



American
Educational
Research
Association

Dropping out of High School: The Role of School Organization and Structure

Author(s): Valerie E. Lee and David T. Burkam

Source: *American Educational Research Journal*, Vol. 40, No. 2 (Summer, 2003), pp. 353-393

Published by: [American Educational Research Association](http://www.aera.net)

Stable URL: <http://www.jstor.org/stable/3699393>

Accessed: 30/05/2014 15:06

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at
<http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



American Educational Research Association is collaborating with JSTOR to digitize, preserve and extend access to *American Educational Research Journal*.

<http://www.jstor.org>

Dropping Out of High School: The Role of School Organization and Structure

Valerie E. Lee and David T. Burkam
University of Michigan

In this study, we explore how high schools, through their structures and organization, may influence students' decisions to stay in school or drop out. Traditional explanations for dropout behavior have focused on students' social background and academic behaviors. What high schools might do to push out or hold students has received less empirical scrutiny. Using a sample of 3,840 students in 190 urban and suburban high schools from the High School Effectiveness Supplement of the National Educational Longitudinal Study of 1988, we apply multilevel methods to explore schools' influence on dropping out, taking into account students' academic and social background. Our findings center on schools' curriculum, size, and social relations. In schools that offer mainly academic courses and few nonacademic courses, students are less likely to drop out. Similarly, students in schools enrolling fewer than 1,500 students more often stay in school. Most important, students are less likely to drop out of high schools where relationships between teachers and students are positive. The impact of positive relations, however, is contingent on the organizational and structural characteristics of high schools.

KEYWORDS: dropouts, school sector, school size, social relations.

Why do students drop out of high school? Who should be held responsible for this unfortunate event? Though there is much agreement among policymakers, educators, and researchers that adolescents should remain in school until graduation, many young people do not complete their secondary school studies. The negative social impact of this loss to our nation's stock of human capital is almost universally acknowledged. Consequently, there is considerable interest in (a) explaining why students leave high school before completion, (b) trying to assign blame for students' dropout decisions, and (c) developing social policies that will keep students in school.

The most common explanations for dropping out focus on the *personal characteristics of individual students*. The list of potential risk factors associated with dropout behavior is long and quite consistent across a myriad of

studies. Research that focuses on identifying these explanatory factors is often organized around comparisons of students who do and do not drop out. Such research typically groups risk factors into three categories: (a) *social background* (e.g., race/ethnicity, gender, socioeconomic status [SES], family structure, inner-city residence); (b) *academic background* (e.g., ability, test scores, grade-repeating history); and (c) *academically related behaviors* (e.g., engagement with school, school grades, course completions and failures, truancy, school disciplinary encounters). When researchers frame dropping out as a function of student background and behavior, the implication is that students themselves are at fault for taking such unwise actions. By framing explanations this way, leaving school before graduation is seen as a bad decision that individual students make, often based on a pattern of unwise behaviors and low commitment to school. A common approach is to characterize students who evidence several of these factors as being "at high risk of dropping out."

Less common but beginning to be heard more often are explanations that focus on the schools that these students attend. Although the comparative perspective mentioned above might take into account such demographic characteristics of high schools as aggregated characteristics of individual students (e.g., minority enrollment, average SES, and average achievement), such school factors would simply be seen as characterizing "at-risk high schools." Less often noted are school characteristics over which schools themselves, or individuals within the schools, have some control (e.g., the governance structures). Although the volume of research investigating school explanatory factors is growing, few studies cast schools as sharing the responsibility for the bad decisions made by some students.

In this paper we focus on the role that schools play in their students' decisions to stay in school or leave before graduating. In particular, we focus on characteristics of schools that may be influenced by policy interventions, above and beyond their demographic composition. We consider three foundational elements of how high schools are organized: (a) their *structures*, in particular school size and sector (i.e., whether the school is public, Catholic,

VALERIE E. LEE is a Professor of Education at the University of Michigan, 4220a School of Education, Ann Arbor, MI 48109; e-mail velee@umich.edu. Her areas of interest are educational equity and research methodology, particularly the use more than one methodological approach to studying the same educational phenomenon. Her current research focuses on optimal educational contexts for children living in poverty.

DAVID T. BURKAM is an Assistant Research Scientist/Lecturer at the University of Michigan, 3210c School of Education, Ann Arbor, MI 48109; e-mail dtburkam@umich.edu. His recent research includes equity issues in kindergarten and early schooling, gender equity in math and science, high school curriculum structure, and measurement issues in student coursetaking and achievement.

or an elite private school—we call the latter “independent schools”); (b) their *academic organizations* (especially the curriculums they offer); and (c) their *social organizations* (in particular, the character of relationships between students and teachers). This focus is grounded by our belief that high schools, through their organizations, may either force out or hold in students whose personal characteristics might put them at risk of dropping out before they graduate.

Our research makes use of nationally representative samples of schools and the students who attend them drawn from the High School Effectiveness Supplement (HSES) to the National Educational Longitudinal Study of 1988 (NELS:88). All sampled students were in high school at the end of their 10th-grade year (1990), but some had left school by the time their cohort peers finished 12th grade (1992). We use longitudinal data on 3,840 students, including achievement test scores, high school transcripts, and survey information collected in 1990 and 1992. As information about the students’ school behaviors, performance, and achievement was measured more precisely by the HSES study in mathematics than in other subjects, we focus on this area of the curriculum to capture students’ academic background and schools’ curriculum structure.

Information about the 190 high schools that the students attended was drawn from descriptive data about schools supplied both in surveys of their principals and from aggregate information from students. The high schools were located in the 30 largest metropolitan areas in the United States. We limited our analysis to students attending public, Catholic, and independent schools that were in the HSES and NELS samples. Our research questions are multilevel in nature; thus we use the hierarchical linear modeling (HLM) methodology. The dependent variable of focus is dichotomous: whether or not students dropped out of high school after 10th grade.

Background

Why Do Students Drop Out of High School?

Because students’ experiences with, and progress in, school play such an important role in their transition from childhood to adulthood in contemporary society, leaving school is seen as particularly harmful for adolescents’ life chances. This action cuts off those who choose to leave school from potentially valuable information, developmental opportunities, and personal assistance. Although the dropout rate has declined substantially since the early 1940s (Rumberger, 1987), the loss to the nation’s stock of human capital from students leaving high school is still unacceptably high. Current estimates of the proportion of adolescents who do not finish high school vary widely (from 75 to 16%), depending on how the rate is calculated (Kaufman, McMillen, & Sweet, 1996; National Center for Education Statistics [NCES], 1992; Rumberger, Ekstrom, Goertz, Pollock, & Rock, 1986). Dropout rates in urban areas are much higher; in large cities a third of entering ninth graders fail to complete high school (Council of Great City Schools [CGCS], 1994).

When and why young people decide to move from the educational to the adult world depends on many factors. As with any important life decision, adolescents' decisions to leave school are often made gradually and draw on a complex web of experiences. Young people continually assess and reassess their success and place in the worlds in which they function simultaneously: family, peers, school, and the larger world. Some students see schools as locations where they can develop their human capital, so that staying in school longer is felt to increase their probability of success in the larger adult world. For other students, schools are places where they are reminded on a daily basis of their lack of success in the academic world.

Although they recognize that the decision to leave school before graduation is made by individuals, a small but growing set of researchers has begun to implicate the school in this decision. For example, Riehl (1999) speaks of schools "discharging" students. Understanding the dropout phenomenon (with the aim of developing social policies that help keep young people in high school until completion) calls for a theoretical perspective that incorporates both individual decisions and organizational actions that may influence those decisions.

The Individual Perspective on Dropping Out

Status Attainment

There is widespread agreement that leaving school before graduating is a major detriment to achieving high status in U.S. society. Although schools have always been seen as major vehicles for social mobility, the status attainment perspective has typically held that responsibility falls on individuals to decide whether they should take advantage of the opportunities offered to them (including those offered by schools). Seminal studies of educational attainment from the 1960s and 1970s, such as those by Coleman et al. in 1966, *Equality of Educational Opportunity*, and Jencks et al. in 1972, *Inequality*, were important in developing and supporting the status attainment perspective. These studies were held to demonstrate conclusively that individuals' educational success was almost entirely dependent on their social background, as particular features of schools were shown to have almost no influence on individual outcomes. The peculiarly American attitude of individualism—holding individuals largely responsible for their own success and failure—undergirds dominant attitudes about school dropouts as well as the majority of research on the topic. A current manifestation of the individual perspective about dropping out is useful: the notion of risk.

The Concept of "Risk"

Although the concept of risk, along with factors of risk that define individuals, is somewhat controversial among social researchers, this construct is invoked increasingly in explanations of human behavior. Drawn originally from the

fields of epidemiology and biostatistics, the language of risk defines individuals' propensity for achieving some outcome, particularly an unwelcome one (Kraemer et al., 1997). The notion of risk typically is captured with lists of risk factors that are or are not possessed by individuals. Psychologists who draw on the construct of risk consider both individual and contextual factors. For example, an important study by Sameroff, Seifer, Baldwin, and Baldwin (1993) focused on risk factors defined on both individuals and families that were linked to children's cognitive development from early childhood through adolescence.

Two Types of Risk

Risk is a common perspective for studies of school dropout, which is widely agreed to be an unwelcome educational outcome (Natriello, McDill, & Pallas, 1990; Pallas, 1989). Researchers and writers concerned with dropping out often divide the construct into two categories: social risk and academic risk. Social risk includes demographic factors associated with a higher likelihood of school difficulties: race/ethnicity, age, language-minority status, gender, family income, parents' education, and family structure. Members of racial and ethnic minority groups drop out at higher rates than White students, as do those from low-income families, from single-parent households, and from families in which one or both parents also did not complete high school (Natriello et al., 1990; Rumberger, 1987).

There is a difference between the exact *moment* when students leave school and the *process* of disengaging from school that begins well before they arrive at the moment when they leave school. Some scholars suggest that the cumulative process of school disengagement may begin as early as the first grade (Entwistle, Alexander, & Olson, 1997). However, most dropouts actually leave school sometime between the 10th and 12th grades (Frase, 1989), in part because the legal age for school leaving is 16 in most states. Besides the cumulative nature of the school disengagement process, social risk factors are themselves seen as cumulative. That is, a student characterized by more of these factors is at a statistically greater risk of dropping out.

Academic risk, which refers to students' school behaviors and performance, reflects the actual manifestation of school-related problems (Caterall, 1998). These behaviors characterize the dropout process. For example, students who eventually drop out often have a history of absenteeism and grade retention (Lee & Burkam, 1992), academic trouble (Bryk & Thum, 1989), and more general disengagement from school life (Entwistle et al., 1997; Finn, 1989; McNeal, 1995). Leaving school may actually represent some students' final attempt to "resolve" such problems (Croninger & Lee, 2001; Fine, 1987). Even young children may be at academic risk of eventually dropping out if early in their school lives they manifest such school behaviors as low grades, low educational expectations, special education placement, early grade retention, and discipline problems (Alexander, Entwistle, & Horsey, 1997). Like social risk, academic risk factors are also cumulative.

Characteristics of individuals that define their academic and social risk are correlated; students at high social risk are more likely to manifest at-risk academic behaviors. Despite their statistical association, we suggest that these two sorts of risk factors are conceptually quite separate. Students and schools have very little control over factors that constitute social risk (SES, race/ethnicity, gender, family circumstances), whereas academic risk factors such as absenteeism, grade retention, special education placement, and low performance are amenable to personal and school interventions. Both social and academic risk defined on individuals are also linked to the characteristics of schools that are associated with students dropping out.

