGATION IN SCHOOLS

Despite the longstanding interest in school segregation, the volume of research documenting its effects has been relatively modest until recently. For example, in their extensive review of the research literature, Jencks and Mayer note, "Given the central role that everyone assigns to residential and school segregation, we were surprised by how little effort social scientists had made to measure the effect on individual behavior of either neighborhood or school composition" (1990, p. 178). Moreover, much of the earlier literature also focused primarily on elementary schools (Schofield, 1995). However, in recent years, research has steadily accumulated, including review articles (Orfield & Lee, 2005; Mickelson & Bottia, 2010; Van Ewijk & Sleegers, 2010a; Van Ewijk & Sleegers, 2010b).

During the last two decades, several studies using national databases have examined the effects of high school segregation on educational outcomes such as test scores, graduation, and college attendance. One study reexamined ninth grade student data from the Coleman Report, confirming that student body composition, which can be considered a measure of school segregation, had strong effects on test scores (Borman & Dowling

2010; Konstantopoulos & Borman, 2011). More specifically these studies found that both the racial/ethnic composition and the socioeconomic composition of a school had nearly twice the effect on student achievement test scores compared with the students' own race/ethnicity or SES. A number of other studies have examined the effects of high school social composition using the National Education Longitudinal Study (NELS), a study of 25,000 eighth graders that began in 1988 (Carbonaro & Gamoran, 2002; Goldhaber & Brewer, 1997; Lee, Smith, & Croninger, 1997). NELS is a highly suitable dataset for studying high school effects on student achievement because it includes achievement test scores collected just before students entered high school (spring of eighth grade) and again in the spring of 10th and 12th grades, which can be used to model the growth in achievement that occurs while students are attending a particular high school. One study concluded that the effect of the average SES of students attending the school on achievement growth was similar in magnitude to the effect of students' own SES, net of other background factors (Rumberger & Palardy, 2005a). Moreover, school socioeconomic status had as much impact on high SES students as it did on low SES students and almost as much impact on whites as on blacks. Another study using NELS data confirmed that the socioeconomic composition of the school impacted growth in a composite measure of four achievement test scores (mathematics, science, reading, and history) and was negatively associated with dropout rates (Rumberger & Palardy, 2005b).

Two studies by Ryabov examined the effects of socioeconomic and racial composition on student grades, achievement, and attainment using 1995 National Longitudinal Study of Adolescent Health data (Ryabov, 2011; Ryabov & Van Hook, 2007). The first study in middle and high school found that school socioeconomic composition, but not racial composition, was associated with achievement test scores (Ryabov & Van Hook, 2007). The second study found that school socioeconomic composition and racial composition (proportion minority) were associated with middle and high school grades and with subsequent high school completion for all racial/ethnic groups (i.e., whites, blacks, Latinos, Asians) (Ryabov, 2011).

A recent meta-analysis consolidating the body of research on ethnic composition concluded that its effect on achievement is generally small, but varies by group (Van Ewijk & Sleegers, 2010b). For example, the effect is slightly larger for black students than for immigrant minority populations. The authors also found that the proportion of immigrant minority students attending the school was not associated with achievement for white students and that having a high proportion of students from a given minority group impacted the achievement outcomes of the given group more

than for whites or other minority groups (Van Ewijk & Sleegers, 2010b). Together, these results suggest that few unqualified generalizations can be made about the effects of ethnic composition. One potential explanation for this lack of clarity is that the effects of ethnic composition have more to do with other attributes of the student body that are correlated with ethnic composition, such as socioeconomic composition and student background characteristics, than with ethnic composition itself (Coleman, 1990).

A recent paper used data from the Education Longitudinal Study of 2002, a study of 20,000 high school sophomores begun in 2002, to examine the impact of socioeconomic composition of high schools on high school graduation and subsequent college enrollment (Palardy, 2013). Controlling for students' own social class background, the study found that attending a high socioeconomic composition high school increased students' odds of graduating from high school by 40%, and for those who did graduate, it increased their subsequent odds of enrolling in a 4-year college by 55%.

While the vast majority of the research on school segregation focuses on racial and socioeconomic segregation, very little research has examined linguistic segregation. This is an noteworthy gap in the literature because recent immigration patterns suggest that linguistic segregation in schools has become a major concern in some school districts in California, Texas, and Florida that have high percentages of native Spanish-speaking students. Most of the research related to linguistic segregation focuses on tracking and grouping of students with limited English proficiency within schools (i.e., within-school segregation), while less is known about the effect of attending a school with a high concentration of English learners (i.e., between-school segregation). The literature on within-school linguistic segregation suggests it has negative consequences on academic performance and school behaviors. However, it is not clear whether the segregation itself is the primary problem, or whether the more fundamental issues are differential instructional practices that tend to accompany linguistic segregation. For example, Harklau (1994a, 1994b) showed that two forms of within-school segregation of English learners (i.e., academic tracking/ability grouping and assignment to an ESL classroom) compromised language development, literacy, and other academic skills. Placement in an ESL classroom limited linguistic exposure and opportunities for language use due to having classmates with limited fluency. Moreover, placement in a low track and an ESL classroom resulted in lower teacher expectations and exposure to a less advanced curriculum. More recent studies confirm these findings (Callahan, 2005; Callahan, Wilkinson, & Muller, 2010).

A confounding factor in studying the effects of linguistic segregation is its frequent concurrence with racial and socioeconomic segregation.



That is, nonnative English-speaking students are often Hispanic and from low SES families (Gándara & Orfield, 2010). The effects of ethnic and socioeconomic segregation must be disentangled to produce unbiased estimates of the effects of linguistic segregation. Also, while no research could be found that examines the effects of linguistic segregation on school behaviors, to the degree that linguistic segregation limits exposure to the social and cultural norms of the dominant social and linguistic group, it may hinder the development of positive school behaviors and more subtle cultural capital.

## UNDERLYING MECHANISMS OF THE EFFECTS OF SEGREGATION

Beyond documenting the consequences of segregation, developing effective interventions generally necessitates understanding the mechanisms through which segregation impacts student outcomes. The two most prominent explanations in the research literature are peer influences and school effects. A body of literature has linked peer influences to a variety of academic and behavioral outcomes such as achievement, attainment, educational aspirations, misbehavior, drug use, and delinquency (Cook, Deng, & Morgano, 2007; Hallinan & Williams, 1990; Jang, 2002; Mounts & Steinberg, 1995; Palardy, 2013). The general theory is that school peers influence social, behavioral, and educational norms and values through interactions, which may then impact the development of academic skills and school behaviors (Coleman et al., 1966; Dreeben & Barr, 1988; Engberg & Wolniak, 2010; Hanushek, Kain, Markman, & Rivkin, 2003; Jencks & Mayer, 1990). Peer influences may depress or enhance academic performance and behavioral tendencies depending on peer attributes. For example, having peers with higher levels of educational skills, attitudes, and attributes that are associated with high achievement will likely enhance one's academic performance and promote the development of productive school behaviors. Segregating students in schools based on SES, ethnicity, or linguistics may limit the range of peers' attributes and result in negative consequences in underprivileged settings. Coleman (1990) explained the link between peer influences and segregation as follows:

The higher achievement of all racial and ethnic groups in schools with higher proportions of white students is largely, perhaps wholly, related to effects associated with the student body's educational background and aspirations. This means that the apparent benefit of a student body with a high proportion of white students comes not from racial composition per se, but from the better educational background and higher educational aspirations that are, on average, found among white students. (pp. 92–93)

It should be noted, however, that a recent study found black students benefit from having black peer networks at school (Ryabov, 2011). This does not suggest that black students benefit from attending majority-black schools, but rather benefit from having some black peers.

A relevant question to the present study is whether the same peer influences are expected to affect both academic performance and school behaviors. Recent research by Cook, Deng, and Morgano (2007) provides insight into this issue. They found peer influences to be largely “domain-specific.” That is, friends’ academic attributes predicted students’ academic performance, whereas friends’ social and behavioral patterns predicted students’ behavior.

Segregation may also impact student outcomes through the mediating effects of school resources, structures, and practices. For example, research indicates that low socioeconomic composition high schools have less rigorous and less academically oriented curricula, on average, due in part to efforts by school personnel to match the curriculum and instructional rigor with their perceptions of students’ abilities and aspirations (Coleman, 1966; McDonough, 1997; Thrupp, 1999). However, Lee and Smith (1999) found that academic press, which measures the school’s emphasis on academics, was a significant predictor of academic achievement and academic engagement and had an especially powerful effect in low SES schools when coupled with appropriate social supports. This is particularly important because access to a college preparatory curriculum can dictate future educational and employment opportunity, such as admission to 4-year colleges and professional degree programs.

Other research found that school effects mediate the association between segregation and student outcomes. For example, one study found that four school process variables—teachers’ expectations about students’ ability to learn, time spent on homework, number of advanced courses (college prep) taken by students in the school, and percentage of students who reported feeling unsafe at school—explained the majority of the effects of socioeconomic composition on student achievement growth during high school (Rumberger & Palardy, 2005a). Another more recent study found that three measures of school practice—academic press (the degree to which the curriculum and instruction focus on academics), math pipeline (how far students advance in the math curriculum), and teacher morale—had positive effects on 4-year college enrollment (Palardy, 2013).

Research on academic tracking also provides insight into the mechanisms through which segregation impacts student outcomes, largely reinforcing the school effects literature. While track placement is typically based on prior academic performance, tracking can be considered a form of within school segregation in that tracks tend to sort students by social class, ethnicity, and English language status (Callahan, 2005;

Callahan, Wilkinson, & Muller, 2010; Gamoran, 1992; Mickelson, 2001; Oakes, 2005). The research literature suggests that tracking impacts student achievement, attitudes, and behavior. At the high school level, tracks tend to differ in terms of rigor of instruction, curriculum, and teacher quality and expectations, all of which provide superior learning opportunities and higher levels of academic engagement for high track students (Callahan, 2005; Callahan, Wilkinson, & Muller, 2010; Mickelson, 2001; Oakes, 2005). Moreover, students are more likely to develop friendships with students in their track, which may influence their attitudes, behaviors, and even their achievement, again generally to the detriment of low track students (Gamoran, 1992). The differences between the high and low tracks at a large and diverse school can resemble the differences between affluent and low SES schools in terms of quality of instruction and student composition. Because the track placement criterion, prior academic performance, is associated with prior opportunity to learn, tracking tends to serve as a structural reinforcement to preexisting educational inequalities and results in the widening of differences in achievement and school behaviors between low and high SES students, white and minority students, and native and nonnative English speakers (Callahan, 2005; Callahan, Wilkinson, & Muller, 2010; Mickelson, 2001; Oakes, 2005).

