

**Dropping out of Middle School: A Multilevel Analysis of Students and Schools**



Russell W. Rumberger

*American Educational Research Journal*, Vol. 32, No. 3 (Autumn, 1995), 583-625.

Stable URL:

<http://links.jstor.org/sici?sici=0002-8312%28199523%2932%3A3%3C583%3ADOOMSA%3E2.0.CO%3B2-J>

*American Educational Research Journal* is currently published by American Educational Research Association.

---

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/era.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

---

JSTOR is an independent not-for-profit organization dedicated to creating and preserving a digital archive of scholarly journals. For more information regarding JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## Dropping Out of Middle School: A Multilevel Analysis of Students and Schools

Russell W. Rumberger

*University of California, Santa Barbara*

*Prior research on dropouts has often focused on high schools and examined the issue from either the individual perspective or the institutional perspective. Using data from the National Educational Longitudinal Survey of 1988 and a new form of hierarchical linear modeling (HLM), this study focuses on dropouts from middle school and examines the issue from both individual and institutional perspectives. At the individual level, the results identified a number of family and school experience factors that influence the decision to leave school, with grade retention being the single most powerful predictor. But disaggregating the analysis also revealed that there are widespread differences in the effects of these factors on White, Black, and Hispanic students. At the institutional level, the results revealed that mean dropout rates vary widely between schools and that most of the variation can be explained by differences in the background characteristics of students. But restricting the analysis to lower SES schools shows widespread differences in both mean dropout rates and social class differentiation among such schools. Moreover, much of the variation among those schools can be explained by social composition of students and by several structural features of schools and school climate.*

---

RUSSELL W. RUMBERGER is a Professor, Department of Education, University of California, Santa Barbara, California 93106. He specializes in school dropouts, education and work, and the economics of education.

---

One of the major policy issues facing American education today is the problem of school dropouts. The urgency of this issue was recognized by both the President of the United States and the nation's governors in 1990 when they adopted the goal of increasing the high school graduation rate to 90% by the year 2000 as one of the six National Goals of Education (U.S. Department of Education, 1990, pp. 4–5). A related objective is to eliminate the existing gap in high school graduation rates between minority and nonminority students.

Although the definition and measurement of dropout rates is problematic (Kominski, 1990), the U.S. Census Bureau estimated that 11.0% of all youth 16 to 24 years old in 1992 were dropouts, meaning they were not enrolled in school and had not graduated (McMillen, Kaufman, Hausken, & Bradby, 1993, Table 8). And while the proportion of students completing high school continues to improve overall, there remains widespread variation among social groups and schools. For instance, dropout rates were 8% for White youth 16–24 years of age in 1992, but 14% for Blacks and 29% for Hispanics (McMillen et al., 1993). And in some urban school systems, dropout rates have been reported as high as 40% (Hammack, 1986; Hess & Lauber, 1985).

The problem of school dropouts has become a major concern for policymakers and educators for at least two reasons. First, dropouts are costly. Dropouts experience higher levels of unemployment and receive lower earnings than high school graduates (Rumberger, 1987, Table 4). Dropouts are also more likely to have health problems, engage in criminal activities, and become dependent on welfare and other government programs than graduates (Rumberger, 1987, Table 4). These problems generate large social costs. In one city alone, it was estimated that a year's cohort of dropouts from the city school system would cost \$3.2 billion in lost earnings and more than \$400 million in social services (Catterall, 1987, Tables 3 and 4). These costs are likely to rise in the future because the number of low-skilled jobs is declining in the U.S., making it harder for dropouts to survive economically. A recent study by the U.S. Census Bureau (1992) found that more than one third of all high school dropouts who were employed full-time and year-round in 1990 worked in low-wage jobs that paid less than \$12,195 per year!

The second reason for the growing concern about the dropout problem is that demographic changes could increase the number of dropouts in the absence of effective interventions. The proportion of students who are racial and ethnic minorities, who come from poor families, and who live in single-parent households—all factors that research has shown are associated with school failure and dropping out (Natriello, McDill, & Pallas, 1990; Rumberger, 1987)—is increasing in the nation's schools. Current estimates show that about 30% of the nation's students are at risk of failure, and demographic projections suggest the proportion will increase in the future (Levin, 1986; Natriello, McDill, & Pallas, 1990). In fact, the projected increase in the Hispanic population of more than 50% over the next 3 decades, coupled with the expected 25% decline in White students over the same period, could increase dropout rates nationally (Rumberger, 1990).

Widespread interest in dropouts has generated considerable research on the causes of the problem, with research contributions coming from a number of social science disciplines, including psychology, sociology, anthropology, and economics. Research has also been based on both qualitative and quantitative research methodologies, with quantitative studies primarily testing predictive models of dropping out on large populations of students (Bryk & Thum, 1989; Ekstrom, Goertz, Pollack, & Rock, 1986; Rumberger, 1983) and qualitative studies developing in-depth understandings of the dropout process on particular populations of students (Delgado-Gaitan, 1988; Fine, 1991; Trueba, Spindler, & Spindler, 1989). Research to date has shown that dropping out of school, like educational achievement more generally, is caused or influenced by a wide variety of factors associated with students, their families, the schools that they attend, and their communities (for reviews, see Natriello, 1986; Rumberger, 1987; Weis, Farrar, & Petrie, 1989).

Although existing research on the causes of dropping out of school is extensive, it suffers from several shortcomings. First, few research studies have attempted to model dropout behavior in a comprehensive fashion, simultaneously accounting for the effects of individual, family, and school factors and distinguishing between truly independent factors, such as ethnicity and family background, and such intervening factors as school behavior and academic achievement. Second, previous predictive studies have tended to focus on descriptive and structural characteristics of students and their families—such as, a student's ethnicity or family socioeconomic status—which reveal very little about the underlying *processes* that influence school achievement and dropout behavior. Finally, most previous research focuses on dropping out of high school, even though many students, especially minority students, leave before entering high school. For instance, census data show that almost 50% of Hispanic males who dropped out of school between 1986 and 1987 did so before completing 1 year of high school (U.S. Bureau of the Census, 1990, Table 7).

In order to address these limitations and expand the existing research literature on dropouts, this study develops and tests a more comprehensive model of dropping out of middle school, drawing on a range of both qualitative and quantitative research literature. The analysis also focuses on two levels of interest: the individual level, which examines the factors that influence students' decisions to leave school, and the school level, which examines the factors that influence rates of dropping out among schools. The research is based on the extensive data available from the National Education Longitudinal Survey of 1988 (NELS:88; Ingles, Scott, Lindmark, Frankel, & Myers, 1992).