The School Perspective on Dropping Out

Schools Can Push Students Out

Some interesting extant research has rejected the more common focus on individuals' risk of dropping out, turning away from the "blame the victim for the problem" orientation that seems to underlie research that focuses exclusively on personal risk factors. Instead, these studies explore school factors that are associated with dropping out. Several qualitative or interpretative studies have considered how schools themselves engage in practices or create conditions that push certain types of students out of school, especially those who exhibit the social and academic risk factors discussed above (Delgado-Gaitan, 1988; Fine, 1991; Riehl, 1999; Valenzuela, 1999; Wehlage, Rutter, Smith, Lesko, & Fernandez, 1989). We recognize that the first studies to introduce the "push out" perspective are field-based studies, often conducted in schools where dropout rates are high. These studies go far beyond the well-documented findings that dropout rates vary widely between high schools (Pallas, 1986) and between student populations within high schools (Rumberger, 1987). Large comprehensive high schools, especially in urban areas, report the highest dropout rates (Bryk & Thum, 1989), even exceeding half of ninth-grade cohorts in some urban high schools (CGCS, 1994).

Relevant Quantitative Studies

A series of recent quantitative studies by Russell Rumberger and his colleagues that use longitudinal data from NELS:88, complex multivariate models, and multilevel analysis methods provide an important grounding for the current study. Rumberger's (1995) study was unusual in its focus on early dropout behavior (between 8th and 10th grades) and the middle-school characteristics associated with that behavior. In middle schools with lower-SES compositions, dropout rates were related to *school demographic composition* (higher minority and poverty concentrations), *school structure* (larger schools, more students per teacher), and *school organization and climate* (more homework and fairer discipline). In terms of SES differentiation in dropping out, Rumberger found that high-poverty and large schools were more differentiating environments—

resulting in larger SES disparities—as were middle schools with K–8 grade spans and higher teacher–student ratios.

Another study by Rumberger and his colleagues was retrospective, in that it explored the individual and school factors associated with students not completing high school 2 years after their cohort had graduated (Rumberger & Larson, 1998). Most findings here focused on individuals' academic and social risk factors. One finding, seldom mentioned in other studies on this topic, concerned mobility. Students who dropped out were considerably more likely to have changed schools, before or during high school, and sometimes more than once. Beyond the usual social risk factors associated with dropping out (minority status, single-parent family status, and low SES), the authors also identified academic risk factors (low expectations, grade retention, high absenteeism, and low school performance). Surprisingly, school factors were generally unrelated to dropping out in these complex analysis models. The authors also investigated the factors associated with the dropouts' having obtained a GED in the 2 years after they left school.

Another study (Rumberger & Thomas, 2000) used the HSES, the same data that we used in this study. The authors explored both dropout and turnover rates in urban and suburban high schools. They reported that dropout rates were higher in public schools as compared with Catholic and other private schools, in urban schools as compared with suburban and rural schools, and in larger schools as compared with smaller schools. Findings about school resources were noteworthy: Dropout rates were lower in schools with more excellent teachers (as reported by students) and with lower student–teacher ratios. Reflecting other studies, these authors reported that dropout rates were higher in schools with poor attendance and with more students who had been retained before high school.

How schools push out (or “discharge”) students was the focus of another recent study focused on the full population of New York City high schools (Riehl, 1999). Using both quantitative and qualitative components, the author focused on an interesting organizational factor: “technical uncertainty.” Riehl tested the hypothesis that schools “practice input boundary maintenance by discharging more students under conditions of environmental uncertainty” (1999, p. 250). Results of her multilevel analyses supported this hypothesis, demonstrating that when environmental uncertainty in a school is greater, students are more likely to be discharged as dropouts.

Transferring and Dropping Out

Students who leave their high schools can either transfer to another school (and thus stay in school) or leave school altogether. Two studies examined these alternatives to staying in a given high school. Lee and Burkam (1992) conceptualized school transfer as an alternative to dropping out and considered demographic, family, and school factors associated with staying in school, transferring, or dropping out. Using data from High School and Beyond (HS&B) and separate but identical multinomial logistic models in

public and Catholic schools, we found that Black and Hispanic students were more likely to transfer in both sectors, as were students from larger families and those engaging in more at-risk academic behaviors. In both sectors, being over-age (undoubtedly reflecting a history of school retention) and living in a stepfamily were associated with dropping out. Although the factors linked to transferring and dropping out (as opposed to staying in the same school) were quite similar in public schools, they were dissimilar in Catholic schools. We concluded that transferring (usually to a public school) represented a viable alternative to dropping out for disaffected students in Catholic schools, whereas that option was a less viable alternative for public school students. We suggested that low dropout rates in Catholic schools (which typically ignore the higher transfer rates) might be explained by the fact that such students had alternative educational settings to consider.

Rumberger and Thomas (2000) used multilevel methods and the HSES data to explore the same behaviors. Some school factors were associated with both higher dropout and higher school transfer rates (higher proportions of retained students, lower-quality teachers), whereas other factors were related to higher transfer rates but not to dropout rates (high minority enrollment, lower teacher salaries). An interesting finding was that non-Catholic private schools had lower dropout rates but higher transfer rates than public schools, as in the Lee and Burkam (1992) study.

A Broader School Perspective

The research reviewed in this section continues our discussion of school influences on adolescents. However, we broaden the discussion here in two ways. First, we suggest a more theoretically focused conceptual model, where we characterize schools along three dimensions: *school structure*, *academic organization*, and especially *social organization*. Second, in our discussion of these dimensions, we expand our search for relevant studies beyond those that focus on dropping out, to include a broader set of outcomes.

School Structure

Beyond demographic composition and location (often strongly related), schools also can be characterized by structural properties such as school sector and enrollment size. Several studies have investigated sector differences in dropout and transfer behavior, demonstrating that even after taking account of demographic and academic features of students attending each type of school, dropout rates are lower in Catholic than public schools (Bryk, Lee, & Holland, 1993; Lee & Burkam, 1992; Rumberger & Thomas, 2000). Of course, the studies that investigate sector differences in dropping out take into account the potential selection factors that typically favor private schools. Thus the particular holding power of nonpublic schools may be due to other organizational features that those schools possess. However, these studies do not explore such organizational explanations.

Another school structural feature is enrollment size. Rumberger and Thomas (2000) demonstrated that sector, urbanicity, and size all were related to dropping out. Once school demographic composition, resources, and attendance were accounted for (as well as many measures of social and academic risk of students), dropout rates were still higher in urban schools, in public schools, and in large schools. Although size was not a factor for dropping out in the Rumberger and Larson (1998) study, students were shown to be more likely to leave high school during their first 2 years if they had attended larger middle schools (Rumberger, 1995).

Several studies by Lee and colleagues have demonstrated the influence of school size on student outcomes. A review of the effects of school size on students' well-being also explores how size influences organizational properties of schools (Lee, 1999). In a multilevel study focusing on school size and achievement gains, Lee and Smith (1997) demonstrated that students learned more, and that learning was more equitably distributed by student SES, in high schools that enrolled 600–900 students (i.e., small but not too small). Although the same size range was effective in schools with different social and racial/ethnic compositions, size influenced learning most strongly in low-SES schools. Another study of school size focused on middle-grade students in Chicago (Lee & Loeb, 2000). Again, smaller schools (in this case, K–8 public schools with 750 or fewer students) were more favorable educational environments, not just for students' learning but also for positive teacher attitudes toward students. Specifically, teachers in smaller schools took more personal responsibility for their students' learning than did teachers in larger schools. The authors concluded that size has both a direct and an indirect effect on learning, by influencing teachers' attitudes, which in turn influence their students' learning.

Like the effects of sector, the effects of the structural feature of size are estimated after taking into account potential selection differences that may be associated with school size. Although the majority of size studies explore direct effects of school size on student outcomes, it is unlikely that size alone exerts a direct effect. Rather, we suspect that smaller size typically is associated with other organizational factors—a less elaborated and differentiated curriculum, more personal relations between adults and students, or more positive attitudes of teachers. The latter explanation was explored in the Lee and Loeb (2000) study.

School Academic Organization

Our discussion here centers on the structure of the high school curriculum. A growing body of research demonstrates that students learn more, and that learning is distributed more equitably, in schools with a constrained academic curriculum. Such a curriculum is characterized by two features: (a) It consists largely of academic courses, and (b) very few low-level courses are offered. In “constrained curriculum” schools, students typically must complete many of these courses to graduate. Most studies on this topic have focused on the

mathematics curriculum. The “constrained curriculum” structure represents a major explanatory factor for why students learn more and why learning is more equitably distributed in Catholic schools than in public schools (Bryk et al., 1993; Lee & Bryk, 1989).

Two recent studies have shown similar positive effects (i.e., higher and more equitably distributed learning) for a constrained curriculum structure in public high schools as well (Lee, Burkam, Chow-Hoy, Smerdon, & Geverdt, 1998; Lee, Croninger, & Smith, 1997). Another study showed stronger curriculum structure effects in Catholic schools than in either elite private schools or public schools with regard to how far students progress in the mathematics curriculum (Lee, Chow-Hoy, Burkam, Geverdt, & Smerdon, 1998). Moreover, Catholic schools demonstrated more social equity than schools in the other two sectors, in that their students’ progress in the math curriculum was less dependent on mathematical ability. These studies estimating curriculum structure effects centered on achievement outcomes. Curriculum structure effects on dropout behavior have not been explored.

School Social Organization

The social organization of schools is a construct of prime importance to this study. Although the idea is often considered in very different lines of research (e.g., social support, student–teacher relations, personalism, schools as communities), the ideas behind them are quite similar. The umbrella label of “social capital,” which undergirds all of these discussions, has stimulated much writing and some empirical research in recent years. The concept of social capital identifies a crucial observation about collective life: that the quality of social relationships themselves either enhances or hinders individuals’ capacity to attain desirable social goods (Coleman, 1990; Dornbusch, Flasgow, & Lin, 1996; Fukuyama, 1995). Benefits are seen as accruing to individuals from their engaging in social relationships, benefits that may serve as resources on which they may draw. Moreover, when social relationships encompass broader patterns of interaction between individuals, they often serve as resources for neighborhoods, communities, and other social groups. These exchanges of social resources enhance the effectiveness not only of individual actions but also of collective actions.

Coleman (1988) pointed out the special significance of social capital for children. As children mature, the focus of their social development shifts from parents to include peers, other adults, and schools. As they grow older, the school must assume the primary responsibility for teaching them the social and cognitive skills needed to successfully fulfill adult roles (Coleman, 1987). Thus the social relationships that are developed in school become increasingly important as children move into adolescence. Because social capital represents the potential for more effective action embedded in school-based social relationships, it can be seen as both an individual asset and a communal good (Coleman, 1990; Fukuyama, 1995; Lee & Smith, 1999). Conceptualizations of social capital may thus create a useful link between micro and macro theories of human behavior.

Lee and Croninger (1998) attempted to provide some conceptual development of this construct as it relates to schools. The authors distinguished between *mechanisms* through which social capital may influence student development (e.g., volition, impetus, norms) and *qualities* of social capital itself (e.g., uses, location, intentionality). At the micro level (in this case, the student), individuals may benefit from their specific relationships with teachers. At the macro level (in this case, the school), social capital includes norms, traditions, and behavior patterns that shape both the goals that people pursue and their opportunities for doing so. We draw special attention in this study to this macro level where the broad patterns of student-teacher relationships are seen as tapping the quality of social capital in schools. Because we conceptualize these relationships as a property of the social organization of schools, we focus on a macro form of social capital (and hence we employ this measure at the school level rather than the student level).

Social Organization and Dropping Out

Both qualitative and quantitative studies suggest that students who leave high school before graduating often cite lack of social support as one reason for doing so. Students who are disaffected with school report being unconnected with teachers, even after having made efforts to gain assistance from school personnel (Croninger & Lee, 2001). Unengaged students claim that teachers don't care about them, are not interested in how well they do in school, and are not willing to help them with problems (Fine, 1986; Lee, Ready, & Ross, 1999; MacLeod, 1987; Valenzuela, 1999). Interviews with dropouts as they left school revealed that half said they were quitting explicitly for social reasons: because they didn't get along with teachers or other students (Caterall, 1998).