In summary, the research literature suggests that both peer influences and school effects can mediate the impact of segregation to some degree. However, the degree seems to depend in part on the outcome and the form of segregation.

## SEGREGATION AND STUDENT BEHAVIOR

While a body of research has accumulated on the effects of school segregation, the vast majority of the studies focus on student achievement outcomes and some on student attainment, largely ignoring the potential consequences of segregation to school behaviors and other “noncognitive” outcomes. This is a noteworthy gap in the research literature for several reasons. First, the Supreme Court ruling on *Brown vs. The Board of Education* to abolish segregated schools was grounded in part on the potential negative socio-emotional and behavioral ramifications of segregation (*Brown v. Board of Education*, 1954). Second, psychologists have long recognized that school success pertains to more than just cognitive ability (i.e., analysis and reasoning), but also includes affect (emotions and temperament) and conation (motivation, volition, and self-regulatory behaviors) and that all three can be developed through schooling (Corno, 1993; Duckworth, Peterson, Matthews, & Kelly, 2007; Dweck, 1999; Hilgard, 1980; Stanford Aptitude Seminar, 2002). Third, a recent National

Research Council report concluded that students attending low SES and high minority urban high schools tend to be less academically and behaviorally engaged compared with their suburban counterparts, suggesting segregation plays a role in student engagement (National Research Council, 2004). Fourth, as mentioned earlier, the research literature suggests that school behaviors are predictive of future educational, social, and labor market success, perhaps as much or more as achievement outcomes (Bowles & Gintis, 1976; Christle, Jolivette, & Nelson, 2007; Farkas, 2003; Jackson, 2013; Ou & Reynolds, 2010). For these reasons, more research is needed on the effects of school segregation on school behaviors.

While there is a dearth of research that specifically examines the effects of school segregation on student behavior, one comprehensive study on high poverty urban schools provides insight (Lippman, Burns, & McArthur, 1996). The study examined whether students attending high poverty urban schools differ from students at suburban and rural schools on a range of school behaviors. Students attending high poverty urban schools had lower rates of extracurricular participation, spent less time on homework, had higher incidence of disciplinary problems that may lead to suspension or probation, had lower attendance rates, and felt less safe at school. Together, these measures suggest that students at high poverty urban schools are less academically and socially engaged at school. Another study found that students attending urban schools are more likely than others to be suspended due to conduct violations (National Research Council, 2003). While these stark differences in student behaviors at urban schools and suburban schools may be due to concentrated poverty, these studies did not explicitly test that, nor did they control for student background differences. Hence, it is not clear whether the results are due to socioeconomic segregation or to differences in the backgrounds of the students who attend high poverty urban schools compared with suburban schools.

Low SES and high minority schools also tend to have stricter disciplinary policies and practices, which may be a response to higher levels of disorder, disruption, and misbehavior that interfere with student learning. However, while reducing disorder, disruption, and misbehavior may improve the learning environment, research indicates that strict disciplinary policies have the negative side effect of facilitating voluntary and involuntary drop-out (Balfanz, Byrnes, & Fox, 2014; Bowditch, 1993; Fine, 1991). Strict disciplinary practices such as “zero tolerance” also tend to increase suspension rates which often results in the adolescents who are in greatest need of school supports, both behavioral and academic, being shut out. Given that black and Hispanic students are suspended from school at approximately three times the rate of white students, such suspension practices also contribute to achievement gaps (Balfanz, Byrnes, & Fox, 2014). Furthermore,

while out on suspension, these youth often have insufficient parental supervision, which can lead to community conduct that puts them in the criminal justice system and along the path of the so-called school-to-prison pipeline. Recent research suggests that school-wide positive behavioral interventions and supports (SWPBIS), a widely used alternative to zero tolerance, is a far more effective disciplinary strategy that leads to a significant reduction in suspensions and office referrals (Bradshaw, Mitchell, & Leaf, 2010).<sup>7</sup>

## METHODS

### DATA

This study used data from the Education Longitudinal Study of 2002 (ELS: 2002), a survey of approximately 15,000 high school 10th graders who attended 750 public, Catholic, and other private schools (U.S. Department of Education, 2004). Data were collected on an extensive number of variables from students, their parents, teachers, and school principals in the spring of 2002 (10th grade) and again in the spring of 2004, 2006, and 2012. Student and school sampling weights were developed by NCES, which when applied to the data result in an approximately nationally representative sample of 2002 10th graders and schools serving 10th graders. ELS is an outstanding database for modeling the effects that schools have on student outcomes.<sup>8</sup> Moreover, because ELS is relatively new, results based on ELS are more relevant for addressing current educational issues than are results from older databases. This is important because a substantial proportion of the research literature on school segregation and compositional effects in American high schools is based on data that are a generation old and may be obsolete given the substantial social and educational change that occurred during that period. We limit our sample to students who attended public schools because public schools have greater significance to educational policy and because students attending private schools are more susceptible to selection bias that can confound estimated effects. Our sample included 10,151 students who attended 581 public high schools.

### *Outcome Variables*

We constructed two composite measures of student outcomes, one for academic performance and the other for school behaviors. Academic performance is a factor score derived from three student measures: reading achievement test scores, math achievement test scores, and grade point average (GPA). School behaviors is also a factor score estimated from three student measures: number of absences, having been suspended, and having been retained in ninth or 10th grade. Appendix Table 1 provides a

summary of the measurement models for these two outcomes. All student variables used in the factor model were collected at the end of 10th grade after most students had attended the school for 2 years. Tenth grade measures were used because many of the variables were not collected in 12th grade.

In developing these outcomes, we drew from the recent work of Jackson (2013), using highly similar variables and measurement models. However, while he refers to the outcomes as “cognitive” and “noncognitive” skills, we use the terms “academic performance” and “school behaviors” because we believe these labels more accurately describe the constructs being measured.<sup>9</sup> Whereas grades and achievement test scores are commonly used to measure academic performance, variable selection for the school behaviors factor may benefit from an explanation. School suspension is normally due to a behavior or conduct violation such as fighting, cheating, or vandalizing. Grade retention in high school is generally the result of failing to earn sufficient course units to be promoted to the next grade level. Moreover, failure to pass high school courses is often the result of lack of effort or motivation, cheating, poor attendance, or other school behaviors. Excused and unexcused absences are predictive of a number of negative school behaviors, including academic and social disengagement, and unexcused absences are associated with delinquency (Kearney, 2008).

### *Independent Variables*

Independent variable selection was guided by the research literature on school segregation and compositional effects (Choy, 2002; Light & Strayer, 2000; Palardy, 2013; Rumberger & Palardy, 2005a). Appendix Table 2 provides a list of all variables used in this study and their descriptive statistics grouped by low, medium, and high socioeconomic composition schools. The independent variables on the table are organized into six broad classes: Student Inputs, Individual Peer Influences, Student Body Composition, School Inputs, Collective Peer Influences, and School Practices, the first two being student variables and the latter four being school variables. Those classes are further subdivided into subclasses. Below we describe key measures from each class of school variables. Note that Student Inputs are statistical controls for differences in the backgrounds of the students among the sample of schools and are not of substantive interest in the present study.

### *Student Body Composition*

Three forms of school segregation are examined in this study: socioeconomic, racial/ethnic, and linguistic. These forms of segregation are captured by variables measuring the composition of the student body at the school, which are school means of student variables. Socioeconomic composition,

which is our measure of socioeconomic segregation, is the mean SES of sampled students in each school.<sup>10</sup> Three ethnic composition variables are used to measure the proportion of the student body at each school that is Asian, black, and Hispanic.<sup>11</sup> Linguistic composition is the proportion of the sampled students at each school for whom English is not their native language.

### *School Inputs*

School inputs are aspects of schools that are largely beyond the control of school personnel and include variables measuring school resources and structures. School inputs are used in this study to statistically control for their effects in an effort to minimize selection biases on estimates of the effects of segregation.

### *Peer Influences*

Peers may influence students' academic performance and school behaviors directly through individual interaction or through the collective attitudes and behaviors of the student body at the school (Palardy, 2013). This study is designed to disentangle the effects of these individual and collective peer influences. The individual peer influences are measured using student level pertaining to the behaviors and attitudes of school friends, such as whether at least one friend dropped out of school, whether the student's closest friend at school desired the student to attend college, and the importance to friends of attending class regularly, studying, and earning good grades. These measures of peer influence are more proximal than the vast majority used in education research in that they are based on students' own reports of their close school friends' attitudes and behaviors rather than the more typical measure based on the average attitudes or characteristics of students at the school, which can be based largely on students the respondent has little or no direct interaction with (Palardy, 2013; Willms, 2010). These more proximal measures provide more precise estimates of peer influences. The collective or compositional measures of peer influence are school averages and include factor scores measuring mean peer aspirations and mean peer motivation to learn (see Appendix Table 1 for all factor score measurement models).

### *School Practices*

This class of variables is subdivided into three subcategories: academic, teaching, and disciplinary. Academic practices include three measures: academic press, which is a factor score of principal-reported items on the degree to which curriculum and instruction focus on academics; homework time,

which measures the mean number of hours per week that students report spending on homework; and math pipeline, which measures how far the average student advances in the mathematics curriculum. Math pipeline is a proxy measure of curricular rigor, particularly in terms of math coursework. Teaching practices include factor scores measuring average student ratings of teacher quality, self-ratings of teacher efficacy, and principal ratings of teacher morale. Disciplinary practices include factor scores measuring average student reports of the fairness of the discipline policy, school safety, the level of classroom disruption, and the level of disorder and abuse at the school.