### Current Research

Research on the causes of dropping out of school has focused on two different levels of analysis. The first and most common focuses on the individual level.

This research addresses the general question: What are the factors that explain differences in dropout rates among individuals? The purpose of this research is to identify the wide range of factors in and out of school that may influence a student's decision to drop out of school, particularly those factors that could be altered through appropriate interventions.

A second strand of research focuses on the school or institutional level. This research addresses the question: What are the factors that explain differences in dropout rates among schools? The purpose of this research is to identify the characteristics or features of schools that influence school-level dropout rates, again focusing on those factors that could be altered through changes in policy or practice. Individual research studies have tended to focus on one perspective or the other, but, in order to better understand and solve this problem, it is necessary to consider both perspectives and how they interact (Mehan, 1992).

The discussion below briefly summarizes the existing theoretical and empirical research on school dropouts. This review was used as a basis for constructing and testing a more comprehensive model of dropping out at both the individual and school level.

### **Individual Perspective**

Most research on dropouts has tended to focus on the individual perspective. The attempt in such studies is to identify and explain specific factors that influence a student's decision to leave school before graduation. Although research to date has identified a wide array of such factors, they can be grouped into several major categories: demographic, family background, individual school experiences, and peers and community.

*Demographic.* Virtually all studies of dropouts have shown that demographic factors are highly correlated with the propensity to drop out of school. In particular, dropout rates are significantly higher for Blacks, Hispanics, and Native Americans than for Anglos and Asian students (McMillen et al., 1993, Table 8). Recent data also suggest that immigrant students also have higher dropout rates than native-born students (National Center for Educational Statistics, 1992). While such differences are well documented, research is less clear on their causes. In fact, there are several competing explanations as to why some minority groups in the U.S. generally have lower educational achievement levels than the majority of Whites and other minority groups, such as Asians.

Historically, the most common explanation was that minority groups had higher dropout rates and lower levels of educational achievement because they tended to come from more disadvantaged families. Beginning with the Coleman study of the 1960s, research has repeatedly demonstrated that family background has a powerful influence on student achievement (Coleman et al., 1966; Jencks et al., 1972). And indeed, several empirical studies of dropouts have found that at least half of the observed differences in dropout rates between racial groups can be attributed to differences in family background, particularly the socioeconomic status of students' families

(Fernandez, Paulsen, & Hirano-Nakanishi, 1989; Rumberger, 1983; Velez, 1989). But this perspective fails to explain why some minority groups, with similar levels of socioeconomic background, succeed while other groups do not (Rumberger, 1991). More recently, some researchers have argued that sociocultural factors, such as "accepting the dominant culture," are particularly important in explaining why some ethnic groups are relatively successful in school while others are not (Mehan, 1992; Ogbu, 1989, 1992).

*Family background.* As previously mentioned, family background is widely recognized as the most single important contributor to success in school. In fact, early work by Coleman, Jencks, and others suggested that family background alone could explain most of the variation in educational outcomes (Coleman et al., 1966; Jencks et al., 1972). Although subsequent research found that much of the influence of family background was mediated through schools, in virtually all research on school achievement, family background still exerts a powerful, independent influence. But what aspects of family background matter, and how do they influence school achievement?

Most empirical research on family background has focused on the *structural* characteristics of families, such as socioeconomic status and family structure. Research has consistently found that socioeconomic status, most commonly measured by parental education and income, is a powerful predictor of school achievement and dropout behavior (Bryk & Thum, 1989; Ekstrom et al., 1986; Rumberger, 1983). Research has also demonstrated that students from single-parent and step-families are more likely to drop out of school than students from two-parent families (Astone & McLanahan, 1991; Ekstrom et al., 1986; Rumberger, 1983).

There is considerably less research that has attempted to identify the underlying *processes* through which family background influences school success. One such process is parental involvement in schooling. A growing body of research has shown that students perform better in school if their parents are more involved with their schooling (Astone & McLanahan, 1991; Fehrman, Keith, & Reimers, 1987; Stevenson & Baker, 1987). Parental involvement covers a range of activities, from reading at home to attending school functions and participating in school governance (Epstein, 1990). Additional research has shown that parental involvement varies widely by ethnicity, social class, and even family structure and thus may help explain differential achievement levels among such families (Astone & McLanahan, 1991; Delgado-Gaitan, 1990; Lareau, 1989).

A second process concerns parental practices, sometimes referred to as *parenting style*. Recent research has demonstrated that students develop more psychosocial maturity and do better in school when they come from families in which parents monitor and regulate their children's activities at the same time that they provide emotional support and encourage independent decision making (Astone & McLanahan, 1991; Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987; Lamborn, Mounts, Steinberg, & Dornbusch, 1991). Again, these parenting practices have been shown to vary by family ethnicity, socioeconomic status, and structure and can thus contribute to differential

school success (Astone & McLanahan, 1991; Dornbusch et al., 1987; Lamborn et al., 1991).

Although little empirical research to date has assessed the impact of parental school involvement and parenting practices on dropping out, the few existing studies that have examined them have found that these factors appear to affect the propensity to drop out or finish school, even after controlling for socioeconomic status (Astone & McLanahan, 1991; Rumberger, Ghatak, Poulos, Ritter, & Dornbusch, 1990).

*Peers and community.* There is a long tradition of research and theory on the influence that peers have over adolescent development (Coleman, 1961; Cusick, 1973). Recent empirical studies have demonstrated that peers exert considerable influence on educational achievement as well (Hallinan & Williams, 1990). But few studies have examined the relationship between peers and dropping out (e.g., Ekstrom et al., 1986).

Another body of research and theory has demonstrated that neighborhoods and communities also influence adolescent and student achievement (Dornbusch, Ritter, & Steinberg, 1991; Garner & Raudenbush, 1991; Wilson, 1987). And there is at least some empirical evidence that differences in neighborhood characteristics can help examine differences in dropout rates among communities (Clark, 1992; Crane, 1991).

*School experiences.* Research on dropouts has consistently shown that a host of negative school-related experiences serves as powerful precursors to the decision to formally leave school. For example, students who drop out of school are more likely than other students to have poor school performance, disruptive behaviors, poor attendance, negative attitudes toward school, and early school failure—particularly, repeating grades (Barrington & Hendricks, 1989; Cairns, Cairns, & Neckerman, 1989; Ekstrom et al., 1986; Grisson & Shepard, 1989; Wehlage & Rutter, 1986). Although such correlates are well-documented empirically, there are relatively few conceptual models to explain how and why these factors influence the dropout process.