Qualitative studies have also shown that positive social relationships can create powerful incentives for students to come to school, even students who report that school work is difficult and expectations are hard to meet (Fine, 1991; LeCompte & Dworkin, 1991; Lee, Smerdon, Alfeld-Liro, & Brown, 2000; Wehlage et al., 1989). Two recent quantitative studies provide evidence for the importance of social contact. One showed that social capital (measured by relationships between students and teachers and by whether teachers reported talking with students outside class) was strongly related to dropping out, even after taking students' social and academic risk factors into account (Croninger & Lee, 2001). Another study focused on 1-year achievement gains for middle-grade students in Chicago (Lee & Smith, 1999). Students' reports of social support from teachers, parents, peers, and neighborhood were positively but modestly related to learning. However, the relationship between social support and student learning was not consistent across schools. Rather, the relationship was contingent on a feature of the school's academic organization: namely, the degree of academic press. Students with strong social support who attended schools with low academic press learned almost nothing, whereas students who reported considerable support from these sources learned quite a lot if they also attended schools where they were pushed academically.

Several studies have defined social support as an aggregate feature of schools' social organization. Examples of this work are represented in the comparisons made by Bryk et al. (1993) between Catholic and public schools. Communal school organization, which is how social capital was defined at the macro level in that research, was a major factor explaining away the considerable differences between Catholic and public schools in students' academic engagement and teachers' commitment. Bryk et al. provide considerable conceptualization of the notion of communal school organization, as well as both qualitative and quantitative empirical evidence to support its saliency in school life.

Summary

Although the major focus of research about students dropping out of high schools focuses on individuals' social and academic risk factors, there is an important and growing research stream focusing on how schools can influence these behaviors. Specifically, how schools are structured and how they are organized in terms of their academic and social elements have been shown to influence students' academic behavior and academic outcomes, as well as their engagement with school, including the ultimate act of disengagement: dropping out. Although some recent research has demonstrated the importance of how schools structure their curriculums, this research has concentrated on the influence of curriculum structure on student learning.

The small but growing body of research that focuses on schools' influence over their students' decision to drop out has suggested that school structure—especially sector and size—may influence this important decision. Most important in this study is the link between macro-level elements of social capital in schools and dropout behavior. The research described in this study is meant to build on, and expand, the small but growing body of research that focuses on how the organization and structure of high schools link students' behaviors and their decision to drop out. Moreover, we recognize that the various structural and organizational features that may influence dropout behavior are likely to act in concert rather than in the independent ways that social researchers typically explore.

Research Focus

Questions and Hypotheses

The major thrust of our investigation is an exploration of the link between school organization and structure and students' decisions to stay in school or drop out. We focus on the dropout decision during students' last 2 years of high school, although our research questions and the conceptual model in which they are embedded are probably also relevant to students who drop out before this time. Investigating dropout decisions, given our school-based focus, is perhaps most appropriate among students who have been in high school for at least 2 years. That is, these students know their high schools

well by the time the decision to leave or stay is made, and the schools also know them well. Students in their last 2 years of high school have also accumulated a record of academic performance and behavior that provides evidence to themselves and their schools about their success in school or lack of it.

Our decision to focus on schools in this study should not be seen as an indication that personal factors are unimportant in the dropout decision. Thus our first research question tests a dropout model developed among individuals. However, even this model (and the methodology we use) takes account of the fact that personal characteristics, and how they are linked to the decision to drop out of high school, are made within the context of the high schools that the students attend.

Question 1: Student Background and Dropping Out

Although our primary focus is not on the characteristics of students who do and do not drop out of high school between the 10th and 12th grades, it is important to identify those factors. Here, we focus on students' social and academic backgrounds. We ask, "*Within the students' high schools, which background factors are associated with the decision to drop out?*"

Our hypotheses and conceptual model for Question 1 consider the several risk factors that have been linked in other studies with lack of success in school. Specifically, we expect that within the high schools students attend, those who are African-American and Hispanic are more likely to drop out than their White or Asian counterparts. We also expect that students of lower SES and those who are over-age for their grade are more likely to drop out. In terms of students' academic history, we expect that those with poor academic performance (lower test scores, lower grades) and those who take less demanding courses are more likely to drop out.

Question 2: School Organization and Dropping Out

Here our main focus is on the organizational explanation. We focus on the organizational and structural characteristics of the high schools that students attend that may influence their decision to drop out or stay in school. The school organizational model is estimated after students' individual characteristics and school demographic features are accounted for. We ask, "*What features of high schools' structure, social organization, and academic organization are associated with dropping out?*"

Our hypotheses here focus particularly on school-based social capital. We expect that schools typified by positive relationships between teachers and students are more likely to hold students than schools defined by a less positive culture. Based on the literature, we also expect that dropping out is less common in smaller schools and in private schools. Such school settings, above and beyond the types of students who attend them, offer organizational benefits for their students that may overcome or ameliorate the influence of individual risk factors the students possess. We base additional

hypotheses on the constrained curriculum model. We expect that schools typified by a constrained academic curriculum are more likely to hold students than schools that offer more nonacademic coursework. Consistent with prior research, we focus on schools' offerings in the mathematics curriculum.

If the social and academic organization of a school is to have ample opportunity to affect a student's decision to drop out, it is necessary for the student to experience both of these organizational characteristics. Hence, we chose to look at students who dropped out of high school *during their last 2 years*, a later time period than that investigated in much of the dropout research. Students who have dropped out of school before the end of the 10th grade have less exposure to the social and academic organization of a school and so are probably less influenced by these factors. Thus an organizational explanation may be more appropriate for later rather than earlier dropouts.

Question 3: The Contingent Nature of Organizational Factors Associated With Dropping Out

The analyses that address Question 2 assume that the influences of school factors on dropout behavior are independent of one another. Here we test whether that is actually the case, i.e., whether structure, curriculum, and social organization might interact with one another in exerting their influence on dropping out. We ask, "*Is the influence of school social organization on dropout decisions contingent on school structure, and if so, what is the nature of the contingencies?*"

Because the issues explored in Question 3 have not been investigated in the literature that we have reviewed, here we must pose hypotheses based on our understanding of social capital in schools and the theory on which it rests. We hypothesize that school social organization—in particular, the nature of the school culture defined by relationships between teachers and their students—may operate differently in large and small schools or in public and private schools. In particular, we expect that in very large schools, particularly those that are public, a culture defined by positive relations between teachers and students may be relatively unimportant. Because it is more difficult for teachers to interact with their students and know them well when they have a great many of them (either in a particular term or for a longer time), the culture defined by these relationships may have a different character and influence than a culture between teachers and students who see one another more frequently and over longer periods. Similarly, relationships between teachers and students in private schools may be uniformly much more positive than those in public schools, simply because the students and teachers may share common values that brought them together in the private schools in the first place. Under such circumstances, the net influence of a school culture that reflects these relationships may be lessened. Moreover, the goals of private schools may be more explicit, as they need to serve only students who choose to support those goals. Although in this study we explore

school social organization defined by the density and influence of positive relationships (i.e., their frequency and net effect), unfortunately we cannot explore their nature (i.e., whether the relationships were anchored by academic concerns or whether they were totally personal).

Conceptual Model

A School Effects Study

Our analyses to address these three research questions are organized around a conceptual model, displayed in Figure 1. Both the model and the questions fall within a type of inquiry called “school effects research.” Studies of this type investigate how characteristics of schools (in this case, structure and organization) influence school members’ attitudes and behaviors (in this case, the decision to drop out or stay in school). Because we investigate school effects on students, we formulate a multilevel model wherein students are “nested” in schools. School organization, the central construct in this study, is located squarely in the middle of our heuristic model. The major outcome—whether students drop out or do not drop out—is located at the right. We underscore the importance of these two constructs to our research by the heavy lines around the boxes that capture them.

Student Background

The boxes at the left of the model characterize two types of important personal background characteristics related to dropping out of high school. Under the heading of *social background*, we include students’ gender, their race/ethnicity, and their family SES. Under the heading of *academic background*, we investigate whether students are over-age for their grade (which would suggest that they had repeated a grade earlier in school), their course-taking behavior in mathematics in the first 2 years of high school, their achievement in mathematics at 10th grade (a proxy for their mathematical ability at that point), and their GPA in mathematics in the first 2 years of high school (which captures their school performance and effort in this subject). We expect that academic and social background characteristics are related to one another, a set of relationships captured by the double-headed Arrow A. Our multilevel analyses investigate the direct relationship of both background constructs on dropping out, captured by Arrows D and E. However, our multilevel analyses also take into account how student background is associated with school organization, mostly through a series of statistical controls (captured by Arrows B and C).

School Organization

Three major constructs characterize school organization in our conceptual model: *structure*, *academic organization*, and *social organization*. School structure we capture with two measures: school size (small, medium, large,

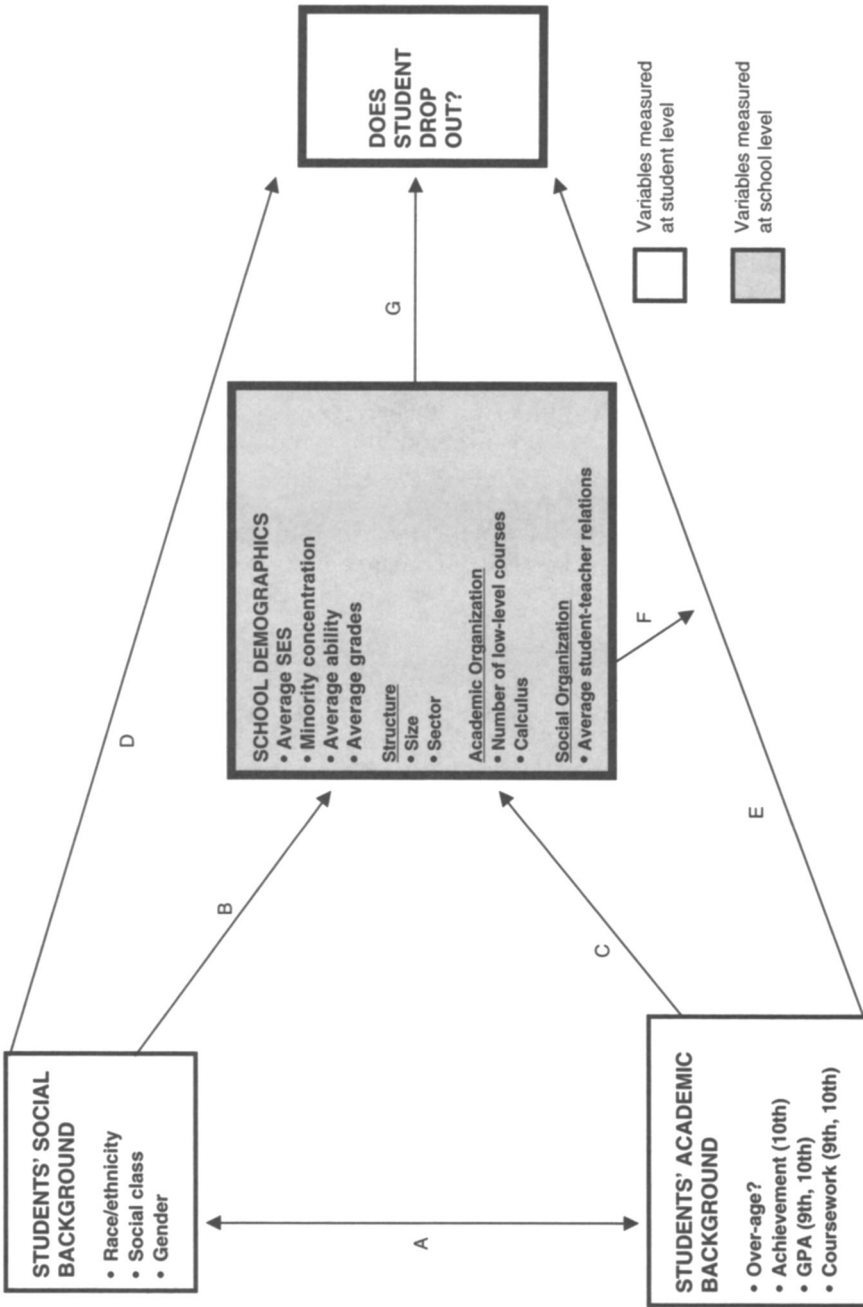


Figure 1. Multilevel heuristic model for investigating school effects on the probability of students' dropping out of high school.

and very large) and school sector. We also operationalize the construct of the high school academic organization in two ways: by the number of mathematics courses offered that are basic or remedial (i.e., below the level of beginning algebra) and by whether the school offers calculus. We consider schools with more basic or remedial courses that do not offer calculus as having a less constrained curriculum than schools that offer fewer low-level courses or that do not offer calculus. Hence our tested notion of the constrained curriculum includes course offerings at both the lower and upper ends of the mathematics pipeline. School social organization is captured by an aggregate measure of how the school's students describe their relationships with teachers. The direct association between school organization and dropping out of school is captured, in our conceptual model, by Arrow G. Because dropping out is hypothesized to be influenced by students' academic background, in our analyses we investigate whether this relationship (specifically the relationship between dropping out and school performance) varies systematically between schools. If it does, then we explore whether school organizational factors are related to this relationship, which is captured on our conceptual model by Arrow F. The demographic characteristics of the schools are included for purposes of statistical control.