School practices are conceptualized as being under the control of school personnel to a substantial degree. While this conceptualizing is helpful for assessing policy implications and accountability, most measures do not fit perfectly into that category and are arguably partially school resources (Willms, 2010).

## DATA ANALYSIS

The data were analyzed both descriptively, to examine the extent of segregation, and inferentially, to investigate the effects of segregation on the academic performance and school behaviors outcomes. A series of multivariate, multilevel models were used to estimate the effects of segregation. The multivariate outcome includes academic performance and school behaviors. Details on the model are provided in the technical appendix.

All variables used in this study had moderate to low rates of missing values (less than 30%). Students and schools with missing values were retained in the analyses via full information maximum likelihood method, which is a model-based missing values method.

## RESULTS

### EXTENT OF SEGREGATION IN AMERICAN HIGH SCHOOLS

Our first research question concerns the extent of racial, socioeconomic, and linguistic segregation in American high schools. Table 1 provides several indices of school segregation that address this question. The results show a high degree of segregation in schools that black and Hispanic students attend and to a lesser extent in schools Asian American students attend. Of the adolescents in our weighted sample (which is approximately nationally representative), 30.2% attended a high school with an enrollment of greater than 50% black and Hispanic (i.e., “majority minority”). However, that percentage is more than double for black and Hispanic students (65.3% and 66.6%, respectively). Similarly, black and Hispanic adolescents were approximately 3 times and 2.5 times more likely than



the average student to attend a highly segregated school (i.e., greater than 90% minority enrollment). Black and Hispanic students were also socio-economically and linguistically segregated in schools. For example, they were seven times more likely than white students to attend a school where more than 50% of the student body qualifies for free or reduced lunch (i.e., “concentrated poverty” schools), and Hispanics were more than 13 times more likely than whites to attend a school where the majority of the students are nonnative English speakers.

Low SES and nonnative English speakers were also segregated in schools.<sup>12</sup> Students from low SES families were five times more likely to attend a school with concentrated poverty than were students from high SES families, more than twice as likely to attend a majority minority or majority nonnative English school, and five times more likely to attend a school with 90% or greater minority enrollment. Nonnative English speakers were almost four times more likely than others to attend a school where the majority of the students were nonnative English speakers and more than twice as likely to attend a school with concentrated poverty or where greater than 90% of the student body belongs to underrepresented minority groups. Linguistic segregation primarily concerns Hispanics. Non-Hispanic, nonnative English speakers were far less likely to be segregated in schools by SES, ethnicity, or language. These figures document the substantial levels of socioeconomic, racial/ethnic, and linguistic segregation in American high schools.

**Table 1. Indices of School Segregation by Group**

Group	% Minority*	Majority Minority*	Greater Than 90% Minority*	Mean SES	% Free Lunch*	Majority Free Lunch*	% Nonnative English	Majority Nonnative English
Asian American	52.0	51.4	11.1	0.27	23.0	5.0	40.0	36.3
Black	64.0	65.3	27.1	-0.33	35.4	23.5	17.3	7.0
Hispanic	62.4	66.6	22.9	-0.39	34.2	20.2	39.3	37.1
White	19.4	9.3	0.4	0.17	16.9	2.7	10.5	2.7
Low SES	40.4	37.3	12.4	-0.54	28.6	12.8	18.6	12.3
High SES	26.2	17.0	2.6	0.84	14.2	2.4	15.4	5.7
Nonnative English	60.4	62.3	22.9	-0.20	32.4	19.4	40.7	39.6
Mean	35.5	30.2	9.3	0.00	23.2	9.3	18.2	11.3
(SD)	(31.2)	(45.9)	(29.1)	(1.00)	(18.3)	(29.0)	(20.8)	(31.6)

\* Source = Common Core Data

Segregated schools differ from other schools on more than just student body composition. An examination of the differences on other factors provides insight into potential mechanisms through which segregation may affect academic performance and school behaviors. Such factors include measures of school inputs, peer influences, and school practices. Appendix Table 2 provides the means from each school variable by low, medium, and high SES school categories. Pervasive differences were noted that consistently challenge the learning environment at low SES schools relative to high SES schools. For example, principals at low SES schools were far more likely to report that learning is hindered by inadequate resources such as poor facilities and insufficient equipment. One subclass of school practices that had particularly pervasive differences between low and high SES schools is academic climate. The mean level of math pipeline progression was 1.77 standard deviations lower at low SES schools, which indicates that students at low SES schools are far less likely to take math coursework required for 4-year college admissions. There were also significant differences in the disciplinary climate, with higher levels of misbehavior and students feeling unsafe at low SES schools. Perhaps consequently, teacher morale was lower at low SES schools. Moreover, students at low SES schools tended to have more negative peer influences. For example, students at low SES schools were more than 50% more likely to have a friend who dropped out of high school. Finally, students at low SES schools had classmates with academic performance one standard deviation lower and school behaviors over a half standard deviation lower, on average, than students at high SES schools. In short, attending a low SES school presents a substantial number of challenges to students who are pursuing high academic performance and positive school behaviors.

#### TO WHAT DEGREE DO SCHOOLS VARY ON ACADEMIC PERFORMANCE AND SCHOOL BEHAVIORS?

The second research question is addressed by examining the proportion of the variance in academic performance and school behaviors that is between schools, which is commonly referred to as the intraclass correlation coefficient (ICC). While school effects typically account for a significant proportion of the variance in student outcomes, it is generally the case that individual differences among students account for the majority of the variance (Borman & Dowling, 2010; Lee, Smith, & Croninger, 1997; Palardy, 2008; Willms, 2010). This is also true in the current study. Table 2 provides the variance components and ICCs for both outcomes (see bottom panel). The results show that 18.8% of the total variance in academic performance and 13.9% of the total variance in student behaviors are between

schools. It is this between-school variation that we examine in the present study, particularly with regards to its association with school segregation. It is also worth noting that academic performance and school behaviors are strongly correlated both among students within the same schools ( $r = 0.589$ ,  $p < 0.01$ ) and between school means ( $r = 0.708$ ,  $p < 0.01$ ). This indicates that students who score high on academic performance have a strong tendency to score high on school behaviors. Similarly, schools that have high mean academic performance are very likely to have high mean school behaviors.

Schools differ substantially in terms of the demographic characteristics of the students attending them, and these characteristics are strongly associated with student outcomes. Given that public schools typically have little or no authority over who attends, statistically controlling for differences in student demographics among schools provides a more realistic estimate of the proportion of the variance that is due to school effects. The Student Controls model in Table 2 shows that after controlling for differences in student demographics across schools the ICCs are reduced by 62.2% (to 0.071) for the academic performance outcome and by 34.5% (to 0.091) for the school behaviors outcome. This suggests that between one- and two-thirds of the between-school differences in these two outcomes can be explained by individual differences in the demographic characteristics of the students who attend these schools, while the rest can be attributed to characteristics of the schools themselves including compositional effects. Therefore, the school behaviors outcome appears to be slightly more dependent on school effects than the academic performance outcome. After controlling for student demographics, the between-school correlation between the two outcomes was reduced by 56% to 0.309, while the within-school correlation changed very little. Note that schools account for a slightly higher percentage of the variance in school behaviors than academic performance after controlling for student demographics.

## COMPOSITIONAL EFFECTS

The compositional effects shown in Table 2 are interpreted as proximal estimates for the effects of school segregation above and beyond the students' own demographic backgrounds. The set of compositional variables accounts for an additional 26.4% and 12.7% of the between-school variance in academic performance and school behaviors compared with the student demographics model. The likelihood ratio test statistic indicates that the addition of the compositional variables significantly improved the model fit ( $\chi^2 = 140.6$ ,  $df = 10$ ,  $p < 0.01$ ). Two compositional effects are statistically significant for each outcome. Mean SES had a positive effect on

**Table 2. Total and Compositional Effects of School Segregation on Academic Performance and School Behaviors**

Variable Name	Unconditional (1)		Student Controls (2)		Compositional (3)	
	Academics	Behaviors	Academics	Behaviors	Academics	Behaviors
Student Controls						
SES	—	—	0.25**	0.26**	0.23**	0.26**
American Indian	—	—	-0.82**	-0.41*	-0.83**	-0.42*
Asian/Pacific Islander	—	—	0.21**	0.38**	0.20**	0.41**
Black	—	—	-0.86**	-0.55**	-0.75**	-0.39**
Hispanic	—	—	-0.56**	-0.41**	-0.50**	-0.33**
Nonnative English			-0.38**	-0.11**	-0.37**	-0.06
Student Composition						
Mean SES	—	—	—	—	0.55**	-0.10
Proportion Asian American	—	—	—	—	0.55	0.14
Proportion Black	—	—	—	—	-1.04**	-1.63**
Proportion Hispanic	—	—	—	—	-0.36	-0.66
Proportion Nonnative English	—	—	—	—	-0.28	-1.31†
Variance Components						
Within School (% variance explained)	0.783** —	0.853** —	0.692** (11.6)	0.792** (7.2)	0.692** (0)	0.792** (0)
Between School (% variance explained)	0.181** —	0.138** —	0.053** (70.7)	0.079** (42.8)	0.039** (26.4)	0.069** (12.7)
Intra-class correlation	0.188	0.139	0.071	0.091	0.053	0.080
Correlation Academics and Behaviors						
Within School	0.589**		0.578**		0.580**	
Between School	0.708**		0.309**		0.375**	

Variable Name	Unconditional (1)		Student Controls (2)		Compositional (3)	
	Academics	Behaviors	Academics	Behaviors	Academics	Behaviors
Model Fit						
Log Likelihood	-25503.6		-24209.2		-24100.8	
Number of Parameters	8		20		30	
Likelihood Ratio Test	—		994.4**		140.6**	

†= significant at  $\alpha = 10\%$ ; \* = significant at  $\alpha = 5\%$ ; \*\* = significant at  $\alpha = 1\%$ . Note: Both outcomes are standardized, as are SES and mean SES, while the ethnic composition measures are in the proportion metric and the student ethnicity indicators are dummy coded. Likelihood ratio test is based on comparison with the previous model. Because restricted maximum likelihood estimation was used, likelihood ratio tests were adjusted using the scaling correction provided on the software output.

academic performance (effect size = 0.55,  $p < 0.01$ ), whereas proportion black had a negative effect (-1.04,  $p < 0.01$ ).<sup>13</sup> For school behaviors, proportion black also had a highly significant negative effect (-1.63,  $p < 0.01$ ), and proportion nonnative English speaker had a negative effect, albeit only of marginal statistical significance (-1.31,  $p < 0.10$ ).<sup>14</sup>

**DOES STUDENTS' BACKGROUND OR SCHOOL SEGREGATION MATTER MORE?**

The third research question concerns the relative magnitudes of the effects of each form of segregation compared to the corresponding student background effect (e.g., the effect of school SES vs. the effect of student SES). This can be addressed by comparing the coefficients on the student and compositional variables for the Composition model in Table 2. This comparison is most informative when the student background and school segregation variables are measured on the same scale, as is the case with SES and mean SES (both are standardized, with a mean of zero and standard deviation of 1.0). For academic performance, the magnitude of the effect

of school SES is approximately twice that of family SES (0.55 vs. 0.23), which suggests that socioeconomic composition of the school one attends has a greater impact on one's academic performance than family SES. For the school behaviors (Effect Size = -0.10), the results are almost the opposite: Mean SES is not statistically associated with school behaviors, while the effect of individual SES has a strong statistical association similar in magnitude as its effect on academic performance (ES = 0.26).