Current models that have been proposed all suggest that dropping out of school is but the final stage in a dynamic and cumulative process of disengagement (Finn, 1993; Newmann, Wehlage, and Lamborn, 1992; Wehlage, Rutter, Smith, Lesko, & Fernandez, 1989) or withdrawal (Finn, 1989) from school. These models also suggest that the process is influenced by several types of factors: early and recent school performance; academic and social behaviors; and educational, as well as general, attitudes. What differentiates these models is how these various factors interact to foster the process of gradual withdrawal and, ultimately, dropping out.

Finn (1989) reviews two alternative models. The first, which he labels the *frustration-self-esteem* model, argues that the initial antecedent to school withdrawal is early school failure which, in turn, leads to low self-esteem and then problem behaviors, such as absenteeism. The second, which he labels the *participation-identification* model, argues that the initial antecedent to withdrawal is the lack of participation in school activities which, in turn, leads to poor school performance and then to alienation from school.

Wehlage and Newmann (Newmann, 1991; Newmann, Wehlage, & Lamborn, 1992; Wehlage et al., 1989) suggest that educational outcomes are jointly influenced by educational engagement and school membership or social bonding. The former condition is influenced by the nature of educational activities and the latter by such things as social ties to others, commitment to the institution, involvement in school activities, and beliefs in the value and legitimacy of school. This second model resembles one proposed by Tinto (1987) to explain attrition in higher education in which both social integration and academic integration jointly influence the commitment and the decision to finish school.

Although research on dropouts has identified a wide range of factors associated with dropping out of school—both distal factors, such as family background and early school experiences, and proximal factors, such as school attendance and behavior—few studies have examined the role of these factors in a comprehensive fashion. Some have focused primarily on family background—particularly, structural characteristics of families (Astone & McLanahan, 1991; Ekstrom et al., 1986)—while others have focused primarily on schooling experiences (Barrington & Hendricks, 1989; Cairns, Cairns, & Neckerman, 1989; Wehlage & Rutter, 1986). Yet recent writing on adolescent development, in general, and on the experiences of disadvantaged students, in particular, emphasizes the importance of looking at the role of all the major settings—the family, the school, and the community—in order to better understand and address adolescent issues (Jessor, 1993; National Research Council, 1993).

### **School Perspective**

As pointed out earlier, most research on dropouts focuses on individual characteristics and experiences that shape students' decisions to remain in or leave school. While the individual perspective is clearly important in developing a fuller understanding of the dropout process, it is also important to consider another perspective that focuses on the school or institutional level. The latter perspective is concerned with identifying the characteristics and conditions in schools that promote or reduce dropout behavior. Qualitative or interpretive studies, in particular, have stressed the importance in examining how schools create conditions or promote practices that "cause" certain types of students to leave school before graduation (Delgado-Gaitan, 1988; Fine, 1991; Hess, Wells, Prindle, Liffman, & Kaplan, 1986; Wehlage et al., 1989).

There is a large body of research that has attempted to identify a variety of factors that influence the effectiveness of schools, primarily as measured by student test scores. These factors fall into several categories. One concerns the *student composition*. Research has shown that the type or composition of students attending a school, such as their socioeconomic background, has a marked impact on the average achievement level of the school above and beyond the effects that such factors have on the achievement levels of individual students (Lee & Bryk, 1989; Lee & Smith, 1993; Raudenbush &

Bryk, 1986). Another set of factors concerns *structural characteristics* of schools. Such factors as the type of control or orientation (public versus private), size, and resources have all been shown to influence average school effectiveness, although considerable debate remains as to the magnitude of such effects (Bryk, Lee, & Holland, 1993; Coleman & Hoffer, 1987; Coleman, Hoffer, & Kilgore, 1982; Hanushek, 1986). A final set of characteristics concerns the *organization* (e.g., rules, practices, decision making) and *climate* (e.g., discipline, academic press) of a school, which reflect the policies and practices that go on in school and have also been shown to exert important influences on school achievement (Lee & Bryk, 1989; Lee & Smith, 1993).

Although there is a large body of empirical research that has demonstrated the impact of these factors on test scores, only a few studies have examined their influence on institutional dropout rates. One study found widespread differences between the actual dropout rates in the 63 Chicago high schools and rates that were adjusted for differences in the characteristics of students, although the authors were unable to analyze particular school characteristics or practices that contributed to those differences (Toles, Schulz, & Rice, 1986). To date, only three quantitative studies have examined the effects of a variety of school-level variables on institutional dropout rates (Bryk & Thum, 1989; Pittman & Haughwout, 1987; Witte & Walsh, 1990), although only one of the studies (Bryk & Thum, 1989) adequately controlled for the effects of student composition. Two of the studies found that school academic and social climate influenced institutional dropout rates (Bryk & Thum, 1989; Pittman & Haughwout, 1987). Yet a number of qualitative studies have found that school policies and practices greatly influence student success, especially among disadvantaged students (Fine, 1991; Hess et al., 1986).

One of the major difficulties in conducting quantitative studies of school effectiveness is to adequately adjust for differences in the characteristics of students before examining the effects of school-level characteristics on any remaining between-school differences. This problem requires an analysis at two separate levels: the individual and the school. In the past, most researchers tended to focus on one level and ignore the other. A statistical technique known as *hierarchical linear modeling* (HLM) has recently been developed, however, that can examine both levels simultaneously (Bryk & Raudenbush, 1992). Only one study to date has used the HLM technique to estimate the effects of school-level variables on between-school dropout rates after controlling for the effects of individual-level variables (Bryk & Thum, 1989). The study found that 40% of the variance in dropout rates among schools could be explained by the individual and compositional effects of student characteristics. But this study utilized an earlier version of HLM analysis designed for continuous dependent variables, while dropping out is a dichotomous variable that requires estimating through a more complex statistical technique (Raudenbush, 1993).

This review has illustrated that dropping out of school can be analyzed from two perspectives: the individual and the school. And, at each level, dropping out is influenced by a wide array of factors. The purpose of this

study is to draw on the existing theoretical and empirical literature and to construct and test a comprehensive model of dropping out from both perspectives. The study focuses on middle schools and middle-school students because little research to date has focused on this part of the educational system. Specifically, the study addresses the following questions:

1. What factors influence a student's decision to drop out of middle school?
2. How do these factors differ among ethnic groups?
3. What factors influence middle-school dropout rates?