In recognition of the multilevel nature of our research questions, the constructs illustrated in Figure 1 are measured at two levels. Both sets of background measures, and the outcome, are measured on *individual students*, who are represented on our conceptual model in white boxes. School organization and demographics are, of course, measured on *schools*, illustrated in Figure 1 in a gray box. The major relationships in this model, the ones that drive this study, are captured in Arrows F and G.

Method

Sample and Data

The data we used come from the High School Effectiveness Study, which is a supplementary data collection to NELS:88 (Scott, Ingels, Sehra, Taylor, & Jergovic, 1996). The original design for NELS:88 selected about 25 eighth-grade students in each of 1,000 middle-grade schools in 1988 (i.e., in schools that included the eighth grade). These students were surveyed and tested 2 years later, in whatever high schools they were attending. Because the National Center for Education Statistics (NCES), which designed NELS:88, recognized that students did not necessarily move from the middle grades to high schools in blocks, the within-school sample sizes of the original NELS students in high school (specifically, in 10th grade) were relatively small. To facilitate research designed to explore school effects (such as this study), the NCES researchers selected a subsample of high schools where the original NELS:88 students were enrolled, from which to collect more data on additional students. Focusing on the 30 largest metropolitan areas, they selected high schools in urban and suburban areas (rural schools were eliminated) that enrolled at least 5 original NELS:88 students. In those high schools, the

10th-grade student sample was augmented. Most of the original NELS:88 students, as well as the augmented sample, completed the NELS:88 achievement tests and surveys in the spring of both their 10th- and 12th-grade years.

The sample that we used for this study included 190 schools and 3,840 students (with an average of 20.2 students per school). Students were selected who had data on race/ethnicity, gender, and SES at 10th grade, as well as test scores, transcript information, and dropout status. All schools in our sample had data on the constructs of interest to this study, specifically school size, school sector, information about the curriculum, and demographic composition. An additional advantage of using HSES (as opposed to the smaller within-school NELS:88 samples of students) is that all schools in the HSES sample were given school weights by NCES. Because the original sampling design involved considerable oversampling of particular schools (especially private schools and schools with high minority enrollments), the use of school-level design weights is required, and all our analyses are weighted.¹ Lee et al. (1998) provide considerable detail about the HSES sample, as well as the results of imposing sampling restrictions similar to those described here.

Measures

Student Measures

Our outcome variable is a dichotomous measure of whether a student dropped out of school between 10th and 12th grade. That is, all students were in the original HSES sample of in-school students at the 10th grade, and some were also reported as having dropped out by the end of 12th grade, when other in-school students were surveyed and tested.² Students who transferred to another high school or graduated early were not included in our sample.

We captured *students' demographic background* by several measures: gender (female = 1, male = 0), race/ethnicity (a series of dummy variables that captured whether the student was Asian, Hispanic, or Black, with the uncoded category for White students), and SES (a *z* score, with mean [*M*] = 0, standard deviation [*SD*] = 1). We captured *students' academic background* by a dummy variable for whether the student was old for his or her grade (coded 1) or not (coded 0); by another dummy variable for whether the student had taken no academic mathematics courses (Algebra I or higher) by the end of 10th grade (coded 1) or not (coded 0); by the student's score on a standardized mathematics test administered at the end of 10th grade; and by the student's grade point average (GPA) in mathematics courses in the first 2 years of high school, taken directly from his or her transcript. More detail about the construction and coding of all variables used in this study is available in the Appendix.

School Measures

We captured *school demographic composition* with several measures: school average SES, high-minority enrollment (see additional discussion in Appendix),

average math achievement for entering students, and average ninth-grade GPA in math. The latter two measures captured the academic composition of the school as the sampled students began high school. We captured *school structure* by a series of dummy variables. School size is far from normally distributed (high school size is positively skewed), and preliminary investigations indicated nonlinear effects of size on student achievement. Consequently, we divided school size into four categories (small = 600 or fewer; medium = 601–1,500; large = 1,501–2,500; very large = more than 2,500 students), following the practice used elsewhere (Lee & Smith, 1997). Our decision on where to differentiate these categories was based on common usage of size classification. In our analyses, small, large, and very large schools were captured as dummy variables (coded 1), each of which was compared with the medium schools (coded 0).³ School sector was indicated by two dummy variables capturing Catholic and independent schools (each coded 1), compared with public schools (coded 0). Independent schools are elite private schools that are members of the National Association of Independent Schools. Other small private schools, some of which had religious sponsorship, were dropped from our analyses because their missions varied; their numbers were too small for separate analysis, yet they could not appropriately be grouped with schools in the other sectors.⁴

We captured the school's *academic organization* with two measures. One, a dummy variable indicating whether the school offered calculus, focused on the high end of the mathematics curriculum. A second measure, focusing on the low end of the curriculum, captured the number of distinct courses the school offered below Algebra I (i.e., not the number of sections of a course, but the number of complete courses). One of the major constructs in this study, school *social organization*, is captured by a measure of the positive relationships between teachers and students in the school, which we use as an indicator of school-based social capital. We constructed this measure from a series of survey items directed to students, in which they indicated how much the school's teachers cared about them, were interested in them, and responded positively to them. The composite measure was first constructed with factor analysis of the student items and then aggregated to the school level. More detail about this measure is presented in the Appendix. In our multivariate analyses, all variables were used either as dummies (coded 1 and 0) or as *z*-scored continuous variables (with $M = 0$, $SD = 1$). This decision was made to simplify the interpretation of coefficients and enable comparisons of relative magnitudes.

Analytic Approach

Multilevel Questions and Methods

The three research questions around which we organized this study are multi-level, consistent with other school effects studies. Addressing these questions involved estimating the effects of student background on dropping out within each school (Question 1) and the effects of school organization on dropping

out (Questions 2 and 3). We use a multilevel analysis strategy, HLM (Raudenbush & Bryk, 2002); in particular, we used its special application to dichotomous outcomes (Raudenbush, Bryk, Cheong, & Congdon, 2000).

In general, HLM used in a school-effects context involves three steps. The first step typically involves partitioning the variance in the outcome into its within- and between-school components. For example, HLM would allow a researcher to estimate the proportion of the variation in 12th-grade mathematics achievement that may be attributed to between-school differences. It is only this between-school component of the variance (as measured by the intra-class correlation, or ICC) that can be modeled as a function of school factors. However, in this instance, because the outcome measure is dichotomous, this step is not appropriate.⁵

A Two-Step Model

HLM in this application thus involves two meaningful steps (or levels). In Level 1 we estimate, separately within each school, the relationships between academic and personal background factors and the log odds that a student will drop out of school. At this level, the researcher must decide whether the independent variables are to be estimated as *fixed* effects or *random* effects. In our analyses presented here, all independent variables at Level 1 were estimated as fixed effects. That means that the between-school variances of their relationships to the outcome are fixed to zero (i.e., all slopes were kept constant across schools). We were quite interested in estimating at least one of these relationships—the slope of GPA (or school performance) on dropping out—as a random effect. However, we found that this relationship did not vary systematically between schools (this is likely to be a problem of statistical power due to modest within-school sample sizes, rather than a substantive finding). Thus we fixed this effect as well. The implication is that we were unable to estimate any relationships captured by Arrow F in the conceptual model shown in Figure 1.

Presentation of Results

Our results are of two sorts: descriptive and analytic. The descriptive results are also of two types. One type presents group means on students' background measures between two groups of students: those who dropped out and those who stayed in school until graduation. These group mean differences were tested for statistical significance. Continuous variables were tested with *t* tests (both *Ms* and *SDs* were tested); categorical variables, all of which were dummy variables, were tested with contingency tables. Because school size is an important consideration in this study, we also present descriptive results for school-level variables as group means for small, medium, large, and very large schools. These differences were tested for statistical significance with one-way analysis of variance (ANOVA) and a series of contrasts. Group means on each variable for each size group (small, large, and very large schools) were compared separately to medium-sized schools.

Our analytic results are presented in two HLM steps, as described earlier. In both steps, dropping out is the dependent measure. In Step 1, the within-school (Level 1, or student-level) HLM model, we explored relationships between dropping out and student background variables in a multivariate, multilevel context to test the hypotheses posed in Question 1. As would be typical in any logistic regression, the results are presented in the log odds metric. Since this metric is not easily interpretable, we translate each result in the log odds metric into an odds ratio (the ratio between p , the probability of dropping out, and $1 - p$, the probability of remaining in school). The more easily interpreted odds ratio permits an estimate of the percentage increase or decrease in the odds of dropping out. For example, a change in the odds ratio of 1.75 represents a 75% increase in the likelihood (or odds) of dropping out. A change in the odds ratio of .40 represents a 60% decrease in the likelihood of dropping out. We use the terms *probability*, *odds*, and *log odds* only when referring to numbers in those respective metrics (i.e., the probability of dropping out, the odds of dropping out). Like many researchers, we use the term *likelihood* in a nontechnical sense (there is no likelihood metric); a greater likelihood of dropping out could refer to a greater probability, a greater odds, or a greater log odds.

Our Level 2 (or between-school) results report the relationships between the several measures of school organization described earlier and the school-level estimate of the proportion of students who dropped out (i.e., the dropout rate in each school). The Level 2 outcome was, of course, adjusted for all student-level measures in the Level 1 model. The results of the full two-level HLM model, which tested the hypotheses posed in Question 2, are also reported in the log odds and odds ratio metrics.

Testing for Contingent Relations

Our Level-2 HLM model included a series of interaction terms between certain school categories and school social organization (these interactions test the hypotheses posed in Question 3). To investigate whether the effect of school social organization is different in different types of schools (i.e., a contingent relationship), we computed a series of product terms between the student-teacher relationships aggregate and the other school organization measures.

Significance and Standard Errors

The reliability (and hence the significance) of HLM effects is strongly influenced by the within-school sample sizes, as well as by the number of schools. This is, of course, a question of statistical power. The average within-school sample used here (about 20 students per school) is certainly more than sufficient for HLM estimations, but we follow the practice of other researchers in this area and include results of “borderline” significance ($p < .10$). Moreover, we include standard errors in our multivariate tables to further clarify our results.

Results

Student Background and Dropping Out of High School

The overall dropout rates for the entire sample of HSES schools are quite varied, ranging from a low of 0% to a high of more than 50%, with a weighted mean of about 7%. To compute these descriptive dropout rates, we employed the full HSES student (and school) samples, regardless of whether they had any demographic information; all we knew was students' dropout status. In our restricted sample of 3,840 students in 190 schools, weighted results indicate that 5% (179 students) dropped out between the end of 10th and 12th grades (see Table 1). Hence this reduced sample dropout rate shown on Table 1 became somewhat lower after we restricted our attention to cases with available student-level information (and schools with available information about their social and academic organizations).