Comparing the student and other school segregation effects is more challenging because they are on different scales. The effect of attending a 100% black school rather than a 0% black school is 39% larger compared with the effect of being black rather than white is 59% larger (-1.04 vs. -0.75) on the academic performance outcome and over four times larger on the school behaviors outcome (-1.63 vs. -0.39). The only other statistically significant compositional effect is for proportion nonnative English speaker on school behaviors. In this case, the compositional effect is unambiguously larger than the student effect, given that it is 22 times the magnitude of the student effect (-1.31 vs. -0.06) and that the student effect is not statistically significant. In summary, the effects of several measures of school segregation on academic performance and school behaviors were arguably as large as or larger than the effects of the analogous student effect.

## MECHANISMS THAT MEDIATE THE EFFECT OF SCHOOL SEGREGATION

The fourth research question concerned school-based mechanisms that account for the effects of segregation on academic performance and school behaviors. To address this, three sequential models were fit to the data, each of which controlled for an additional cohesive set of variables beyond the compositional effects model. The first model controls for school inputs, which includes school resources and structures that may confound estimates of the effects of segregation on academic performance and school behaviors outcomes. School inputs come first in the sequence because they are conceptualized as aspects of the school that are largely beyond the control of school personnel. The second model controls for individual and collective peer influences, which are also conceptualized as being beyond the control of school personnel. The third and final model controls for school practices, which is the class of school effects over which school personnel have the most direct control of. This hierarchical model-building process provides insight into the degree to which the effects of school segregation are mediated by each of these three types of school effects. The results are summarized in Table 3.

**Table 3. Mechanisms That Mediate the Effects of Segregation on Academic Performance and School Behaviors: School Inputs, Peer Influences, and School Practices**

Variable Name	Inputs (4)		Peer Influences (5)		School Practices (6)	
	Academics	Behaviors	Academics	Behaviors	Academics	Behaviors
Student Composition						
Mean SES	0.55**	0.02	0.49**	-0.06	0.17*	-0.09
Proportion Asian American	0.62	0.74	0.60	0.61	-0.75	-0.27
Proportion Black	-0.99**	-1.59**	-0.73*	-1.29**	-0.10	-0.58
Proportion Hispanic	-0.33	-0.43	-0.25	-0.32	-0.13	-0.18
Proportion Nonnative English	-0.27	-0.87	-0.07	-0.87	0.24	-0.64
School Inputs						
Urban	-0.11	-0.29	-0.09	-0.27	-0.06	-0.20
Rural	0.26	0.06	0.24	0.02	0.24	-0.03
South	0.02	0.33†	0.04	0.32†	-0.06	0.33*
Small School	0.09	0.34†	0.13	0.35†	0.13	0.41**
Large School	0.00	-0.12*	0.00	-0.12*	0.04	-0.08†
Extra Large School	0.03	0.01	0.04	0.02	0.03	0.02
Peer Influences						
Individual (friends)						
Friend Dropped Out	—	—	-0.26**	-0.39**	-0.24**	-0.37**
Friends Attendance	—	—	0.16**	0.29**	0.15**	0.22**
Friends Study Habits	—	—	0.29**	0.05	0.29**	0.04
Friend Grades	—	—	0.31**	0.14*	0.30**	0.13**
Friend College Expectations	—	—	0.07†	0.17**	0.07†	0.17**
Collective (school means)						
Peer Aspirations	—	—	0.09	0.08	0.05	0.06
Peer Achievement Motivation	—	—	0.05	0.08	-0.06	-0.10

Variable Name	Inputs (4)		Peer Influences (5)		School Practices (6)	
	Academics	Behaviors	Academics	Behaviors	Academics	Behaviors
School Practices						
Homework Time	—	—	—	—	0.16†	0.30**
Math Pipeline	—	—	—	—	0.61**	0.31**
Classroom Disruption	—	—	—	—	-0.21*	0.01
Disorder and Abuse	—	—	—	—	-0.08	-0.16*
Teacher Quality	—	—	—	—	0.16†	0.04
Teacher Morale	—	—	—	—	0.14†	0.02
Student Controls	yes		yes		yes	
Variance Components						
Within School (% variance explained)	0.692** (0)	0.792** (0)	0.645** (6.5)	0.717** (9.5)	0.645** (0)	0.717** (0)
Between School (% variance explained)	0.038** (2.6)	0.061** (11.6)	0.038** (5.3)	0.058** (4.9)	0.018** (52.6)	0.045** (22.4)
Model Fit						
Log Likelihood	-24076.4		-23477.0		-23368.5	
Number of Parameters	42		56		68	
Likelihood Ratio Test	29.7**		369.6**		84.2**	

†= significant at  $\alpha = 10\%$ ; \* = significant at  $\alpha = 5\%$ ; \*\* = significant at  $\alpha = 1\%$ . Note: Both outcomes are standardized as are SES and mean SES, while the ethnic composition measures are in the proportion metric and the student ethnicity indicators are dummy coded.

*School Inputs*

No school input measure was significantly associated with academic performance. As a result, controlling for school inputs hardly altered the effects of segregation on academic performance and accounted for only 2.6% of the between-school variance. This suggests that school inputs are not important mediating mechanisms of the effects of school segregation on academic performance.<sup>15</sup> However, a few school inputs were associated



with school behaviors and thus did mediate the effects of segregation. Controlling for school inputs accounted for 11.6% of the between-school variance in school behaviors. In addition, the effect of proportion nonnative English on school behaviors was reduced by 33% (from -1.31 to -0.87) and was no longer statistically significant after controlling for school inputs.

School inputs that were significantly associated with school behaviors includes school size and whether the school is located in the South. Attending a small school (enrollment less than 600) rather than a medium-size school (enrollment 600–1,200) had a positive association with school behaviors, and attending a large school (enrollment greater than 1,200) had a negative association. These findings are consistent with previous research that noted disciplinary problems (e.g., truancy and suspensions rates) and dropout rates tend to increase with school size (Gottfredson, & DiPietro, 2011; Heavyside, Rowand, Williams, & Farris, 1998; Rumberger & Palardy, 2005b).

### *Peer Influences*

Several measures of *individual* peer influences were significant predictors of academic performance and school behaviors, but no *collective* peer influences were (see Table 3). Controlling for the effects of peer influences reduced the magnitude of the association between mean SES and academic performance by 11% (from 0.55 to 0.49) and the effect of proportion black by 26% (from -0.99 to -0.73); however, both coefficients remained statistically significant. After controlling for individual peer influences, the effect of proportion black on school behaviors was reduced by 19% (from -1.59 to -1.29); its effect also remained statistically significant. The addition of peer influences to the model accounted for 6.5% and 9.5% of the within-school variance in academic performance and school behaviors, but none of the between-school variances.

These findings indicate that peer influences mediate the effects of school segregation on academic performance and school behaviors and that almost all of their effects are manifested through student associations with friends at school rather than through the collective or compositional school effects of student body characteristics. This is an important finding because much of the research on peer influences ignores individual peer influences and only models the compositional influences. Ignoring individual peer influences will biases the collective peer influences estimates upward.

### *School Practices*

Several school practices were significant predictors of academic performance and school behaviors (see Table 3). Controlling for these school practices accounted for 52.6% and 22.4% of the remaining between-school variance in academic performance and school behaviors and also reduced the association between mean SES and academic performance by 65% (from 0.49 to 0.17); however, the effect of mean SES remained statistically significant. Furthermore, controlling for school practices reduced the effect of proportion black on academic performance by 86% (from -0.73 to -0.10) and on school behaviors by 55% (from -1.29 to -0.58), reducing both effects to nonsignificant levels.

## DISCUSSION

While a substantial body of research has accumulated on the effects of segregation over the past half century, the vast majority focuses on its consequences on student achievement, mostly ignoring its effects on school behaviors and other noncognitive outcomes. Yet, *Brown v. the Board of Education* (1954) indicated the legal concern with school segregation was it created unequal educational environments for both academic and social-emotional development. Furthermore, research on school behaviors and other noncognitive measures shows they are associated with a range of long-term outcomes such as educational attainment, career trajectory, and earnings (Bowles & Gintis, 1976; Chetty, Friedman, & Rockoff, 2011; Farkas, 2003). The current study begins to address this gap in the research, showing that schools have a substantial impact on students' school behaviors as well as their academic performance.

The remainder of this section discusses the forms of segregation that are most detrimental to educational equity and the specific school effects that are predictive of academic performance and school behaviors. The implications of the results to policy and practice, as well as limitations of the study, are also considered.