## **Research Methods**

### **Data and Samples**

Data for the study come from the National Education Longitudinal Survey of 1988 (NELS:88), a comprehensive survey of students, teachers, schools, and families, designed and funded by the National Center for Education Statistics (NCES). The survey was based on a national probability sample of 1,100 public and private middle schools in the United States with about 25 students per school surveyed, yielding an initial sample size of about 25,000 students (Ingles et al., 1992)

Base-year data were collected in 1988 through four survey questionnaires: a school questionnaire administered to the principal of each school, a student questionnaire administered to a sample of about 25 students per school, a teacher questionnaire administered to about 5 teachers per school who taught courses to the sampled students, and a parent questionnaire administered to the parents of the sample students. A first follow-up survey of all base-year students was conducted in the spring of 1990 when most of the original cohort was enrolled in the 10th grade. Questionnaires were administered to both enrolled students and former students who had dropped out of school between 1988 and 1990.<sup>1</sup>

Data for the present study was drawn from the sample ( $N = 17,424$ ) of base-year students who were resurveyed in 1990 and identified as either still enrolled in school or dropped out. In order to maximize the number of students within each school, students with missing data were retained in the analysis and assigned mean or modal values for the data they were missing.<sup>2</sup> The school sample was restricted to schools with weights and nonmissing data, resulting in a final sample size of 981 schools.<sup>3</sup>

### **Variables**

All the data for this study, except dropout status, were drawn from the four base-year surveys. The data were used to construct a comprehensive set of individual-level and school-level variables to measure their effects on dropping out of school.<sup>4</sup> Weighted means, standard deviations, and brief descrip-

tions for all the variables used in the analysis are shown in Table 1. All individual factor composites, including those constructed by NCES, were normalized to a mean of zero and a standard deviation of one.

*Student-level variables.* Several types or classes of student-level variables were constructed. The first type captures *demographic* variables, which were constructed as a series of dummy variables to identify gender (female), minority status (Black, Hispanic, and Native American), and immigration status (immigrant and second-generation American).

The second class of variables captures *family background* variables. Two types of family background measures were constructed. The first type represents the more traditional structural variables: socioeconomic status, which is a composite measure developed by NCES that reflects parental education, income, and reading materials in the home, and a series of dummy variables indicating single-parent, step-parent, and non-English-speaking households.

The second type of family background variables attempted to capture various dimensions of family practices that prior research suggests could influence the propensity to drop out of school. First, a factor analysis was performed on a number of variables in the student and parent questionnaires about parents' involvement in their child's education. The analysis identified five unique components of parental academic support that identified the extent to which: (1) parents participated in the school PTA or acted as a volunteer at their child's school, (2) parents contacted the school or teacher about academic performance or behavior, (3) parents had attended a school meeting, spoken to a teacher or counselor, or visited their child's class in the last year, (4) parents talked with their child or helped them with their homework, and (5) parents enforced family rules about doing homework and maintaining grades. Descriptive information on all the variables used in the analysis and their factor loadings are shown in the appendix. Another factor composite was constructed to reflect the degree that parents supervised their children's behavior. Finally, a dummy variable identified parents who expected that their child would only finish high school rather than attend college.

The third class of variables captures students' *academic background*, which included whether the student had ever been held back in school, the number of times that the student had changed schools (other than regular promotion) since first grade, and whether the student had *stopped out* of school between the 8th and 10th grade (dropped out or had an unexcused absence of 20 days or more, but returned to school by the first follow-up survey).

The remaining variables were constructed to measure a variety of attitudes, behaviors, and academic performance of students in the eighth grade. These were designed to capture students' social and academic engagement in schooling, which both theoretical and empirical research suggests are important predictors of whether students stay in school.

Table 1

### Weighted Means, Standard Deviations, and Descriptions of Variables

Variable	Mean	SD	Type*	Description (NCES variable names)
I. Student-level variables (unweighted $N = 17,424$ )				
Demographic				
Female	.50	.50	D	(SEX = 1)
Asian	.03	.18	D	(RACE = 1)
Black	.13	.34	D	(RACE = 3)
Hispanic	.10	.30	D	(RACE = 2)
Native American	.01	.11	D	(RACE = 5)
Immigrant	.04	.20	D	Born outside the U.S. (BYP17 = 1)
Second generation	.08	.28	D	Born in U.S., either parent born outside U.S. (BYP17 ≠ 1 and BYP14 = 2 or 3 or BYP17 = 2 or 3).
Family Background				
Socioeconomic status	.00	1.00	FC	NCES composite (BYSES)
Single parent family	.18	.38	D	NCES composite (BYFCOMP = 4 or 5)
Step-family	.14	.35	D	NCES composite (BYFCOMP = 2 or 3)
Non-English speaking home	.10	.30	D	NCES composite (BYHMLANG = 1 or 2)
Parental Academic Support 1	.00	1.00	FC	(see appendix)
Parental Academic Support 2	.00	1.00	FC	(see appendix)
Parental Academic Support 3	.00	1.00	FC	(see appendix)
Parental Academic Support 4	.00	1.00	FC	(see appendix)
Parental Academic Support 5	.00	1.00	FC	(see appendix)
Parental supervision	.00	1.00	FC	Student reports of how often (1 = often, 4 = never) parents require chores done (BYS38B), limit TV watching (BYS38C), and limit going out with friends (BYS38D). Factor has an eigenvalue of 1.46 and explains 49% of combined variance.
Low parental expectations	.13	.33	D	Parents' educational expectation for eighth grader: high school graduation or less (BYP76 = 1, 2, or 3).