This cohort dropout rate seems low, at least in comparison to what we read about America's urban high schools. We suggest several reasons for the low rate. First, many students had already dropped out of school before they would have entered the sample, either before they began high school in 9th grade or between 9th and the end of 10th grade. There is considerable evidence that the end of 9th grade is particularly important in this regard. Thus even our sample of eventual dropouts had "survived" several perilous points in their educational trajectory. Second, we remind readers that our

Table 1
Student Characteristics by Dropout Status

	Dropped out	In school
Unweighted sample size	(179)	(3,661)
Weighted percentages	5.4	94.6
<i>Variables:</i>		
% Female	49.4	47.3
% Asian	0.7	6.1***
% Hispanic	13.7	11.8
% Black	22.6***	3.6
Mean SES	-0.57	0.03***
(SD)	(1.01)	(0.99)
% Over-age	1.2	3.8*
% No academic math courses, Grades 9 and 10	17.5***	4.9
Mean math achievement, Grade 10	33.8	45.3***
(SD)	(11.9)	(14.0)***
Math GPA, Grades 9 and 10, mean	1.86	2.39***
(SD)	(0.97)	(0.88)

Note. Unweighted $n = 3,840$ students.

*Differences in percentages and means tested for significance. Significance levels are indicated on the larger of the two numbers.

* $p < .05$. *** $p < .001$.

school sample includes both Catholic and independent schools, two sectors in which the dropout rate is quite low.

The descriptive comparisons of social background shown in Table 1 indicate that gender was not significantly related to dropping out. Race/ethnicity was associated with dropping out, however, with Asian students more likely to stay in school and Black students more likely to drop out as compared with White students. Hispanic ethnicity was unrelated to dropping out. SES was strongly associated with dropping out; the dropouts' SES was .6 *SDs* lower than the non-dropouts' SES, a large difference.

Academic background was also strongly associated with dropping out. Almost 18% of the dropouts took no academic courses in mathematics during the first 2 years of high school, as compared with only 5% of non-dropouts. Mathematics achievement at the end of 10th grade also strongly favored the non-dropouts, with differences between the two groups of about 1 *SD* (a very large difference). Similarly, students who eventually dropped out of school had lower school performance than non-dropouts as measured by their GPAs in mathematics. On the traditional 4-point GPA scale, the eventual dropouts had earned a GPA below a C average (which would be 2.0), where the non-dropouts' GPA in mathematics was about C+.

Although the proportions of both groups who were over-age at the end of 10th grade were low, being over-age was related to dropping out. More than twice as many non-dropouts (4%) as dropouts (1%) were over-age. This result runs contrary to most extant research, which considers being over-age a characteristic of "at risk" students. We can only speculate that this discrepancy is because either (a) we are looking at the "late" dropouts, or (b) we are looking at dropout behavior in the 30 largest metropolitan sampling areas (MSAs). Being over-age may be a predictor of "early" dropout behavior (i.e., dropping out before 10th grade), but our results suggest that over-age students in the 30 largest MSAs who persist until 10th grade may be more likely to persist until graduation. The same unusual result holds up in the multivariate models presented in the next section.

Several measures of student background that are considered here are likely to be strongly related to one another, yet these descriptive comparisons do not take that possibility into account. Nevertheless, we have evidence from Table 1 that dropping out of high school between 1990 and 1992 was related strongly to students' social and academic backgrounds.

School Size and Dropping Out

Descriptive information about the 190 schools in this sample is presented in Table 2. Although the distribution of the high schools was not balanced across school size, there were substantial numbers of schools in each size category. We selected medium-sized schools as our comparison group in the multivariate analysis simply because there were more schools in this category. It is clear that dropping out is related to school size, although the relationship seems to be nonlinear. That is, the large schools (enrolling

Table 2
School Characteristics by School Size^a

	Small ^b	Medium	Large	Very large
Unweighted sample size	(36)	(67)	(58)	(29)
Weighted percentages	40.6	30.3	21.8	7.3
<i>Variables:</i>				
% Dropped out	5.3	7.0	11.8**	7.5
Average SES	0.61***	0.22	0.13	-0.23***
% Black	4.8***	20.8	19.9	28.2
% Hispanic	2.3*	6.1	14.8**	40.5***
% Asian	3.0	2.7	4.4	7.2
% High minority ^c	9.3*	25.0	37.1	77.3***
Average math achievement, Grade 8	41.4***	37.0	35.4	30.4***
Average math GPA, Grade 9	2.86***	2.34	2.35	1.93**
% Urban	29.0	32.3	28.9	78.0***
% Catholic	40.0***	18.7	8.1	0.0
% Independent	51.7***	6.3	0.5	0.0
% Offering calculus	56.7	66.6	77.7	48.2
Number of below-algebra math courses	2.7***	4.1	4.2	4.7
Average student-teacher relations	0.53**	-0.05	-0.03	-0.13

Note. N = 190 schools.

^aSchool size is defined as follows: small = 600 or fewer; medium = 601–1,500; large = 1,501–2,500; very large = more than 2,500 students.

^bDifferences in percentages and means across school size are tested for significance with pairwise contrasts, comparing small, large, and very large schools with medium-sized schools. Significance levels indicate whether a particular percentage or mean is significantly different from the percentage or mean of a medium-sized school.

^cHigh-minority schools are defined as schools with 40% or higher minority student enrollment.

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

between 1,500 and 2,500 students) had a higher proportion of students dropping out (12%) than either medium or very large schools (where the proportions were both about 7%). The smallest schools (with 600 or fewer students) had the lowest dropout rates, which may be explained by the fact that many private schools are small (about 40% of small schools in this sample were Catholic and 52% were independent schools). The nonlinear relationship between school size and the dropout rate may reflect the fact that we are investigating dropout behavior late in the high school years (i.e., after 10th grade). It is possible that students dropped out of very large schools earlier in their high school careers.

School demographic characteristics were also related to school size. The group of small schools was characterized by the highest average SES and the lowest proportion of schools enrolling more than 40% minority students. Small schools enrolled students with the highest average mathematics achievement and highest GPAs in mathematics. Small schools also offered the fewest number of below-algebra mathematics courses, although the availability of calculus was statistically unrelated to size (most high schools offer this course).

Again, these findings are partially explained by the large proportion of small schools that are private.

The most striking differences in Table 2 relate to average student–teacher relations. Small schools averaged about .5 *SD* higher on this measure than schools of other sizes (which were quite similar to one another in this regard). Because these differences are probably explained by the fact that large proportions of the small schools are private (either Catholic or independent), we investigated this possibility. Average student–teacher relations were associated with school sector (regardless of school size): Student–teacher relations averaged $-.09$ *SD* in public schools, $.27$ *SD* in Catholic schools, and $.69$ *SD* in independent schools; these are large group mean differences.

It is clear from these descriptive differences among students and schools that the characteristics considered are associated with the probability that a student will drop out of high school after 10th grade. Because school sector, size, racial and economic composition, and curriculum are also related to one another, the bivariate relationships can be misleading and possibly completely spurious. At the least, the group mean differences displayed in Tables 1 and 2 suggest the importance of considering each of these factors in our multivariate and multilevel analyses, to which we now turn.

Multilevel Analyses of Students, Schools, and Dropping Out

Within-School HLM Model

The results of the analysis investigating Question 1, where we explore the relationship between students' social and academic background and the likelihood of their dropping out of school, are shown in Table 3. The reader may recall from our earlier discussion that we were anxious to investigate some of these relationships as social distribution parameters. However, because those relationships did not vary between schools, none of them could be successfully modeled as random Level 2 outcomes. Therefore, all of the independent variables shown in Table 3 were estimated as fixed effects. We have centered each of these variables around the mean for the entire sample, and each continuous variable was *z*-scored ($M = 0$, $SD = 1$). Because of these decisions, the intercept shown in Table 3, the adjusted log odds of dropping out (-3.40) translates into an adjusted dropout rate of slightly more than 3%.⁶ In the multilevel analyses shown in Tables 3 and 4, characteristics of schools with positive log odds coefficients are associated with a greater likelihood of dropping out, whereas negative log odds coefficients suggest an association with a lower likelihood.

The within-school (Level 1) HLM model provides somewhat different results from the descriptive results shown in Table 1. Descriptive results suggest that gender is unrelated to dropping out, and the multivariate analysis confirms this. However, racial/ethnic differences persist. These multivariate results consistently support a 73% decrease in the odds of Asians dropping out as compared with Whites (change in odds = $.27$, $p < .05$), but the results

Table 3
Within-School Model of School Dropout between 10th and 12th Grades

Independent variable	Change in log odds	SE	Change in odds	
<i>Adjusted log odds of dropping out:</i>				
Intercept	-3.40	0.15	0.03	
<i>Fixed effects:</i>				
Female	0.12	0.25	1.13	
Asian	-1.31*	0.63	0.27*	
Hispanic	-0.39**	0.16	0.68**	
Black	0.33	0.24	1.39	
SES	-0.57***	0.10	0.57***	
Over-age	-1.20**	0.31	0.30**	
No academic math courses	0.75~	0.43	2.12~	
Math achievement, Grade 10	-0.04	0.25	0.96	
Math GPA, Grades 9 and 10	-0.39***	0.10	0.68***	
<i>Chi-square table:</i>				
	<i>SD</i>	Variance	<i>df</i>	χ^2
Intercept	1.089	1.187	189	328.4***

Note. Unweighted $n = 3,840$ students, unweighted $N = 190$ schools.
~ $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

for Hispanic and Black students are contrary to our original hypotheses. In the multivariate and multilevel context, after controlling for SES and prior performance, we find that Hispanics are less likely to drop out (a 32% decrease in the odds of dropping out, $p < .01$), but Blacks are no more likely than Whites to drop out. It may be that the Hispanics who leave school before graduation leave early and therefore did not appear in our sample. Strongly associated with dropping out is student SES (a 1-*SD* increase in SES led to a 43% decrease in the odds, $p < .001$).

Perhaps more interesting are the results for students' academic background. As with the descriptive results, over-age students are considerably less likely to drop out (a 70% decrease in odds, $p < .01$). A moderately strong individual factor associated with dropping out is students' school performance, captured by their GPA in mathematics (a 1-*SD* increase in GPA is associated with a 32% decrease in the odds of dropping out, $p < .001$). Although descriptive results indicate very large differences between dropouts and non-dropouts in academic achievement, in the multivariate and multilevel model, mathematics achievement is unrelated to dropout behavior when school performance and social background are accounted for. Students who took no academic mathematics courses in their first 2 years of high school were more likely to drop out (a 112% increase in the odds, $p < .10$). The adjusted intercept in each school, which translates into the within-school dropout rate after

adjustments for students' social and academic background, is the dependent variable in our Level-2 HLM. The results in the chi-square table at the bottom of Table 3 indicate that the intercept varies significantly between schools ($p < .001$), even after adjusting for students' social and academic backgrounds.

Between-School HLM Model

The results of our Level-2 HLM model are displayed in Table 4. They include adjustments for the entire set of student characteristics shown in Table 3. The within-school results near the bottom of Table 4 (i.e., the fixed effects) have changed little from Table 3. The analysis includes variables that describe schools in terms of their demographic composition, structure (size and sector), academic organization, and school social organization. We discuss each of these sets of variables separately, although their effects were estimated simultaneously.

School Demographic Composition

As entering math achievement increases, school dropout rates decline slightly. In other words, a 1-*SD* increase in the average mathematics achievement of entering students resulted in a 32% decrease in the odds of dropping out (change in odds = .68, $p < .10$). Adjusted school dropout rates are statistically unrelated to school average SES, high-minority concentration, or students' average GPA in mathematics at Grade 9. These factors were included mainly for control purposes.