### ROBUST EFFECTS OF PROPORTION BLACK AND MEAN SES

The proportion of the students at the school who are black had the most robust effects of the segregation measures examined in this study. It had a strong negative association with both outcomes, which persisted after controlling for students' demographic background, school resources and structures, and peer influences. Only after controlling for school practices did its effects diminish to a nonsignificant level. The robust effects of proportion black was not anticipated because previous research found that

the effect of proportion of students who are black or Hispanic on student achievement and attainment outcomes tends diminish to a nonsignificant level after controlling for socioeconomic composition (Coleman, 1990; Jencks & Mayer, 1990; Palardy, 2013; Rumberger & Palardy, 2005a).<sup>16</sup>

A recent study by Kelly (2010) provides insight into the underlying school mechanisms driving the results for proportion black. He found that teachers at schools with greater than 50% black students reported a significantly more negative “behavioral climate” based on measures such as tardiness, absenteeism, lack of control, and threatening behavior. As a result, teachers at majority-black schools adapted their practices to “facilitate an orderly classroom and minimize the negative effects of disruptions,” (Kelly, 2010, p. 1247). According to Kelly (2010), this may result in less engaging instructional practices. For example, rather than an interactive classroom discussion, teachers employ more “seatwork.” Consistent with Kelly’s findings, of the types of school variables considered in this study, school practices had by far the largest mediating effect of proportion black on both outcomes. School practices mediate 85% of the effect of proportion black on academic performance (from -0.73 to -0.10) and 55% of the effect on school behaviors (from -1.29 to -0.58). Moreover, the results of a post-hoc analysis show that majority-black schools have substantially more negative mean values on almost all school practices considered in this study. For example, students at majority-black schools rated the level of classroom disruptions significantly higher and the quality of the teachers significantly lower than did students at other schools. Moreover, administrators at majority-black schools rated the level of disorder significantly higher than did administrators at other schools, and teachers at majority-black schools rated their own teaching efficacy more than 0.75 standard deviations lower than did teachers at other schools. While we did not have a direct measure of student engagement, students at majority-black schools did far less homework, on average, took fewer college preparatory courses, and experienced less academic press at school. In general, the degree to which academics were emphasized was substantially reduced compared with other schools. In summary, the results support the notion that the negative effect of proportion black on both outcomes is due in large part to differential school practices (Kelly, 2010).

The research literature on student composition suggests that mean SES is the most robust type of compositional effect for achievement and attainment outcomes (Coleman et al., 1966; Rumberger & Palardy, 2013). The results of the present study concur with that literature. Mean SES has a large effect on academic performance, even after controlling for student background, school inputs, and peer influences ( $ES = 0.49$ ). While school practices mediate that effect by 65%, the association remains statistically significant ( $ES = 0.17$ ,  $p < 0.01$ ). A post-hoc analysis shows that

school practices tend to differ between low and high SES schools, but that those differences are not as extensive as for majority-black schools (see Appendix Table 2). The SES school differences are perhaps largest for academic practices. For example, mean time spent on homework is 0.75 standard deviations lower at low SES schools, math pipeline is 1.77 *SDs* lower, and academic press is 0.96 *SDs* lower. This indicates that less time is spent on homework, students typically take far fewer college prep courses, and in general there is a lesser emphasis on academics at low SES schools. In addition to academics, teacher morale is 0.53 *SDs* lower at low SES schools and disorder and abuse is 0.57 *SDs* higher, indicating a more challenging teaching and learning climate in the low SES setting.

The lesser academically oriented school practice found in majority-black and low SES schools may be the result of a deliberate effort by school personnel to match school practices with their perceptions of student preparedness, motivation, and aspirations, as has been suggested by previous research (Coleman, 1966; Thrupp, 1999). If so, that effort may be misguided because other research suggest promoting academics has a strong positive effect on academic performance in low SES schools when coupled with appropriate social supports (Lee & Smith, 1997).

## SCHOOL EFFECTS ON ACADEMIC PERFORMANCE AND SCHOOL BEHAVIORS

Given the dearth of research on school behaviors, this study provides important new findings on the degree to which schools contribute and which aspects of schools are most predictive of school behaviors. The results (see Table 2) indicate that 18.8% and 13.1%, respectively, of the variance in students' academic performance and school behaviors is between schools. However, some part of those percentages are not school effects, *per se*, but rather are due to differences in the background characteristics of the students attending the schools. Controlling for differences in student inputs among schools reduces those percentages to 7.1% and 9.1%, respectively. These latter figures provide estimates of the degree to which schools contribute to students' academic performance and school behaviors. These findings suggest two things: (1) while schools have a substantial effect on both outcomes, the effect on behaviors is slightly larger; and (2) a far greater percentage of the total between school variance on academic performance is due to differences in students' background than for school behaviors.

Besides student composition, the other three types of school effects—inputs, peer influences, and practices—were examined in this study, and each accounted for a significant proportion of the variance in at least one of the outcomes. School inputs, particularly school size, were associated

with school behaviors, but not academic performance. There is a lack of consensus in the research literature regarding the effect of school size on student achievement. Some studies suggest that medium-size schools (enrollment of 600–1,200) are optimal, and other studies indicate that larger schools are more effective after controlling for school inputs similar to those used in the present study (Lee & Smith, 1997; Rumberger & Palardy, 2005b). However, there is greater agreement in the literature that school size is negatively correlated with a range of school behaviors such as attendance, truancy, and expulsion rates, even after controlling for differences in student background (Fowler & Walberg, 1991; Gottfredson & DiPietro, 2011; Haller, 1992).

Another important finding is that peer influences appear to operate almost exclusively at the individual level. In other words, what matters most is who one's friends and close associates at school are and not the average characteristics of the student body at the school. Many educational studies on peer influences rely on measures of collective peer influence, such as the student body composition, while ignoring individual peer influences. The results of the present study suggest that such estimates are likely biased. Another implication is that desegregating schools will not necessarily address the negative consequences of having educationally and behaviorally disadvantaged peers if within school segregation (i.e., tracking) that tends to sort student by race/ethnicity, SES, and English language status, remains a prominent structural feature of the school. That is because other research has shown that students are far more likely to have friends and influential peers who are in the same track (Gamoran, 1992).

While these *individual* peer influences tended to be predictive of both academic performance and school behaviors, the effects of most measures were far more pronounced on one outcome or the other. The clear trend was that academic measures of peer influence (e.g., the importance of grades to close friends) had larger effects on academic performance, whereas non-academic measures of peer influence (e.g., the importance to a close friend of attending class regularly) were more strongly predictive of school behaviors. This finding is consistent with the notion of "domain specific" peer influences (Cook et al., 2007).

The peer influence with the largest effect size on school behaviors was having a friend who dropped out of school, which was 50% larger than its effect on academic performance. This is consistent with other studies showing that having deviant peers or friends who dropped out of school increases the odds of negative school behaviors (Battin-Pearson et al., 2000; Carbonaro, 1998; Kaplan, Peck, & Kaplan, 1997). The peer influence with the largest effect on academic performance was the importance of grades to close friends, which was 55% larger than its effect on school

behaviors. The importance of studying hard to close friends also had a substantial effect on academic performance.

As described above, of the three types of school variables, school practices were the most influential mediator of the effects of segregation on academic performance and school behaviors. School practices also accounted for a larger proportion of the variance between schools on both outcomes. While some school practices promote both academic performance and school behaviors, others affect one or the other. The school practice with the largest effect size was math pipeline, which is a proxy measure for school-wide emphasis on college preparatory coursework. Although it was a strong predictor of both outcomes, its effect size on academic performance was approximately double the magnitude of its effect size on school behaviors. Conversely, the effect of mean time spent on homework on school behaviors was double its effect on academic performance.

The relatively large effects of math pipeline and homework suggest that school practices emphasizing academics are the most critical. While there remains some disagreement regarding the value of homework to student achievement, a recent meta analysis found that homework does tend to have a positive association with achievement (Cooper, Robinson, & Patall, 2006). Moreover, previous research has shown that the mean rate of homework at high schools is a strong predictor of student learning (Rumberger & Palardy, 2005a). The results of the present study confirm the positive association between homework and achievement and suggest that homework has an even stronger association with school behaviors.

Two disciplinary measures were significant predictors of one outcome or the other. Level of classroom disruptions was negatively associated with academic performance, whereas school-wide disorder and abuse was negatively associated with school behaviors. In addition, teacher morale had a positive association with academic performance. Low teacher morale indicates dissatisfaction with aspects of the school environment such as the students or administrative support, which likely undermines teacher effectiveness and exacerbates teacher turnover. Note that teacher morale is significantly lower at low SES and majority-black schools (see Appendix Table 2), suggesting that those contexts present special challenges for teachers. Some of those challenges are also documented in Appendix Table 2, including poor facilities and equipment, and higher student dropout rates.

## IMPLICATIONS TO EDUCATIONAL POLICY AND PRACTICE

### *Implications to Integration*

The results show that individual peer influences and school practices, particularly academically oriented school practices, mediate the effects of the two most consequential forms of school segregation, which are school SES and black composition. As explained previously, the individual peer influences are likely the outcome of within-school segregation (i.e., tracking) that tends to sort low SES, black, Hispanic, and nonnative English speakers into the low track. Addressing the negative consequences of this within-school segregation will likely require minimizing academic tracking (Gamoran, 1992; Mickelson, 2001; Oakes, 2005). However, it remains unclear as to whether negative individual peer influences can be fully addressed without desegregating schools, even if tracking is dissolved. That is because students attending highly segregated schools tend to have a lesser range of students. Thus, for example, students attending a low SES school may have little opportunity to interact with higher SES peers even if they themselves are in the higher track.

The results also show that school practices emphasizing academics mediate the negative consequences of segregation. However, while some previous research suggests that school practices that emphasize academics can be successfully implemented in disadvantaged schools when coupled with appropriate social supports (Lee & Smith, 1997), other studies have concluded that will be met with considerable resistance and may have negative side effects on the disciplinary climate and dropout rate (Coleman, 1966; Thrupp, 1999). For that reason, it may be unreasonable to expect academically oriented practices to have similar positive effects in disadvantaged schools as other schools.