Table 1 (continued)

Variable	Mean	SD	Type*	Description (NCES variable names)
I. Student-level variables (unweighted N = 17,424)				
Academic background				
Held back	.22	.41	D	(BYS74 or BYP44 = yes)
Changed schools	1.14	1.49	C	Number of times since first grade (BYP40)
Stop out	.01	.10	D	Student dropped out and returned to school between 8th and 10th grades (FIDOSSTAT = 3 or 5).
Attitudes in eighth grade				
Locus of control	.00	1.00	FC	NCES composite (BYLOCUS2)
Self-concept	.00	1.00	FC	NCES composite (BYCNCP2)
Low expectations	.12	.32	D	High school or less (BYS45 = 1 or 2)
Teacher quality	.00	1.00	FC	Student reports of how much they agree (1 = strongly agree, 4 = strongly disagree) that the teaching is good (BYS59F), teachers are interested in students (BYS59G), teachers praise their efforts (BYS59H), teachers "put them down," most teachers listen to what they say (BYS58). Factor has an eigenvalue of 2.72 and explains 54% of the combined variance.
Peers 1	.00	1.00	FC	(see appendix)
Peers 2	.00	1.00	FC	(see appendix)
Schoolwork useful	.00	1.00	FC	How much students agree (1 = strongly agree, 4 = strongly disagree) that these eighth grade subjects will be useful in their future: math (BYS69C), English (BYS70C), social studies (BYS71C), and science (BYS72C). Factor has an eigenvalue of 1.95 and explains 50% of the combined variance.
Unsafe	.11	.32	D	Student agrees or strongly agrees with statement that he or she doesn't feel safe at school (BYS59K).
Behaviors in eighth grade				
Homework	5.78	4.60	C	Hours per week spent doing homework, recoded from midpoints (BYHOMIEWK).
Engagement	.00	1.00	FC	Student academic engagement constructed from student reports of how often (1 = usually, 4 = never) they come to class without pencil or paper (BYS78A), books (BYS78B), or their homework done (BYS78C). Factor has an eigenvalue of 1.88 and explains 63% of the combined variance.

Moderate absenteeism	.12	.33	D	Student missed 3 or 4 days of school over the last 4 weeks (BYS75).
High absenteeism	.08	.26	D	Student missed 5 days of school or more over last 4 weeks (BYS75).
Misbehavior	.00	1.00	FC	Misbehavior, constructed from student reports of how often during first semester (0 = never, 2 = more than twice) student was sent to the office for misbehavior (BYS55A), student was sent to office because of problems with schoolwork (BYS55B), and parents received warning about his or her behavior (BYS55E). Factor has an eigenvalue of 2.06 and explains 69% of combined variance.
No school activities	.27	.45	D	Student did not participate in any school activities during current school year (BYS82A-U).
No outside activities	.35	.48	D	Student did not participate in any outside-school activities this year (BYS83A-J).
Performance in eighth grade Grades	2.89	.76	C	Average of self-report grades from sixth grade until now in English, math, science, and social studies, constructed by NCES (BYGRADS).
Test scores	5.04	.98	C	Standardized test composite in reading and math, divided by 10 (BYTXCOMP).
Dropout status, 1990	.06	.24	D	(FIDOSTAT = 4 or 5)
Dropout				
Student composition				<u>II. School-level variables (unweighted J = 981)</u>
Mean socioeconomic status	.06	.65	C	Mean SES of students (NBYSES)
SD socioeconomic status	.76	.17	C	Standard deviation of SES of students (NBYSES)
Mean held back	.19	.14	C	Percent of students held back (HELDBACK)
High minority	.18	.39	D	Minority students greater than 40% (G8MINOR = 5, 6, 7)
High poverty	.12	.33	D	Students on free lunch greater than 50% (GIUNCH = 6, 7)
Structural characteristics				
Catholic	.18	.39	D	Catholic school (G8CTRL = 2)
Other religious	.12	.33	D	Private, other religious school (G8CTRL = 3)

Table 1 (continued)

Variable	Mean	SD	Type*	Description (NCES variable names)
II. School-level variables (unweighted $J = 981$ )				
Independent	.04	.20	D	Private, nonreligious school (G8CTRL = 4)
Grade span K/1-8	.36	.48	D	Grade span K/1 through 8 (G8TYPE = 1)
Grade span 7/8-9	.08	.26	D	Grade span 7/8 through 9 (G8TYPE = 7)
Grade span K/6/7/8-12	.24	.42	D	Grade span K/6/7/8 through 12 (G8TYPE = 2, 3)
Size	4.37	2.71	C	School enrollment/100 (midpoints of BYSCENRL)
Student/teacher ratio	18.29	5.41	C	Composite student-teacher ratio (BYRATIO)
Urban	.25	.43	D	Urban school (G8URBAN = 1)
Rural	.36	.48	D	Rural school (G8URBAN = 3)
Union	.43	.50	D	Teachers covered by collective bargaining (BYSC23 = 1)
Organization/climate				
Nondepartmentalized	.32	.47	D	Instruction nondepartmentalized (BYSC18 ≠ 1)
Mean teacher quality	-0.10	.41	FC	Mean of student reported teacher quality
Mean homework <sup>a</sup>	6.08	1.96	C	Mean of student reported homework
Percent taking algebra <sup>a</sup>	.23	.20	C	Percent of students taking algebra or other advanced math course (BYS6C = 1).
Mean parental involvement <sup>a</sup>	.23	.61	FC	Mean parental involvement
Percent unsafe <sup>a</sup>	.09	.08	C	Percent of students who don't feel safe (UNSAFE)
Percent fair discipline <sup>a</sup>	.69	.17	C	Percent of students who feel discipline is fair (BYS59D = 1, 2).

\*Variables type is: dummy (D), continuous (C), or factor composite (FC).

<sup>a</sup>Values based on full base-year student file ( $N = 24,599$ ).

*Attitudes* included locus of control, self-concept, whether the student did not expect to go to college, a composite factor that measures students' reports about the quality of their teachers, two composite factors that measure students' reports about how they think their peers see them, a composite factor that measures students' reports about whether they feel their academic courses will be useful in their future, and whether students feel unsafe at school.

*Behaviors* included the total number of hours of homework that a student reported doing each week; a composite factor of academic engagement based on a student's reports of coming to class with paper and pencils, books, and homework; a dummy variable indicating whether the student was absent 3 or 4 days (15–20% of the time) in the last 4 weeks; a dummy variable indicating whether the student was absent 5 days or more (25% or more of the time) in the last 4 weeks; a composite factor that measures the extent to which a student had been sent to the office for misbehaving, whether the student's parents had received a warning about the student's behavior, and whether the student had gotten into a fight with another student; a dummy variable indicating that the student did not participate in any extracurricular activities in school or other activities outside of school.

*Academic performance* was measured by academic grade point average and a composite, standardized test score in reading and math.

*School-level variables.* A series of school-level variables were constructed in several areas based on prior school-effectiveness research. The first set of variables measured *student composition*: the mean socioeconomic status of students in the school, the standard deviation of the socioeconomic status of students in the school, the percent of students who had been held back in school, and dummy variables indicating a proportion of minorities or a high proportion of students' receiving a free or reduced school lunch.