Academic Organization

Our results here focus on the structure of the high school curriculum. Schools that offer fewer mathematics courses below the level of Algebra I or offer calculus have lower dropout rates. More specifically, students in schools that offer calculus exhibited 56% lower odds of dropping out ($p < .01$). Students attending schools that were 1 *SD* above the mean in the number of lower-level (i.e., below-algebra) math courses offered experienced a 28% increase in the odds of dropping out ($p < .10$).⁷ Thus we conclude that students are less likely to drop out in high schools with a more constrained academic mathematics curriculum, above and beyond their own course-taking behavior and school performance (factors that were included in the within-school model). This finding addresses Question 2, confirming our hypothesis about the effects of a constrained academic curriculum.

Interpreting Results With Interactions

Researchers are often warned about interpreting "main effects" in the presence of interaction terms. Such cautions are real but sometimes reflect an incomplete knowledge of how such effects are calculated. When interactions are known to occur, interpreting a main (or first-order) effect in a model *without*

Table 4
**Between-School Model:
How School Characteristics Affect Dropout Rates**

Independent variable	Change in log odds	SE	Change in odds	
<i>Adjusted log odds of dropping out:</i>				
Intercept	-3.75	0.31	0.02	
<i>School demographics:</i>				
Average SES	0.66	0.44	1.93	
High minority	-0.32	0.29	0.73	
Average math achievement, Grade 8	-0.38~	0.23	0.68~	
Average math GPA, Grade 9	-0.22	0.17	0.80	
<i>School academic organization:</i>				
Offers calculus	-0.81**	0.25	0.44**	
Number of below-algebra courses	0.25~	0.13	1.28~	
<i>School sector:</i>				
Catholic ^a	-0.56	0.58	0.57	
Independent ^a	-1.09	0.99	0.34	
<i>School size:</i>				
Small ^b	0.75~	0.46	2.12~	
Large ^b	1.32***	0.31	3.74***	
Very large ^b	0.76*	0.39	2.14*	
<i>School social organization:</i>				
Average S-T relations	-1.96**	0.69	0.14***	
<i>Interactions:</i>				
S-T relations by independent sector	2.07**	0.78	7.92**	
S-T relations by large	2.50**	0.87	12.18**	
S-T relations by very large	2.65**	1.11	14.15**	
<i>Fixed effects:</i>				
Female	0.14	0.25	1.15	
Asian	-1.34*	0.65	0.26*	
Hispanic	-0.36~	0.20	0.70~	
Black	0.40	0.28	1.49	
Over-age	-1.17**	0.37	0.31**	
SES	-0.54***	0.13	0.58***	
No academic math courses	0.61	0.41	1.84	
Math achievement, Grade 10	-0.04	0.28	0.96	
Math GPA, Grades 9 and 10	-0.36***	0.11	0.70***	
<i>Chi square table:</i>				
	<i>SD</i>	<i>Variance</i>	<i>df</i>	<i>χ²</i>
Intercept	1.025	1.050	174	263.0***

Note. Unweighted $n = 3,840$ students, unweighted $N = 190$ schools, S-T = student-teacher.
^aAs compared with public schools.
^bAs compared with medium-sized schools (601–1,500 students).
~ $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

interaction terms is inappropriate. The coding of our measures allows for a straightforward interpretation of the first-order and second-order terms (i.e., what some would call “main effects” and “interaction effects”). For example, the first-order effect of school social organization is the effect for schools coded 0 on all other school organization measures (e.g., public schools of medium size, with average levels of math achievement). Our exploratory models included all such interaction terms. The final model represents a more parsimonious (and statistically efficient) model, wherein all nonsignificant interaction terms were removed. Aiken and West (1991) present a detailed discussion of coding practices and the implications for interpretation. They also recommend eliminating nonsignificant interaction terms from final models.

School Structure

The first-order effects of school structure, shown in Table 4, are straightforward. School dropout rates did not differ between public, Catholic, and independent schools in these multivariate analyses, once demographics, size, and organization were taken into account. More exactly, the nonsignificant first-order effects combined with the significant interaction terms involving sector imply that school sector had no significant effect on dropout rates *among schools of average student–teacher relations*. The first-order effects of school size are similar. Compared with medium-sized schools, large and very large schools had higher dropout rates, *among schools of average student–teacher relations*. This was particularly true for large schools (nearing a 300% increase in the odds of dropping out, $p < .001$). Small schools also had higher dropout rates than medium-sized schools (more than a 100% increase in the odds, $p < .10$).

School Social Organization: A Contingent Relationship

Also related to Question 2, our findings seem clear in this regard. Students attending schools defined by more positive student–teacher relations were less likely to drop out than those who attended schools with less positive student–teacher relations (a 1-*SD* increase in average student–teacher relations led to an 86% decrease in the odds of dropping out, $p < .01$). It is important to note that this first-order effect occurred *only* in certain schools (as indicated by the presence of several significant interaction terms shown in Table 4). That is, we found that the effect of school social organization on dropping out is contingent on school structure—for both school size and sector (Question 3). That is, the impact of school average student–teacher relations on dropping out differs by the size and sector (public, Catholic, or independent) of the school. This finding is among the most important of the study.

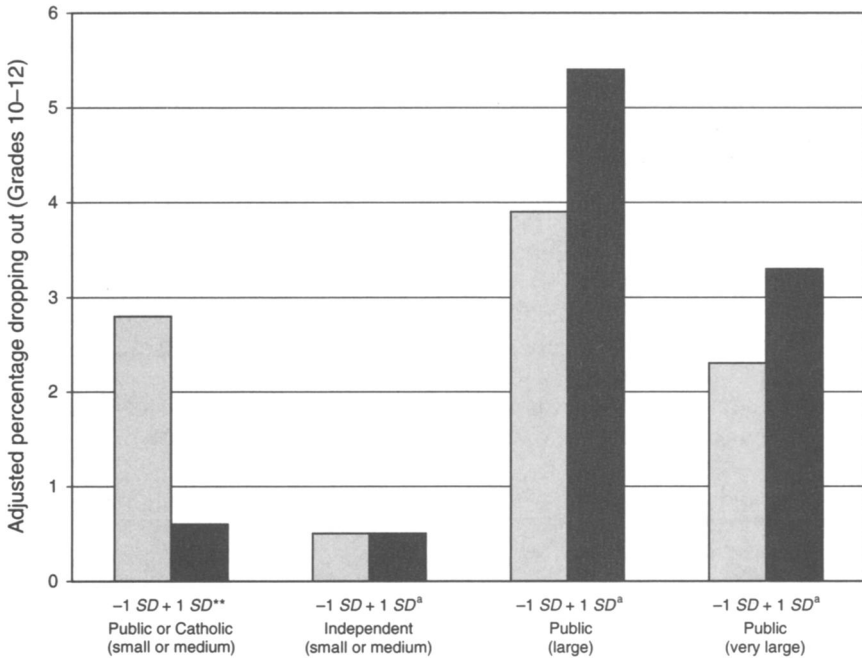
The first- and second-order effects here we interpret as follows. In public or Catholic schools of small or medium size, a 1-*SD* increase in positive student–teacher relations led to an 86% decrease in the odds of dropping out (first-order change in odds = .14). In independent schools of small

or medium size, however, there was no significant impact of student–teacher relations on dropping out (change in log odds = $-1.96 + 2.07 = .11$, a non-significant difference). The lack of an effect here is probably due to very low dropout rates in independent schools and to the fact that average student–teacher relations were especially high in independent schools in the first place, as we reported earlier. Moreover, as school size increased, the impact of positive student–teacher relations disappeared (for large schools, $-1.96 + 2.50 = .54$; for very large schools, $-1.96 + 2.65 = .69$; both are nonsignificant effects).

In Figure 2, we attempt to untangle this differential effect of student–teacher relationships by displaying adjusted school dropout rates in schools characterized by low student–teacher relationships (1 *SD* below the mean) and schools with high student–teacher relationships (1 *SD* above the mean), separately for four school types: (a) public or Catholic schools (of small or medium size); (b) independent schools (of small or medium size); (c) large public schools; and (d) very large public schools. In only the first instance did the strength of student–teacher relationships significantly affect the dropout rate. Public or Catholic schools (of small or medium size) with low student–teacher relationships had an adjusted dropout rate of nearly 3%, whereas similar schools with high student–teacher relationships exhibited a dropout rate of just over half of 1%. Independent schools exhibited a low dropout rate (approximately one half of 1%) regardless of the strength of the student–teacher relationships. Large and very large public schools exhibited higher dropout rates (about 4%–5% in most large schools, and about 2–3% in most very large schools) than other public schools, regardless of the strength of the student–teacher relationships.⁸

From the findings in Table 4 and Figure 2, we conclude that in schools with positive student–teacher relationships—a measure of school-based social capital—the probability that students would drop out of school was reduced. However, these positive relationships benefited students only in certain schools. Specifically, this form of social capital reduced the dropout rate only in public and Catholic schools (where there is more variability in social capital of this type) of small or medium size. Positive student–teacher relationships were unimportant in reducing student dropout rates in independent schools, for two likely reasons: (a) The dropout rates in such schools were already so low that there was little “room” to drop; and (b) student–teacher relationships were universally high in such schools (i.e., there was less variability across schools).

The reason that student–teacher relationships do not influence dropout behavior in large and very large schools may be that other organizational disadvantages from the large enrollments undermine any benefit derived from good student–teacher relations. Even at average levels of student–teacher relations, large and very large schools exhibited higher dropout rates than medium-sized schools. Indeed, even small schools with average student–teacher relations (admittedly a rare occurrence—small schools, in general,



^a No significant difference between schools with low- and high-quality student-teacher relationships.
^{**} $p < .01$.

Figure 2. Adjusted cohort dropout rates for schools with different levels of student-teacher relations: Adjusted percentage of students who drop out (Grades 10–12) for schools with high- (+1 SD) and low- (–1 SD) quality student-teacher relations.

have higher-than-average student-teacher relations, as can be seen in Table 2) exhibit higher dropout rates than medium-sized schools.

The multivariate model presented in Table 4 explains about 12% of the between-school variance in dropout rates, indicating that many school factors that influence dropout behavior remain unknown.⁹ Although explaining away all school-level variance is not a major goal in our analysis, nevertheless we acknowledge that other important school factors may be important. Our focus has been on school structure and organization.

Discussion

Individual Explanations Are Incomplete

The results of this study suggest that explanations for students dropping out of school before graduation that rely solely on students' social background and school behaviors are incomplete. Although our research has demonstrated

that students' social and academic backgrounds both are associated with the likelihood of students' dropping out of high school, the story doesn't (and shouldn't) end there. Our results expand the research on dropout behavior by providing further empirical evidence that schools can exert important organizational effects on students' decisions to drop out or stay in school, above and beyond their individual behaviors and backgrounds.

There are important school effects on dropout behavior, even after taking students' risk factors into account. However, U.S. society and much research on this topic continue to lend strong support to the individualistic model, whereby students and their families are held responsible for dropout behavior. Acceptance of the individual model, we argue, tends to let schools off the hook; they are relieved of responsibility for holding students in school who may not be learning, who are not working hard in school, and who come from families where support for education is not strong. This is a mistake—yet another example of blaming the victim for the problem.

What Could High Schools Do to Hold All Their Students in School?

Some Important Non-Findings

A noteworthy finding from this study is that several features of schools that they are unable to change—specifically, their demographic composition and their sector—are almost completely unrelated to school dropout rates, *once students' background and behavior are taken into account*. Although many policymakers interested in the dropout phenomenon target individual characteristics, others look to schools by referring to the prevalence of this phenomenon in schools that enroll large proportions of low-SES students, high proportions of minorities, and many low-performing and unengaged students. Although the presence of low-achieving students has a marginal influence on school dropout rates in this study, neither average SES nor minority concentration was associated with this outcome after taking other school characteristics into account (from Table 4). Moreover, although observed dropout rates were lower in Catholic and independent schools than in public schools, there was no direct *residual* effect of school sector on dropping out (for schools of average student–teacher relations). These non-findings we consider to be very important, especially in light of the fact that several organizational features—specifically, size, curriculum, and social organization—are important.