Together, the findings of this study on peer influences and school practices and the results of previous research suggest that dissolving tracking and improving academically oriented school practices are not likely to fully address the negative consequences of socioeconomic and ethnic segregation. Fully addressing the negative consequences may also require integration. Unfortunately, schools are going in the opposition direction, becoming more racially and socioeconomically segregated over the past two decades (Orfield & Lee, 2007). This does not suggest that there have been no efforts to integrate schools in recent years. Indeed, a substantial number of school districts nationwide currently assign students to schools based in part on income or SES, which reduces concentrated poverty in schools (Kahlenberg, 2012). However, because desegregation plans are typically limited to schools within a given district, in order for such student

assignment strategies to significantly reduce segregation, schools within the district must originally differ considerably in terms of student composition. The reality of the matter is that student inputs vary far more among schools in different districts than among schools within the same district. Moreover, recent efforts towards ethnic/racial integration of schools in the same district have been blocked by the courts and local politics. For instance, the Supreme Court placed limits on race-based school assignment practices in Seattle and Louisville school districts. Fortunately, however, besides student assignment practices, there are a number of potential strategies for promoting socioeconomic and racial integration of schools (see the following for recent reviews: Kahlenberg, 2001; Palardy, 2013). Several of these strategies involve long term efforts facilitate to neighborhood integration, which is likely the most promising and permanent solution.

### *Implications to School Behaviors*

Another finding of this study with implications to policy is that school practices influence not just student achievement, but also student behaviors. This finding is supported by a growing body of research on the impact schools have on students' "noncognitive" skills or behaviors (Chetty, Friedman, & Rockoff, 2011; Cunha & Heckman, 2010; Duckworth et al., 2007; Heckman & Kautz, 2014; Jackson, 2013). Yet, currently K-12 policies and practices predominantly focus on raising achievement. This focus is driven in part by accountability legislation requiring states and districts to evaluate the performance of schools and/or teachers based on student achievement gains while ignoring performance based on school behaviors and other noncognitive outcomes. This focus is diverting attention from a broader assessment of school effects, as Nobel laureate James Heckman has argued: "A more comprehensive evaluation of educational systems would account for their effects on producing the noncognitive traits that are also valued in the market" (Heckman & Rubinstein, 2001, p. 148). Given the importance of school behaviors to near-term educational success (Farkas, Grobe, Sheehan, & Shuan, 1990) and to long-term life outcomes (Bowles & Gintis, 1976; Chetty, Friedman, & Rockoff, 2011), changes in current policies and practices are needed to place a greater emphasis on developing positive school behaviors.

Some states and school districts have begun moving in this direction. For example, California recently passed a law requiring that test scores comprise no more than 60% of the school's performance estimate, with the remaining part consisting of attendance, promotion, and graduation rates (School Accountability, 2012). Another promising reform movement, the school-wide positive behavioral interventions and supports



(SWPBIS) disciplinary strategy, has also been adopted in a large number of school districts nationwide with considerable success in reducing suspensions and problem school behaviors that interfere with learning (Bradshaw, Mitchell, & Leaf, 2010). Similarly, integrating social emotional learning (SEL) into curricula has produced positive results. Research suggests that SEL programs, which are designed to assist students in developing intrapersonal, interpersonal, and decision-making skills, are effective for improving a range of problem school behaviors, including poor attendance and conduct that results in suspension and expulsion (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Durlak, Weissberg, & Pachan, 2010). Another reform that shows promise is curricula and instruction that embrace the belief that aptitude is malleable rather than fixed and that through persistent efforts students can increase their aptitudes (Dweck, 1999; Stanford Aptitude Seminar, 2002). Dweck (1999) refers to this belief as a “growth mindset” (as opposed to a “fixed mindset”). Research shows that instruction promoting a growth mindset improves critical student attitudes and behaviors such as motivation to learn and effort, and ultimately their achievement (Dweck, 1999). Importantly, teachers play a critical role in fostering the growth mindset (Corno, 1993; Dweck, 1999; Stanford Aptitude Seminar, 2002).

## LIMITATIONS AND FUTURE RESEARCH

While ELS is an outstanding data source for modeling school effects, it has limitations. As a secondary database, variable selection was limited to that which was collected by NCES. Some salient measures of both school inputs (e.g., per pupil expenditures) and school practices (e.g., whole school reform) were not available. Another limitation is self-selection of students and teachers into high schools, which confounds efforts to estimate causal effects. While self-selection bias is a lesser concern for studies like this one that use only public schools, which typically enroll students based on geographical boundaries, self-selection can nonetheless threaten the validity of causal claims. This study attempts to address this issue by controlling for a range of student and school factors that may be related to student composition and the outcomes. However, it is difficult to ascertain whether all confounding endogenous factors have been controlled.

A third limitation is the cross-sectional nature of the outcomes. The concern is that some part of the students’ academic skills was established prior to entering high school. However, using a status score outcome was necessary because most of the items used in the academic performance outcome were only measured on one occasion. However, the results of a post-hoc analysis using change in math achievement as the outcome had

highly similar results compared to our measure of academic performance, suggesting that the status score bias is minimal.<sup>17</sup>

## SUMMARY AND CONCLUSION

The effect of school segregation on equality of education opportunity has been a major legal and educational issue since the dawn of the civil rights movement in the 1960s. However, it has been a less prominent policy issue lately, perhaps due to a potentially misguided view that little can be done to constructively address the matter. This lack of attention among policy makers is troubling, given that the hard-earned school integration gains of the 1960s and 1970s have largely been lost as schools have resegregated over the past twenty years (Orfield & Lee, 2007).

Past research on the effects of school segregation has focused primarily on its association with student achievement and attainment, while ignoring its effects on school behaviors. This is a critical gap in the literature because a growing body of research indicates school behaviors are predictive of success on a range of outcomes, particularly longer-term outcomes such as adult well-being and college and career success (Bowles & Gintis, 1976; Bowles, Gintis, & Osbourne, 2001; Cunha & Heckman, 2007; Fletcher, 2013; National Research Council, 2012; O'Connor & Paunonen, 2007). This study begins to address that gap.

The results indicate that schools vary substantially in terms of mean student academic performance and school behaviors, even after controlling for differences in the demographic background of students attending the schools. Furthermore, student segregation in schools, as measured by socioeconomic, ethnic, and linguistic composition, accounted for a significant proportion of the variance in academic performance and school behaviors. The results show that attending a segregated school is a source of inequality that is strongly predictive of students' academic performance and school behaviors. Two forms of segregation had the most potent effects on student outcomes. Socioeconomic segregation was positively associated with academic performance, but not with school behaviors, and proportion black was negatively associated with both academic performance and school behaviors. The results also show that two mechanisms—peer influences and school practices—mediated the effects of school segregation on academic performance and school behaviors.

These findings suggest adolescents' schoolmates affect their academic performance and school behaviors. Because black and Hispanic students are more likely to attend socioeconomically and racially segregated schools they are particularly susceptible to the negative consequences of school segregation.

## NOTES

1. In addition to the 17 Southern states where school segregation was required by law, segregation was optional in four states, forbidden by law in 16 Midwest and Northeast states, and 11 states had no law. All 16 Civil War Confederate states were amongst the 17 states that required segregated public schools in 1950. Oklahoma, which became a state in 1907, was the 17th. Interestingly, Kansas was one of the four states that had an optional segregation law in 1950, which was enforced in Topeka public elementary schools. Furthermore, the particular Topeka neighborhood where the *Brown v. Board of Education* case originated was integrated. The contexts of optional state law and integrated neighborhood likely facilitated the challenging of Kansas state law and ultimately the overturning of *Plessy v. Ferguson* (1896).

2. *Brown* applied only to blacks. Segregation rights for Latinos were not recognized until the 1973 *Keyes v. Denver* decision, which has rarely been enforced (Orfield & Lee, 2004). Perhaps consequently, Latino school segregation has steadily increased since it was first tracked in 1968.

3. As historian David Tyack has documented, blacks in some cities supported separate but equal schools, “maintaining that such systems offered opportunities for Negroes to obtain good jobs and claiming that black children in mixed schools suffered from the insults of white children and the cruelty and bias of white teachers” (Tyack, 1974, pp. 110–111).

4. The Coleman Report (Coleman et al., 1966) is a notable exception. It examined the degree to which a number of school factors contribute to educational inequity, including socioeconomic and racial/ethnic composition of schools.

5. The association between ethnic composition (i.e., percent black and Hispanic) and socioeconomic composition (mean SES) among high schools is apparently not as strong as among elementary schools. For example, in 2002 those two variables had a -0.29 correlation among high schools (Palardy, 2013). Moreover, at least among high schools, this correlation decreased markedly between 1988, when it was -0.52, and 2002.

6. Wake County is an interesting case study. Wake County schools had been desegregated by race to a large degree for a long period before the socioeconomic school desegregation policy was adopted. Racial integration of the schools likely facilitated lower residential segregation and reduced resistance to the socioeconomic desegregation intervention. Note that greater than 40% free or reduced-price lunch is also the federal criterion for being classified as a Title I School (i.e., high poverty school).

7. According to Bradshaw, Mitchell, and Leaf (2010), SWPBIS is designed to “reduce disruptive behavior problems through the application of behavioral, social learning, and organizational behavioral principles. SWPBIS aims to alter school environments by creating improved systems and procedures that promote positive change in student behavior by targeting staff behaviors.”

8. The stratified two-stage sampling design involved selecting a sample of schools that enroll 10th graders based on probabilities proportional to school enrollment. Adolescents of Asian, Pacific Islander, and Hispanic ethnicity were oversampled to

ensure sufficiently large samples of minority groups. As a result of these sampling strategies, neither the student nor the school sample can be considered representative of the national population of 2002 10th graders or schools that enrolled 2002 10th graders. However, NCES provides student and school sample weights to transform the data into nationally representative samples of 10th graders and high schools. The present study uses the ELS:2002 first follow-up, base year panel weight (F1PNLWT) and the base year school sample weight (BYSCHWT). For additional information on ELS:2002, see <http://nces.ed.gov/surveys/els2002>

9. Jackson (2013) conceptualized the items used in the school behaviors factor as sociobehavioral proxy measures of Big Five personality dimensions that are commonly used by psychologists to measure personality traits. He also included GPA as an item in both the cognitive skills and noncognitive skills composites under the rationale that GPA reflects both ability and effort.