A second set of variables measured the *structural characteristics* of the school: a series of dummy variables identifying whether the school was Catholic, other religion, or independent; a series of dummy variables indicating the grade span of the school, school size, student-teacher ratio; dummy variables indicating whether the school was urban or rural; and a dummy variable indicating whether the teachers in the school were covered by a collective bargaining agreement.

The last set of variables measured school *organization and climate*: a dummy variable indicating whether the school was organized with no or semi-departments rather than the traditional departments, the mean student report of teacher quality, the mean hours of homework students report, the percent of students taking algebra or other advanced math courses, the mean level of parental participation, the percent of students who feel unsafe in the school, and the percent of students who feel the discipline is fair.<sup>5</sup>

### **Models and Statistical Techniques**

Modeling the effects of both student-level and school-level variables on dropout behavior presents formidable conceptual and methodological prob-

lems. Although most studies have focused on only a single level of analysis, a few studies have attempted to estimate the effects of these two types of variables in a single model, either by including school-level variables in an individual-level model or by including aggregated values of individual-level variables in a school-level model. But both techniques can produce faulty results (Bryk & Raudenbush, 1992). The first technique produces aggregation bias, which underestimates the effects of those variables that are estimated at the inappropriate level. For example, Summers and Wolfe (1977) found that the effects of school resources, such as teacher experience and education, were underestimated if school-level aggregate measures were used rather than measures of resources that students actually received in the classroom. The second technique fails to fully capture the effects of certain variables, such as student socioeconomic status, that operate at both levels of analysis.

Recently, a new statistical technique, known as *hierarchical linear modeling* (HLM), has been developed that overcomes these limitations. Specifically, HLM allows researchers to model student-level outcomes within schools and then to identify and model any between-school differences that arise (Bryk & Raudenbush, 1992). Although HLM provides the most appropriate way of handling multilevel data, previous versions of HLM were not appropriate for estimating models with dichotomous dependent variables, such as dropout status.

Fortunately, a new version of HLM has recently been developed that provides appropriate estimates for dichotomous dependent variables (Raudenbush, 1993). However, the version available for this study had a limitation: It could not produce weighted estimates of student-level models. Because the NELS data set is weighted at both the student and school levels, unweighted student-level estimates could produce biased estimates. Moreover, HLM analysis is primarily designed to examine between-school differences in single models of student-level outcomes. This approach precludes, for example, the common practice of desegregating the individual sample into separate subgroups to examine how the effects of individual factors vary from one subgroup to another.

Due to these limitations, this study was carried out in two parts. In the first part of the study, a robust and recursive, student-level model of dropout behavior was developed and tested with logistic regression using only individual-level variables. One advantage of using logistic regression is that the program can produce weighted estimates of the student-level coefficients, which is not possible with the nonlinear HLM program. It also focuses the analysis solely on the student-level model and allows the testing of several student-level models for different subgroups of students. However, not only are school-level effects ignored in this part of the study, but the model assumes that the effects of the individual-level variables on dropping out do not vary from school to school. This assumption was tested in the second part of the study.

In this second part of the study, a nonlinear HLM analysis was performed. The student-level model specified in this part of the study was based on the

results of the first part. The focus of this part of the study was to explain between-school differences in predicted mean dropout rates (dropout rates adjusted for differences in student characteristics between schools) and between-school differences in the effects of the student-level variables on dropout rates.

*Logistic models.* A series of recursive, linear models were developed and tested to measure the effects of a broad range of demographic, family, and school experience factors on dropping out of school. Dropping out is a dichotomous dependent variable that can be expressed as a probability,  $p$ , that takes on a value of unity if the student drops out, zero otherwise. In order to model dropout behavior, it is necessary to transform  $p$  into a log of the odds (or logit) which can be expressed as a linear function of a series of independent variables. The basic model can be specified as:

$$\text{Log}[p_i/(1 - p_i)] = \beta_0 + \beta_1 \text{DEMOG}_i + \beta_2 \text{FAMILY}_i + \beta_3 \text{SCHEXP}_i + \epsilon_i, \quad (1)$$

where  $p_i$  is the probability that student  $i$  dropped out of school between 1988 and 1990, DEMOG is an array of demographic variables, FAMILY is an array of family background variables, SCHEXP is an array of school experience variables, and  $\epsilon$  is an error term. Because students in the NELS survey were not sampled randomly, this model was estimated in a recursive fashion using weighted logistic regression.<sup>6</sup>

*HLM models.* HLM analysis requires two types of models: a Level 1 model to estimate the effects of student-level variables on a student outcome and a Level 2 model to estimate the effects of school-level variables on the coefficients from the Level-1 analysis. Significant predictors from the logistic regression analysis were used to construct the following student-level model for the HLM analysis:<sup>7</sup>

$$\begin{aligned} \text{Log}[p_{ij}/(1 - p_{ij})] = & \beta_{0j} + \beta_{1j} \text{Black}_{ij} + \beta_{2j} \text{Hispanic}_{ij} + \beta_{3j} \text{Second}_{ij} \\ & + \beta_{4j} \text{Ses}_{ij} + \beta_{5j} \text{Supervision}_{ij} + \beta_{6j} \text{Expectations}_{ij} \\ & + \beta_{7j} \text{Heldback}_{ij} + \beta_{8j} \text{Change}_{ij} + \epsilon_{ij}, \end{aligned} \quad (2)$$

where  $p_{ij}$  is the probability that student  $i$  from school  $j$  drop outs out of school, Black and Hispanic are dummy variables for those race groups, Second is a dummy variable indicating second generation, Ses is the socioeconomic status of the student, Supervision is parental supervision, Expectations is a dummy variable indicating low parental expectations, Heldback is a dummy variable indicating whether the student was ever held back in school, Change is the number of times students changed schools, and  $\epsilon$  is the error term.

A distinctive feature of HLM analysis is that the estimated coefficients for the student-level model can be allowed to vary across schools and any observed differences can be modeled with school-level variables. To test for these differences, the coefficients from the student-level model were allowed

to vary across schools. In this case, the school-level model takes on the following form:

$$\beta_{pj} = \gamma_{p0} + u_{pj}, \quad p = 0, 1, 2, 3, 4, 5, 6, 7, 8. \quad (3)$$

The variance of the error term ( $\tau_p$ ) can then be examined to see if there are significant differences between schools. If the variance term is not significant, then the student-level coefficient is "fixed" ( $u_{pj} = 0$ ) so that the effect of the student-level coefficient is constrained to be the same for all schools (Bryk & Raudenbush, 1992, pp. 55–56). In those cases where there were significant differences in the estimated coefficients across schools, a series of school-level models were tested to determine what factors could explain these differences. The school-level model took on the form:

$$\beta_{pj} = \gamma_{p0} + \gamma_{p1}\text{STUCOMP}_j + \gamma_{p2}\text{STRUCHAR}_j + \gamma_{p3}\text{CLIMATE}_j + u_{pj}, \quad (4)$$

where, for each school  $j$ ,  $\beta_p$  represents a coefficient from the student-level model, STUCOMP is a vector of student composition variables, STRUCHAR is a vector of structural characteristics of schools, CLIMATE is a vector of organization and school climate variables, and  $u$  is a random error term.