School Academic Organization

We conclude that the structure of the high school curriculum is associated with holding students in high school until graduation. Regardless of students' own academic background and school performance, schools with what has been called in other studies “a constrained academic curriculum”—more challenging courses, fewer remedial or nonacademic courses—hold students in school (Lee et al., 1998). This finding flies in the face of those who say that high schools must offer a large number of undemanding courses to keep

uncommitted students in school. Although other research has shown the positive effects of a constrained curriculum structure on academic learning and its socially equitable distribution (e.g., Lee & Bryk, 1989; Lee et al., 1997, 1998), those findings about the benefits of a constrained academic curriculum may now be extended to show positive effects for keeping students from dropping out.

School Size

Much has been written in recent years about the importance of the size of secondary schools (e.g., Lee, 1999; Lee & Loeb, 2000; Lee & Smith, 1997). In general, this research has supported making high schools smaller than they are, but not so small that they cannot offer a reasonable curriculum to their students. Although these studies have focused primarily on the direct relationship between school size and student achievement (and its equitable distribution), the authors have argued in these writings that school size is unlikely to have a direct relationship with many of these outcomes. Similar findings accrue in this study: Students are more likely to drop out of larger high schools, although actual size categories are slightly different in each study.

However, we make the same argument here as we have made elsewhere. School size, per se, is unlikely to directly influence the probability that students will drop out of high school. Rather, there are likely to be other organizational features that accrue to students and staff in smaller high schools. One of those organizational features is how school members—particularly teachers and students—relate to one another. It is noteworthy, however, that there are residual direct effects for school size here, even when this aspect of school social organization is taken into account.

These findings suggest the importance of school size in relation to dropping out, above and beyond its relationship with the quality of relationships among school members. We also suggest that such findings indicate that there may be other social benefits that accompany smaller size—including organizational trust, members' commitment to a common purpose, and more frequent contact with people with whom members share their difficulties, uncertainties, and ambitions. These measures, unfortunately, are not part of this analysis, as items to capture such constructs are unavailable in the HSES. Our results demonstrate that school size is quite important and that students in medium-sized schools are the least likely to drop out. As such, the findings here are quite consistent with other recent studies that show that the size of secondary schools influences important school outcomes and that smaller (but not too small) size is generally better.

School Social Organization

The most important finding in this study, in our opinion, is that students are less likely to drop out of high schools where relationships between teachers and students (as perceived by the students) are more positive. Although many

schools themselves have little ability to influence who attends them, we believe that the adults who work in schools (teachers and administrators) are able to consciously alter how they interact with their students. Quite clearly, students stay in school when social relations with their teachers are positive. This association persists even when students' background, school demographics, and school sector are taken into account.

However, our analyses have provided some insight into particular organizational settings where the student-teacher relationship may thrive. In large and very large schools (that is, schools that enroll more than 1,500 students), average positive relationships do not seem to hold students in school. Developing and sustaining such relationships, at the organizational level, is surely much more difficult in larger and more anonymous settings. Thus the influence of attending a school characterized by positive social relationships on students' decisions to drop out is restricted to high schools that enroll fewer than 1,500 students. Similarly, the effect of positive relations on keeping students from dropping out is restricted to public and Catholic high schools. It does not apply in independent schools, probably because average relationships there are uniformly quite positive and dropping out is quite rare.

Positive Student-Teacher Relationships

The effect of positive student-teacher relations operates at both the school and the individual levels. Our study investigates student-teacher relations as an element of the social organization of schools, and so we consider the impact of positive relations at the *school level* through the use of a school average. It is reasonable to assume that positive student-teacher relations also influence students at the *individual level*. That is, a student's relationships with particular teachers may affect his or her decision to remain in school or to drop out of school. The individual-level consideration of just this question was taken up in a recent study (Croninger & Lee, 2001), and the results confirmed the importance of this link.

There is, of course, considerable variation in the quality of student-teacher relations within a single school. Before aggregating our composite measure to the school level, our measure of student-teacher relations was captured as a z score across the entire student sample ($M = 0$, $SD = 1$). School aggregate means (see Table 2) revealed the strong relationship between school size and school average student-teacher relations. However, it is interesting that the school aggregate SD s of this measure were not significantly related to school size. On average, the within-school SD was between 0.9 and 1.0; this indicates that there was nearly as much variation within each school on this measure as in the overall sample, regardless of school size. Moreover, the school aggregate SD s were not significantly related to the school aggregate means: Schools defined by positive student-teacher relations displayed within-school variation similar to that in schools defined by negative student-teacher relations. Consequently, we conclude that the fact that average relationships in large and very large schools failed to influence students'

decisions to drop out is unlikely to be attributable to low reliability or greater imprecision of the measure in those schools. We recognize the important influence on students of relationships with teachers both among individuals and as a characteristic of the social organization of schools. In this study, our focus is on the latter phenomenon.

The Importance of Using the Appropriate Analytic Approach

Data and Methods Coincide Well With Questions

The data used for this study, the HSES supplement to NELS:88, have provided us with an opportunity to explore a school organizational explanation for the dropout phenomenon. Certain design elements of the data—that they are multilevel, that they are longitudinal, and that they include large and random samples of secondary schools in America’s cities and suburbs—made our study possible. The HSES design, which augmented the number of sampled students in each sampled school, allowed us to make use of the multilevel research methods that are critical in examining school effects on individual behaviors.

On the other hand, the findings reported here probably represent a lower bound for possible organizational influences on students’ academic behaviors, for two reasons. First, we were able to explore dropping out only in students’ last 2 years of high school; we know that many students leave high school well before the end of 10th grade. Second, our results may not reflect the full breadth and depth of the relationships because of the HSES design. Within-school sample sizes in HSES are still modest (averaging 20 students), limiting our ability to identify social distribution outcomes. We were especially interested in exploring the organizational factors that might be associated with the relationship between dropping out and school performance, what are called “cross-unit interactions” in HLM. That is, we were anxious to identify features of schools that allowed them to hold even low-performing (and relatively uncommitted) students in school. Modest within-school sample sizes limited our ability to explore such relationships in HSES. Whether the relationships really did not vary systematically between schools, or whether such variation was impossible to detect with the design of HSES because of low power, is unclear. Our results would likely be both stronger and richer with a more complete data structure.

Direct Effects and Total Effects

The analytic model explored here estimates only the *direct* effect of school academic and social organization on the likelihood of dropping out of high school. Clearly, our within-school model includes certain student-level predictors that are themselves likely to be influenced by school structure and organization (for example, the student’s prior math achievement and whether the student completed academic math courses). The *total* effect of school structure and organization would include these potential *indirect* effects as

well as the direct effects estimated here. Consequently, the full influence of a school's academic and social organization is likely to be much larger than is suggested by our results here.

Interactions Are Important

Our final words focus on a common analytic oversight. The large majority of quantitative research ignores potential interactions and instead concentrates on first-order effects only (usually without testing for the presence of interactions). In this study, a very important finding is the contingency of the influence of school social organization on dropout behavior. Only in some settings is this organizational phenomenon important; in others it is not. We would not know this had we not investigated interactions among the school factors that we considered in this study. We argue that researchers should systematically check for possible second-order effects. Many studies may have drawn incomplete or incorrect conclusions because of this oversight. In some instances first-order effects are seen as nonsignificant (and conclusions are drawn—incorrectly—that they are not important) simply because researchers have failed to explore interactions. Our findings here reinforce the importance of exploring interaction effects and not relying entirely on main effects.

Enriching the Discussion of Dropping Out

It is possible to examine the findings from this paper and ask, "Have we learned anything new here?" Very few thoughtful people would dispute the importance of positive human relationships in tipping the scales of potentially harmful behaviors. Moreover, it is quite logical that such relationships would matter more in settings that were organized more simply—simply because human interactions are themselves easier to create and maintain in such settings.

In closing, we offer a few reasons to justify the importance of our contribution to the investigation of why students leave school before graduating, even though there is overwhelming evidence that such behavior is damaging to their long-term life chances. First, our analyses are quite complex; that is, we bring together many different factors associated with dropping out that have been considered individually in other studies. We also make use of a methodology that is rather new and quite appropriate, so that we may have uncovered relationships not visible with single-level techniques. Second, we emphasize the importance of considering the school as being at least part of the problem. Although not all characteristics of schools are amenable to easy policy manipulation (changing school size and improving human relations being two of the more difficult), it is much easier for social intervention to change schools than to change individuals. Laying at least part of the blame at the feet of schools seems to us to move the discussion in the right direction, away from blaming the victim for the problem. Third, we hope that this

study's publication in a widely read journal will help to keep the seemingly intractable problem of high school dropout alive in the public consciousness. As a nation we should not become complacent or accepting of this problem. We all need to do what we can to keep high school students in school until they graduate. We hope that this study has provided at least a few suggestions for how this might be accomplished.

Notes

A preliminary version of this paper was presented at a January 2001 conference sponsored by Achieve and The Civil Rights Project at Harvard University: "Dropouts in America: How Severe Is the Problem? What Do We Know About Intervention and Prevention?" We appreciate the useful advice of Gary Oldfield and Elizabeth DeBray on preliminary versions of this paper. The conclusions and opinions expressed are those of the authors. The data, from the High School Effectiveness Supplement to the National Education Longitudinal Study of 1988, are available to researchers holding a license to use confidential data through NCES. The study's first author holds such a license (control number 912050011E). Address all correspondence regarding this paper to Dr. Valerie E. Lee, School of Education, University of Michigan, Ann Arbor, MI 48109.

¹Unfortunately, the student-level weights included in the HSES dataset were calculated on the basis of inappropriate statistical assumptions and so should not be used. After consultation with NCES, we calculated our own student-level weights (both overall weights used for descriptive analyses and with-school weights used in the HLM analyses). All results presented here are consequently weighted results, weighted at both the student and school levels.

²Dropout status in HSES is defined more accurately than it often is elsewhere. That is, a student's dropout status was based on school reports as well as on a confirmation from the student or the student's parents. HSES students from the original NELs:88 data were classified as dropouts only if both of the above conditions were met. However, HSES students who entered as part of the data augmentation were classified as dropouts if their school classified them as such (i.e., there was no attempt to verify that status with the student or the student's parents).

³Researchers are usually reluctant to lose important information by collapsing continuous measures into categorical ones, and we share that concern. Unfortunately, distributional properties and the presence of nonlinear effects—both of which are important assumptions for most estimation procedures—may necessitate the practice. That was the case in our study for both minority enrollment and school size. These measures have required similar treatment in research other than our own.

⁴We followed the same practice here in categorizing private schools as we have in many other studies using HSES (Lee, Burkam, et al., 1998; Lee, Chow-Hoy, et al., 1998) and NELs (Croninger & Lee, 2001; Lee, 2001).

⁵The variance for a binomial variable is the simple product of the proportion of those coded 1 and those coded 0. In other words, the variance of a binomial variable is not independent from the mean (unlike a continuous measure where the mean and variance are separate parameters). Consequently, partitioning (or explaining) variance is not a statistical goal.

⁶The intercept can be used to estimate the dropout rate, adjusted for the social and academic background of the students. More exactly, it can estimate the probability of dropping out for a group of students with an average gender and racial/ethnic background (e.g., average percentage female, average percentage Black), average SES, average achievement and grades, and an average proportion of over-age students.

⁷To make more practical sense of this finding, we remind readers that a 1-SD increase in the number of low-level math courses translates into about 1.75 courses. Thus, for every two additional courses offered below the level of algebra, students experienced more than a 30% increase in the odds of dropping out.

⁸We calculated the adjusted dropout rates separately for each of the four school types from the log odds equation by substituting group means on all predictor variables, and

allowing student-teacher relations to vary from -1 SD to $+1$ SD within each school type. We then converted these adjusted log odds back into the probability metric.

⁹To calculate the percentage of explained between-school variance, subtract the residual variance in the intercept listed in the chi-square table at the bottom of Table 4 (1.050) from the initial variance in the intercept listed in Table 3 (1.187), and then divide by the initial variance estimate: $[(1.187 - 1.050)/1.187 = .12]$.