10. The 10th grade SES variable available from the ELS was constructed by NCES as equally weighted composites of five measures: family income and each parent's education level and occupational status.

11. We model black and Hispanic composition separately because research suggests they have differential effects on school behaviors. Additionally, because linguistic composition is correlated with Hispanic composition, but not black composition, when modeled together to estimate their independent effects, the effect of Hispanic composition is expected to diminish, but the effect of black composition is not.

12. Low SES schools are defined as having a mean SES 1.0 or more standard deviations below that of the average school (i.e., the bottom 16% of the schools on mean SES), whereas high SES schools are defined as having a mean SES 1.0 or more standard deviations above that of the average school (i.e., top 16%).

13. The magnitude of the effect of socioeconomic composition on academic performance can also be conveyed in terms of the expected difference in academic performance for students attending low and high SES schools after controlling for student demographics and school composition. The Appendix Table shows that the average high SES school is 2.92 standard deviations higher on mean SES than the average low SES school. Therefore, adolescents attending a typical high SES school are expected to have academic performances 1.61 standard deviations higher than students at a typical low SES school ( $2.92 \times 0.55 = 1.61$ ). The magnitude of this difference is equivalent to the difference between a mean school GPA of 2.00 and 3.25.

14. Recall that both outcomes are standardized. Therefore, the magnitudes of the effects for individual predictors are comparable across outcomes. However, the interpretations of the coefficients in Tables 2 and 3 depend on the metric of the predictor. For mean SES, which is a standard normal variable, the coefficients are interpreted as the expected standard deviation change in the outcome per standard deviation change in mean SES, which is often referred to as a standardized "effect size." The coefficients on the variables that are in the proportion metric are interpreted as the expected standard deviation change on the outcome per unit change in the proportion, where a unit is the difference between a proportion of 0 and a proportion of 1..

15. Caution is in order here because the ELS did not have measures of some important school resources, such as per pupil expenditures, which previous research indicates are important predictors of student achievement (Greenwald, Hedges, & Laine, 1996). Also, many factors that we classify as school practices were conceptualized as school resources by Grubb (2008).

16. There are two likely sources of this inconsistency in the findings of previous research and the results of the current study. First, we uncouple proportion black and proportion Hispanic, whereas most past studies combine them in a single measure under the theory that they have similar effects on educational outcomes (see note #9). Second, the outcomes used in this study are different from previous research on segregation. Our measure of academic performance is not based solely on achievement test scores, but rather also includes GPA. Research suggests this factor score is a richer measure of academic performance than achievement test scores alone (Heckman et al., 2006; Jackson, 2013). Furthermore, in our review of the research literature, we did not find previous research on segregation or compositional effects that used an outcome similar to our school behaviors.

17. To estimate the potential bias resulting from using a status outcome for academic performance, we ran a parallel analysis that controlled for 10th grade math achievement with 12th grade math achievement as the outcome. Math achievement was the only test score available that was measured twice and therefore could be used to estimate this ANCOVA model during the period students were attending a particular school. The results of the parallel analysis were highly similar to the results for the academic performance outcome. For example, for the compositional model, the coefficients in units of effect size for mean SES on math achievement and academic performance were 0.51\*\* and 0.55\*\*, for proportion black were -0.98\*\* and -1.04\*\*, for proportion Hispanic were -0.17 and -0.36, and for proportion nonnative English were -0.42 and -0.28.

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## TECHNICAL APPENDIX

### **The Multivariate Multilevel Model**

We used a series of multivariate multilevel models to address the research questions of the present study. Our general interest is school effects on two inter-related student outcomes. Specifically, we modeled the effects of three forms of school segregation (socioeconomic, racial/ethnic, and linguistic) on academic performance and school behaviors outcomes. Multilevel models are used because students (level 1) are nested in schools (level 2). Nested data violates the assumption of statistical independence when analyzed using traditional statistical approaches. Multilevel models alleviate that concern and provide the opportunity to model the dependencies in the data.

The two outcomes used in this study can be modeled as two separate multilevel models or jointly in a multivariate multilevel model. We use the multivariate model in this paper to exploit two advantages of that approach. The first advantage is that it provides estimates of two additional parameters that are of substantive interest in the present study—the individual and school level correlations between the outcomes. The student level correlation addresses whether high academic performance students tend to exhibit better school behaviors. At the school level, it provides insight into whether schools with higher mean academic performance tend to have higher mean school behaviors. Moreover, the hierarchical modeling building approach we use provides estimates of the degree to which student inputs mediate those correlational associations. A second advantage of the multivariate approach is that when the outcomes are correlated, the standard errors on the fixed effects for the multivariate approach will generally be smaller, thereby increasing the power of statistical test of those effects (Snijders & Bosker, 2012).

The multivariate outcome can be conceptualized as a third level of the multilevel model, the within student level, in addition to the student and school levels. It can also be conceptualized as a two-level model with parallel equations for the outcomes. When there are only two outcomes, it is arguably more straightforward to present the model using the two-level manner. In that case, the level 1 (student) model uses a continuous outcome (e.g., academic performance or school behaviors) and can be represented by the equations:

$$Y_{1ij} = \beta_{10j} + \sum_{p=1}^P \beta_{1pj} X_{pij} + r_{1ij} \quad r_{mij} \sim N(0, \sigma^2)$$

$$Y_{2ij} = \beta_{20j} + \sum_{p=1}^P \beta_{2pj} X_{pij} + r_{2ij},$$

where  $Y_{1ij}$  is the outcome 1 (academic performance) for individual  $i$  in school  $j$ ,  $\beta_{10j}$  is the expected value on outcome 1 for students attending school  $j$  conditioned on student covariates  $X_1$  through  $X_p$ ,  $\beta_{11j}$  through  $\beta_{1qj}$  represent the expected change on outcome 1 per unit change in the respective covariate,  $X_1$  through  $X_p$ , and  $r_{1ij}$  is the level 1 model residual for outcome 1, which captures within-school variance in the outcome not accounted for by the predictors in the model. The second equation is for outcome 2 (school behaviors), which has parallel terms to the outcome 1 equation. The residuals for the  $m$  outcomes, where  $m$  is either outcome 1 or 2 in this case, are assumed to have means of zero, to be multivariate normal, and to covary.  $\sigma^2$  represents a variance-covariance matrix of the multivariate residuals.

The level-two, or school-level, model can be represented by the following set of equations:

$$\beta_{10j} = \gamma_{100} + \sum_{q=1}^Q \gamma_{1q0} W_{qj} + u_{10j} \quad u_{M0j} \sim N(0, \tau_u)$$

$$\beta_{11j} = \gamma_{110} \cdot$$

$$\cdot \quad \cdot$$

$$\cdot \quad \cdot$$

$$\cdot \quad \cdot$$

$$\beta_{1qj} = \gamma_{1q0}$$

$$\beta_{20j} = \gamma_{200} + \sum_{q=1}^Q \gamma_{2q0} W_{qj} + u_{20j}$$

$$\beta_{21j} = \gamma_{210} \cdot$$

$$\cdot \quad \cdot$$

$$\begin{matrix} \cdot & \cdot \\ \cdot & \cdot \end{matrix}$$

$$\beta_{2qj} = \gamma_{2q0}$$

where  $\gamma_{100}$  is the intercept estimates for outcome 1,  $W_{1j}$  through  $W_{qj}$  are school-level covariates,  $\gamma_{110}$  through  $\gamma_{1q0}$  are school-level slope coefficients for outcome 1, which describe the expected change in outcome 1 per unit change in the associated  $W$  variable, and  $u_{10j}$  represents the school residuals or random effect for outcome 1, which describes the deviation in the model-estimates and observed values for each school. Again, the outcome 2 equation terms have parallel interpretations to the terms in the outcome 1 equations. Finally, the residuals for the two outcomes are assumed to be multivariate normal with means of 0 and a variance-covariance matrix represented by  $\tau_u$ . Note that the equations indicate that only the level 1 intercept coefficients ( $\beta_{10j}$  and  $\beta_{20j}$ ) randomly vary across schools and that each of the level 1 slope coefficients ( $b_{11j}$  through  $b_{1qj}$  and  $b_{21j}$  through  $b_{2qj}$ ) are fixed to be equal for all schools, which is the case for each model estimated in the present study.

**Appendix Table 1. Factor Score Measurement Models**

<b>Academic Performance Outcome</b>		
BYTXRIRR	Reading achievement test score, spring 10 <sup>th</sup> grade	.891
BYTXMIRR	Math achievement test score, spring 10 <sup>th</sup> grade	.907
FIRGP10	Grade point average, 10 <sup>th</sup> grade (transcript data)	.773
Percent of Variance Explained		77.9
<b>School Behaviors Outcome</b>		
BYS24C	Number of absences the previous term, spring 10 <sup>th</sup> grade	.715
Retained	Retained in 9 <sup>th</sup> or 10 <sup>th</sup> grade	.571
Suspended	Suspended from school during the previous term	.725
Percent of Variance Explained		58.4
<b>Facilities Hinder Learning</b>		
BYA50A	Learning hindered by poor condition of buildings	.665
BYA50B	Learning hindered by poor heating/air/light	.658
BYA50C	Learning hindered by poor science labs	.687
BYA50D	Learning hindered by poor fine arts facilities	.594
BYA50E	Learning hindered by lack of space	.613
BYA50F	Learning hindered by poor library	.582
Percent of Variance Explained		55.4
<b>Equipment Hinders Learning</b>		
BYA50G	Learning hindered by lack of texts/supplies	.777
BYA50H	Learning hindered by too few computers	.798
BYA50I	Learning hindered by lack of multimedia	.858
BYA50K	Learning hindered by poor voc/tech equipment/facilities	.735
Percent of Variance Explained		63.7
<b>Academic Press</b>		
F1A38B	Teachers press students to achieve	.800
F1A38D	Learning is high priority for students	.717
F1A38E	Students expected to do homework	.667
F1A38G	Classroom activities are highly structured	.714
F1A38L	Counselors/teachers encourage students to enroll in academic classes	.613
Percent of Variance Explained		50.3