In order to control for differences in student composition between schools, all student-level variables were centered around their grand means. Thus, the intercept term from the student-level model represents the estimated mean dropout rates for schools assuming that each school enrolled students who had mean values of the student-levels for the entire population of students. The HLM estimates were weighted using school weights in order to adjust for the nonrandom sampling of schools in the NELS:88 data.

## Results

### Logistic Regression

The logistic regression analysis was carried out in three steps. First, univariate estimates for all the independent variables were computed for the entire sample of students. Second, a series of multivariate, recursive models were tested to examine the effects of both distal (demographic, family and academic background) and proximal (experiences in eighth grade) factors on dropping out of school on the entire sample of students. Third, the final multivariate model from Step two was estimated separately for Black, Hispanic, and White (non-Hispanic) students in order to examine how the effects of the independent variables varied from group to group.

The logistic regression estimates for the entire sample of students are shown in Table 2. Because the predicted probability of dropping out associated with any single independent variable depends on the values of the other variables in the model, the values shown in the table are the transformed coefficients ( $e^{\beta}$ ). A transformed coefficient is referred to as odds [ $p/(1 - p)$ ] ratio, and its value is independent of the other variables in the model. It represents the ratio of the predicted odds of dropping out with a one-unit

Table 2  
**Predicted Odds Ratios for Dropping Out: Eighth Graders, 1988-1990**

Variable	Multivariate estimates							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Demographic								
Female	0.95	0.91	0.84	0.94	1.18	1.36**	1.54**	1.57**
Asian	0.29**	0.61	0.71	0.84	0.82	0.80	0.76	0.79
Black	1.56**	2.17**	1.61**	1.55**	1.43**	1.55**	1.25	1.09
Hispanic	2.16**	2.20**	1.22	1.42	1.57*	1.43	1.31	1.24
Native American	2.15**	2.46**	1.41	1.70	1.47	1.54	0.99	0.88
Immigrant	0.95	1.06	0.94	0.94	0.90	1.03	1.14	1.20
Second generation	0.71*	0.63*	0.67	0.67	0.63*	0.70	0.73	0.74
Family Background								
Socioeconomic status	0.37**		0.40**	0.49**	0.57**	0.59**	0.60**	0.63**
Single parent family	2.20**		1.27*	1.28*	1.13	1.20	1.22	1.12
Step-family	1.75**		1.81**	1.71**	1.24	1.34*	1.46**	1.36*
Non-English speaking home	1.67**		0.89	0.98	0.99	1.01	1.06	1.11
Parental Academic Support 1	0.56**			0.73**	0.80**	0.83**	0.85*	0.87
Parental Academic Support 2	1.25**			1.16**	1.04	0.99	0.85	0.83**
Parental Academic Support 3	0.83**			0.99	0.97	0.96	0.91	0.91
Parental Academic Support 4	0.64**			0.91	0.90	0.96	1.01	0.94
Parental Academic Support 5	1.11*			0.99	0.94	0.93	0.93	0.91
Parental Supervision	1.34**			1.28**	1.27**	1.20**	1.11*	1.10
Low parental expectations	4.57**			2.69**	2.07**	1.84**	1.77**	1.62**
Academic background								
Held back	11.22**				6.16**	5.39**	4.90**	4.07**
Changed schools	1.30**				1.23**	1.25**	1.23**	1.21**
Stop out	3.99**				1.05	0.95	0.57	0.54

Table 2 (continued)

Variable	Univariate estimates		Multivariate estimates					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Attitudes in eighth grade								
Locus of control	0.57**					0.83**	0.93	0.98
Self-concept	0.72**					0.97	0.91	0.94
Low expectations	6.79**					1.91**	1.67**	1.39**
Teacher quality	1.25**					0.84**	0.79**	0.79**
Peers 1	1.08*					0.83**	0.86**	0.83**
Peers 2	1.50**					1.31**	1.01	0.95
Schoolwork useful	1.27**					1.06	1.01	0.97
Unsafe	2.31**					1.04	0.92	0.92
Behavior in eighth grade								
Homework	0.92**						0.97	0.98
Engagement	0.67**						0.91	0.96
Moderate absenteeism	2.03**						2.01**	1.98**
High absenteeism	5.10**						3.46**	3.38**
Misbehavior	1.90**						1.52**	1.45**
No school activities	2.38**						1.36**	1.23
No outside activities	2.23**						1.26*	1.28*
Academic performance in eighth grade								
Grades	0.29**							0.51**
Test scores	0.31**							0.79**
-2 Log likelihood		4067.9	3687.7	3521.4	3104.9	3004.1	2798.9	2708.3
Improvement in LI(%)		1.9	11.0	15.1	25.1	27.5	32.5	34.7

Note. Coefficients represent the estimated effects on the odds ratios  $\text{lexp}(\beta)$ , which are the ratios of the odds of dropping out due to a one-unit change in the independent variable to the odds of dropping out without the change.

\*Significant at .05 level.

\*\*Significant at .01 level.

increase in the independent variable to the predicted odds without the one-unit increase. Thus a value of one signifies no change in the odds of dropping out. A value greater than one indicates that the odds of dropping out increase due to a one-unit increase in the independent variable, while a value less than one indicates that the odds of dropping out decrease due to a one-unit increase in the independent variable.

*Univariate estimates.* The first column of Table 2 shows the univariate estimates of the independent variables on the odds of dropping out. Almost every variable in the model was a significant predictor of dropping out of eighth grade.

Among the demographic factors, Black, Hispanic, and Native American eighth-grade students had significantly higher odds of dropping out than other students, while Asian students had significantly lower odds. This finding is consistent with virtually all previous research and statistical reports that show non-Asian minority groups have higher dropout rates than other students (e.g., McMillen et al., 1993; Rumberger, 1987). Immigrant eighth-grade students did not have higher odds of dropping out of school compared to native (third generation or more) students, while second generation students had significantly lower odds than native students. This result challenges a recent statistical report showing higher dropout rates for immigrant students (National Center for Education Statistics, 1992).