References

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park: Sage Publications.
- Alexander, K. L., Entwistle, D. R., & Horsey, C. S. (1997). From first grade forward: Early foundations of high school dropout. *Sociology of Education*, 70, 87-107.
- Bryk, A. S., Lee, V. E., & Holland, P. B. (1993). *Catholic schools and the common good*. Cambridge, MA: Harvard University Press.
- Bryk, A. S., & Thum, Y. M. (1989). The effects of high school organization on dropping out: An exploratory investigation. *American Educational Research Journal*, 26, 353-384.
- Caterall, J. S. (1998). Risk and resilience in student transition to high schools. *American Journal of Education*, 106, 302-333.
- Coleman, J. S. (1987). Families and schools. *Educational Researcher*, 15, 32-38.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94 [Suppl.], S95-S120.
- Coleman, J. S. (1990). *Foundations of social theory*. Cambridge, MA: Harvard University Press.
- Coleman, J. S., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weinfeld, F., & York, R. (1966). *Equality of educational opportunity*. Washington, DC: U.S. Government Printing Office.
- Council of Great City Schools. (1994). *National urban education goals, 1992-93: Indicators report*. Washington, DC: Author.
- Croninger, R. G., & Lee, V. E. (2001). Social capital and dropping out of high schools: Benefits to at-risk students of teachers' support and guidance. *Teachers College Press*, 103(4), 548-581.
- Delgado-Gaitan, C. (1988). The value of conformity: Learning to stay in school. *Anthropology and Education Quarterly*, 19(4), 354-381.
- Dornbusch, S. M., Flagg, K. L., & Lin, I. (1996). The social structure of schooling. *Annual Review of Psychology*, 47, 401-429.
- Ekstrom, R. B., Goertz, M. E., Pollock, J. M., & Rock, D. A. (1986). Who drops out of high school and why? Findings from a national study. *Teachers College Record*, 87, 356-373.
- Entwistle, D. R., Alexander, K. L., & Olson, L. S. (1997). *Children, schools, and inequality*. Boulder, CO: Westview Press.
- Fine, M. (1987). Why urban adolescents drop into and out of public high schools. In G. Natriello (Ed.), *School dropouts: Patterns and policies* (pp. 89-105). New York: Teachers College Press.
- Fine, M. (1991). *Framing dropouts: Notes on the politics of an urban public high school*. Albany: State University of New York Press.
- Finn, J. D. (1989). Withdrawing from school. *Review of Educational Research*, 59, 117-143.
- Frase, M. (1989). *Dropout rates in the United States: 1988*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Fukuyama, F. (1995). *Trust, social virtues, and the creation of prosperity*. New York: Free Press.

- Jencks, C., Smith, M., Ackland, H., Bane, M. J., Cohen, D., Gintis, H., Heyns, B., & Michelson, S. (1972). *Inequality: A reassessment of the effect of family and schooling in America*. New York: Basic Books.
- Kaufman, P., McMillen, M., & Sweet, D. (1996). *A comparison of high school dropout rates in 1982 and 1992* (NCES 96-893). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Kraemer, H. C., Kazdin, A. E., Offord, D. R., Kessler, R. D., Jensen, P. S., & Kupfer, D. J. (1997). Coming to terms with the terms of risk. *Archives of General Psychiatry*, 54, 337-343.
- LeCompte, M. D., & Dworkin, A. G. (1991). *Giving up on school: Student dropouts and teacher burnouts*. Newbury Park, CA: Corwin Press.
- Lee, V. E. (1999). School size and the organization of secondary schools. In M. T. Hallinan (Ed.), *Handbook of the sociology of education* (pp. 327-344). New York: Kluwer Academic/Plenum.
- Lee, V. E. (2001). *Restructuring high schools for equity and excellence: What works*. New York: Teachers College Press.
- Lee, V. E., & Bryk, A. S. (1989). A multilevel model of the social distribution of achievement. *Sociology of Education*, 62, 172-192.
- Lee, V. E., & Burkam, D. T. (1992). Transferring high schools: An alternative to dropping out? *American Journal of Education*, 100, 420-453.
- Lee, V. E., Burkam, D. T., Chow-Hoy, T., Smerdon, B. A., & Gevert, D. (1998). *High school curriculum structure: Effects on coursetaking and achievement in mathematics for high school graduate* (Working Paper No. 98-09). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics.
- Lee, V. E., Chow-Hoy, T., Burkam, D. T., Gevert, D., & Smerdon, B. A. (1998). Sector differences in high school course taking: A private school or a Catholic school effect? *Sociology of Education*, 71(3), 314-335.
- Lee, V. E., & Croninger, R. G. (1998 April). *Elements of social capital in the context of six high schools*. Paper presented at Social Capital: An International Conference Bridging Disciplines, Policies, and Communities. East Lansing, Michigan State University.
- Lee, V. E., Croninger, R. G., & Smith, J. B. (1997). Course-taking, equity, and mathematics learning: Testing the constrained curriculum hypothesis in U.S. secondary schools. *Educational Evaluation and Policy Analysis*, 19(2), 99-121.
- Lee, V. E., & Loeb, S. (2000). School size in Chicago elementary schools: Effects on teachers' attitudes and students' achievement. *American Educational Research Journal*, 37, 3-31.
- Lee, V. E., Ready, D. D., & Ross, K. E. (1999 August). *Personalism and academic press in the context of six high schools*. Paper presented at the annual meeting of the American Sociological Association, Chicago.
- Lee, V. E., Smerdon, B. A., Alfeld-Liva, C., & Brown, S. L. (2000). Inside large and small high schools: Curriculum and social relations. *Educational Evaluation and Policy Analysis*, 22(2), 147-171.
- Lee, V. E., & Smith, J. B. (1997). High school size: Which works best, and for whom? *Educational Evaluation and Policy Analysis*, 19(3), 205-227.
- Lee, V. E., & Smith, J. B. (1999). Social support and achievement for young adolescents in Chicago: The role of school academic press. *American Educational Research Journal*, 36(4), 907-945.
- MacLeod, J. (1987). *Ain't no makin' it: Leveling aspirations in a low-income neighborhood*. Boulder, CO: Westview Press.
- McNeal, R. B. (1995). Extracurricular activities and high school drop outs. *Sociology of Education*, 68, 62-80.

- National Center for Education Statistics [NCES]. (1992). *Transitions experienced by 1988 eighth graders*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Natriello, G., McDill, E. L., & Pallas, A. M. (1990). *Schooling disadvantaged children: Racing against catastrophe*. New York: Teachers College Press.
- Pallas, A. M. (1986). *The Condition of education, 1986*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Pallas, A. M. (1989). Conceptual and measurement problems in the study of school dropouts. In R. G. Corwin, & K. Namboodiri (Eds.), *Research in sociology of education and socialization* (Vol. 8, pp. 87–116). Greenwich, CT: JAI Press.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Newbury Park, CA: Sage.
- Raudenbush, S. W., Bryk, A., Cheong, Y. F., & Congdon, R. (2000). *HLM 5: Hierarchical linear and nonlinear modeling* (esp. chap. 5). Chicago: Scientific Software International.
- Riehl, C. (1999). Labeling and letting go: An organizational analysis of high school students who are discharged as dropouts. *Research in Sociology of Education and Socialization*, 12, 231–268.
- Rumberger, R. W. (1987). High school dropouts: A review of issues and evidence. *Review of Educational Research*, 57, 101–112.
- Rumberger, R. W. (1995). Dropping out of middle school: A multilevel analysis of students and schools. *American Educational Research Journal*, 32(3), 583–625.
- Rumberger, R. W., & Larson, K. A. (1998). Student mobility and the increased risk of high school drop out. *American Journal of Education*, 107(4), 1–35.
- Rumberger, R. W., & Thomas, S. L. (2000). The distribution of dropout and turnover rates among urban and suburban high schools. *Sociology of Education*, 73(1), 39–67.
- Sameroff, A. J., Seifer, R., Baldwin, A., & Baldwin, C. (1993). Stability of intelligence from preschool to adolescence: The influence of social and family risk factors. *Child Development*, 64(1), 80–97.
- Scott, L. A., Ingels, S. J., Sehra, S., Taylor, J. R., & Jergovic, D. (March 1996). *High school effectiveness study: Data file user's manual* (National Educational Longitudinal Study of 1988). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics.
- Valenzuela, A. (1999). *Subtractive schooling: U.S.–Mexican youth and the politics of caring*. Albany: State University of New York Press.
- Wehlage, G. G., Rutter, R. A., Smith, N. A., Lesko, N., & Fernandes, R. R. (1989). *Reducing the risk: Schools as communities of support*. London: Falmer Press.

Manuscript received February 13, 2002

Revision received October 10, 2002

Accepted November 1, 2002

APPENDIX

Student-Level Variables

Dropout: Dummy-coded dropout status variable, 1 = dropped out between 10th and 12th grades, 0 = did not drop out between 10th and 12th grades (recoded from S2DOSTAT). Dropout status in HSES was defined more accurately than is often the case. That is, a student's dropout status was based on school reports and confirmation from the student or the student's parents. The original NELS:88 data classified HSES students as dropouts only if both of the above conditions were met. However, HSES students who were part of the data augmentation were classified as dropouts if their school classified them as such (there was no attempt to verify that status with the student or the student's parents).

Female: Dummy-coded gender variable, 1 = female, 0 = male.

Asian: Dummy-coded race variable, 1 = Asian, 0 = other.

Hispanic: Dummy-coded race variable, 1 = Hispanic, 0 = other.

Black: Dummy-coded race variable, 1 = Black, 0 = other.

SES: Standardized composite measure of socioeconomic status including parental education, parental occupational prestige, and household income, $M = 0$, $SD = 1$.

Over-age: Dummy-coded age variable, 1 = over 16, 0 = 16 or younger.

No academic math courses, Grades 9 and 10: Dummy-coded course-taking variable, 1 = no courses at or above the level of algebra, Grades 9 or 10; 0 = one or more courses at or above beginning algebra, Grades 9 or 10.

Math achievement, Grade 10: Standardized test of math achievement, Grade 10.

Math GPA, Grades 9 and 10: Grade-point average in math courses, Grades 9 and 10, from school transcript.

School-Level Variables

Average SES: Aggregate measure of school-average SES.

High minority: Dummy-coded school demographic variable, 1 = 40% or higher minority students, 0 = less than 40%. This decision was chosen because the distribution of minority enrollment across schools is noticeably non-normal. In fact, it is bimodal, with the modes at the tails.

Average math achievement, Grade 8: Aggregate measure of school-average entering math achievement.

Average math GPA, Grade 9: Aggregate measure of school-average math course performance (GPA), Grade 9.

School offers/does not offer calculus: Dummy-coded curriculum measure, 1 = school offers calculus, 0 = school does not offer calculus.

Number of below-algebra courses: Continuous curriculum measure, number of math courses offered below the level of high school algebra (1 Carnegie unit = 1 course).

Catholic: Dummy-coded school sector variable, 1 = Catholic school, 0 = other.

Independent: Dummy-coded school sector variable, 1 = independent school, 0 = other.

Small: Dummy-coded school size variable, 1 = 0–600 students, 0 = other.

Large: Dummy-coded school size variable, 1 = 1,501–2,500 students, 0 = other.

Very large: Dummy-coded school size variable, 1 = more than 2,500 students, 0 = other.

Student-teacher relations: Aggregate measure of school social organization based on student-level standardized composite score created by a student-level factor analysis (Cronbach's $\alpha = .79$). Scores were then averaged within the school. Student-level data were on a four-level agree/disagree scale including these items: (a) *Teachers are interested in students*, (b) *Teaching is good at this school*, (c) *Most teachers listen to me*, (d) *When I work hard teachers praise my effort*, (e) *Students get along well with teachers*, and (f) *Discipline is fair at school*.