<b>Teacher Morale</b>		
F1A38C	Teacher morale is high	-.754
F1A38H	Many teachers are negative about students	.747
F1A38M	There is often conflict between teachers and administrators	.810
Percent of Variance Explained		59.4
<b>Teacher Quality/Support</b>		
BYS20E	The teaching is good	.661
BYS20F	Teachers are interested in students	.813
BYS20G	Teachers praise effort	.553
Percent of Variance Explained		46.8
<b>Teacher Efficacy</b>		
BYT44ED	Importance of teacher's attention to student success	.665
BYT44EE	Importance of teaching methods to student success	.836
BYT44EF	Importance of teacher's enthusiasm to student success	.668
Percent of Variance Explained		52.9
<b>Classroom Disruptions</b>		
BYS20D	Other students often disrupt class	.708
BYS20K	Disruptions get in way of learning	.746
BYS20L	Misbehaving students often get away with it	.765
Percent of Variance Explained		54.8
<b>Disorder and Abuse</b>		
BYA49N	How often student bullying a problem at school	.663
BYA49O	How often verbal abuse of teachers a problem at school	.855
BYA49P	How often disorder in classrooms a problem at school	.703
BYA49Q	How often student disrespect for teachers a problem at school	.851
Percent of Variance Explained		59.0
<b>School Safety</b>		
BYS20J	Does not feel safe at this school	.705
BYS20M	There are gangs in school	.820
BYS20N	Racial/ethnic groups often fight	.805
Percent of Variance Explained		60.6

Items are on 4- or 5-point Likert-type scale.

Appendix Table 2. Descriptive Statistics for Total, Low, Medium, and High SES School Samples

Variable Name	Total	Low SES	Med SES	High SES	Major. Black	Descriptions and (ELS:02 NAME and coding)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Student-level Variables (N=10,936)						
Outcomes						
Academic Performance**	0.00 (1.00)	-0.47 (.92)	-0.06 (0.98)	0.54 (0.91)	-0.59 (0.87)	Factor score (BYTXRIRR, BYTXMIRR, FIRGP10)
School Behaviors**	0.00 (1.00)	-0.28 (1.04)	-0.09 (1.02)	0.29 (0.89)	-0.44 (0.96)	Factor score (BYS24C, BYS24F [recode 1= 2-5, 0=oth- erwise] BYP48] or BYP48K [repeated 9 <sup>th</sup> or 10 <sup>th</sup> grade; recoded 1= 1, 0=otherwise])
Student Inputs						
SES**	0.00 (1.00)	-0.63 (0.74)	-0.08 (0.92)	0.77 (1.03)	-0.28 (0.89)	Socioeconomic status composite (BYSES) <sup>p</sup>
Asian/Pacific Islander**	0.04	0.02	0.04	0.05	0.01	(BYRACE=2)
Black**	0.15	0.20	0.14	0.07	0.69	(BYRACE=3)
Hispanic**	0.15	0.24	0.15	0.05	0.06	(BYRACE=4, 5)
American Indian	0.01	0.01	0.01	0.01	0.00	(BYRACE=1)
White	0.65	0.53	0.66	0.82	0.13	(BYRACE=7)
Nonnative English**	0.17	0.21	0.18	0.13	0.10	(BYSTLANG = 1)
Individual Peer Influences (friends)						
Friend Dropped Out**	0.52	0.61	0.53	0.40	0.58	Have friend who dropped out (F1S65A = 2-5)
Friends Attendance**	0.35	0.30	0.34	0.44	0.28	Important to friend to attend class (BYS90A = 3)



Variable Name	Total	Low SES	Med SES	High SES	Major. Black	Descriptions and (ELS:02 NAME and coding)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Student-level Variables (N=10,936)						
Friends Study Habits**	0.22	0.19	0.21	0.28	0.23	Important to friend to study (BYS90B = 3)
Friends Grades**	0.50	0.43	0.49	0.61	0.42	Important to friend to get good grades (BYS90F = 3)
Friend College Expectations**	0.37	0.33	0.36	0.43	0.39	Friend desires student to attend college (BY66C=1)
School-level Variables (N=581)						
Student Body Composition (School Segregation Proxies)						
Mean SES**	0.00 (1.00)	-1.24 (0.33)	-0.14 (0.58)	1.68 (0.59)	-0.44 (0.74)	Standardized mean (BYSSES) <sup>P</sup>
Proportion Asian American**	0.04 (0.10)	0.01 (0.05)	0.04 (0.10)	0.12 (0.16)	0.01 (0.03)	Mean (BYRACE=2)
Proportion Black**	0.11 (0.22)	0.20 (0.30)	0.09 (0.19)	0.06 (0.10)	0.71 (0.13)	Mean (BYRACE=3)
Proportion Hispanic**	0.11 (0.20)	0.18 (0.29)	0.09 (0.16)	0.07 (0.12)	0.11 (0.09)	Mean (BYRACE=4, 5)
Proportion Nonnative English	0.10 (0.16)	0.09 (0.17)	0.10 (0.16)	0.14 (0.14)	0.13 (0.12)	Mean (BYSTLANG = 1)
School Inputs						
School Resources						
Student/Teacher Ratio**	15.55 (5.10)	16.68 (7.09)	15.00 (4.34)	16.67 (3.23)	16.62 (5.22)	Student/teacher ratio (CP02STRO) <sup>CC</sup>

Variable Name	Total	Low SES	Med SES	High SES	Major. Black	Descriptions and (ELS:02 NAME and coding)	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Student-level Variables (N=10,936)							
Learning Hindered by Facilities	0.00 (1.00)	0.15 (0.92)	-0.05 (1.01)	-0.03 (1.09)	0.88 (1.04)		Factor score (BYA50A, B, C, D, E, F) <sup>p</sup>
Learning Hindered by Equipment**	0.00 (1.00)	0.29 (0.74)	-0.06 (1.06)	-0.30 (0.99)	0.66 (0.90)		Factor score (BYA50G, H, I, K) <sup>p</sup>
School Structures							
Urban†	0.15	0.15	0.14	0.26	0.49		School located in urban setting (BYURBAN=1) <sup>cc</sup>
Rural**	0.44	0.49	0.46	0.13	0.08		School located in rural setting (BYURBAN=3) <sup>cc</sup>
South	0.3	0.48	0.34	0.27	0.49		Located in Southeastern U.S. (BYREGION = 3)
Small School**	0.56	0.73	0.56	0.14	0.53		Total school enrollment 2001/02 (CP02STEN=1-600) <sup>cc</sup>
Large School**	0.13	0.05	0.13	0.27	0.19		(CP02STEN=1201-1800) <sup>cc</sup>
Extra Large School**	0.09	0.03	0.09	0.24	0.05		(CP02STEN=1801+) <sup>cc</sup>
Collective Peer Influences							
Mean Peer Aspirations**	-0.06 (0.27)	-0.01 (0.30)	-0.09 (0.25)	0.04 (0.22)	0.66 (1.24)		Mean factor score (BYS90D, F, H)
Mean Peer Achievement Motivation**	-0.09 (0.23)	-0.11 (0.25)	-0.11 (0.22)	0.02 (0.20)	0.96 (1.15)		Mean factor score (BYS90A, B, D)
School Practices							
Academic							
Academic Press**	0.00 (1.00)	-0.27 (0.93)	-0.13 (0.99)	0.69 (0.94)	-0.19 (0.83)		Mean factor score (F1A38B, D, E, G, L) <sup>p</sup>
Homework Time**	0.0 (1.00)	-0.38 (1.06)	-0.01 (0.98)	0.37 (0.91)	-1.11 (0.74)		Mean hours of homework per week (BYS34A+BYS34B)

Variable Name	Total	Low SES	Med SES	High SES	Major. Black	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Descriptions and (ELS:02 NAME and coding)
Student-level Variables (N=10,936)						
Math Pipeline**	0.00 (1.00)	-0.81 (0.72)	-0.06 (0.76)	0.96 (0.76)	-0.56 (0.93)	Mean level of math coursework completed (F1RMAPIP) <sup>TR</sup>
Teaching						
Teacher Quality**	0.00 (1.00)	-0.11 (1.12)	0.08 (0.98)	-0.23 (0.93)	-0.37 (1.93)	Student ratings of teach quality, Factor score (BYS20E, F, G)
Teacher Efficacy	0.00 (1.00)	-0.10 (1.01)	0.02 (1.04)	0.02 (0.83)	-0.68 (0.67)	Factor score (BTTE44D, E, F) <sup>T</sup>
Teacher Morale**	0.00 (1.00)	-0.19 (1.05)	0.04 (0.99)	0.34 (0.92)	0.01 (1.06)	Factor score (F1A38C, H, M) <sup>P</sup>
Disciplinary						Factor score (BYS20D, K, L)
Classroom Disruption**	0.00 (1.00)	0.26 (0.95)	-0.14 (0.99)	0.33 (1.00)	-0.17 (1.11)	
Disorder and Abuse	0.00 (1.00)	-0.17 (0.95)	0.00 (0.96)	0.40 (1.24)	-0.61 (1.12)	Factor score (BYA49N, O, P, Q)
School Safety**	0.00 (1.00)	0.07 (1.04)	-0.09 (1.01)	0.34 (0.77)	-0.69 (0.84)	Factor score (BYS20J, M, N)

† 0.10; \* 0.05; \*\* 0.01; Student variables are weighted by F1PNLWT (normalized) and school variables are weighted by BYSCHWT (normalized). □ Low and high SEC samples include high schools at least ±1.0 SD from mean SEC respectively. All variables are based on student survey responses unless otherwise noted (<sup>CC</sup> = Common Core data; <sup>I</sup> = Integrated Postsecondary Education Data System (IPEDS); <sup>N</sup> = NCES administered achievement test score; <sup>P</sup> = principal report; <sup>T</sup> = teacher report; <sup>TR</sup> = H.S. Transcripts).

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