Among the family background factors, the estimates show that both structural and process variables are associated with higher dropout rates. Consistent with previous research, the estimates show that socioeconomic status is a powerful predictor of dropping out: eighth-grade students one standard deviation above the mean in socioeconomic status (which was normalized to a mean of zero and a standard deviation of one) were almost one third as likely to drop out as students with mean values of socioeconomic status. Conversely, eighth-grade students one standard deviation below the mean in socioeconomic status were 3 times as likely to drop out of school as students with mean values of socioeconomic status. Students from single-parent families, step-families, and non-English-speaking families had significantly higher odds of dropping out of school than other students.

All of the family process variables were significant predictors of dropping out. The most powerful family process variable was the first academic support factor composite, which measured the extent to which parents participate in the PTA and act as volunteers in the school (see appendix). Students of actively involved parents were much less likely to drop out than other students. Students who reported less parental supervision had 34% higher odds of dropping out than other students. Both of these results support the growing research literature that shows parental academic support and supervision are important predictors of academic success in school (Dornbusch et al., 1987; Epstein, 1990). Finally, the results reveal that students with parents with low educational expectations for their children (only graduating from high school) were more than 5 times as likely to drop out of school.

Academic background factors were highly predictive of dropping out of eighth grade. Students who were held back in school were more than 11 times as likely to drop out of school than students who were not held back. Because more than one fifth of all eighth-grade students were held back sometime in their academic career, this finding appears to support the contention that holding back students has long-term, deleterious effects on student achievement (Grissom & Shepard, 1989). Another study based on the NELS:88 sample further found that being held back in the upper grades was more detrimental than being held back in the lower grades (Kaufman & Bradby, 1992). Changing schools also significantly increased the odds of dropping out of school: Each time a student changed schools, the odds of dropping out increased by 30%. Again, other studies have also found that changing schools increased the odds of dropping out (Hess & Lauber, 1985). Finally, students who were reported as dropouts sometime between 1988 and 1990 were 4 times as likely to be identified as a dropout during the first follow-up period in 1990.

Students' attitudes in eighth grade also predicted dropping out of school. Students with high locus of control and self-concept were much less likely to drop out of school than other students. Students who only expected to graduate from high school were almost 7 times as likely to drop out of school as other students. Eighth-grade students who felt that other students saw them as a troublemaker and not a good student (Factor composite 2) were 50% more likely to drop out compared to other students. Finally, students who felt that their academic subjects were not going to be useful in their future or felt unsafe at school were more likely to drop out between the 8th and 10th grades.

Students' behaviors in eighth grade predicted dropping out of school as well. Students who reported doing more homework and coming to class with their books and assignments were less likely to drop out, while students who were absent more than 25% of the time or even 15% to 20% of the time were much more likely to drop out of school. Also, students who misbehaved or did not participate in either extracurricular activities in school or other organized activities out of school also had significantly higher odds of dropping out of school.

Finally, students' academic performance in eighth grade predicted dropping out of school. A one-point higher grade point average reduced the predicted dropout rate by more than 70%, while a one-standard-deviation increase in test scores (standardized for the entire NELS sample) reduced the odds of dropping out by more than two thirds.

Overall, the results reveal that a wide variety of demographic, family, and educational factors predict the odds of eighth-grade students' dropping out of school. These results are consistent with the many empirical studies done on dropouts, most of which have focused on high school rather than middle-school students. The results confirm that many of the factors that predict dropping out of high school also predict dropping out of middle school.

*Multivariate estimates for the entire sample.* The next phase of the analysis tested a series of multivariate, recursive models where the predicted odds of dropping out due to more distal background factors were estimated separately and then together with more proximal factors that captured students' experiences in eighth grade. In this way, it is possible to examine both the direct effects of background factors on dropping out and their indirect effects through their association with eighth-grade experiences. The successive steps of the recursive analysis are displayed in Columns 2 through 8 of Table 2.

Changes in the predicted odds of dropping out associated with demographic variables become insignificant after controlling for other factors. For example, Black, Hispanic, and Native American students have twice the odds of dropping out compared to White students (Column 2). However, after controlling for the structural characteristics of family background—particularly, socioeconomic status—the predicted odds of dropping out for these minority students are no different than those for White students (Column 3). This finding is consistent with previous research that shows that most or all of the observed differences in dropout rates of Blacks and Hispanics can be accounted for by differences in family background (Kaufman & Bradby, 1992; Rumberger, 1983; Velez, 1989). Changes in the predicted odds for second generation students also become insignificant after controlling for family background. One interesting finding is that female students have higher predicted odds after controlling for differences in attitudes, behavior, and academic performance in eighth grade. This finding is also consistent with previous studies (e.g., Ekstrom et al., 1986). It suggests that, while girls overall have similar dropout rates as boys, girls with similar attitudes, behavior, and academic performance as boys have higher dropout rates.

Some of the family background variables become insignificant after controlling for the academic background and school experiences of eighth-grade students, while others do not. In the former case, this suggests that family background may influence students' academic experiences which, in turn, may influence their likelihood of dropping out. For example, students from single-parent families have significantly higher odds of dropping out even after controlling for socioeconomic status (Column 4). Yet they do not have significantly higher odds after controlling for academic background (Column 5). This suggests that students from single-parent families are more likely to drop out because they are more likely to have been held back or to have changed schools which, in turn, increases the odds of dropping out.

Even controlling for socioeconomic status and other structural factors (Column 3), many of the family process variables remain significant. This suggests that simpler models, which include only structural characteristics of families, fail to reveal important family practices associated with student success in school. Yet these variables do not render SES insignificant, suggesting that there are other aspects of social class influencing student achievement that these factors do not capture.

After controlling for demographic and family background factors, the univariate estimates of being held back and changing schools were reduced, but remained significant. In fact, even controlling for these factors, students who were held back in school had 6 times the odds of dropping out, while each time students changed schools increased their odds of dropping out by 23% (Column 5).

Controlling for background characteristics did alter the predicted odds of dropping out of eighth grade associated with student attitudes (Column 6). Changes in the predicted odds of dropping out associated with self-concept, attitudes toward school work, and feelings of safety were no longer significant. Students with a high locus of control still had lower odds for dropping out, but not after controlling for behavior (Column 7). Students with low educational expectations were twice as likely to drop out as other students. Students who reported having better and more caring teachers had 16% lower odds of dropping out, even controlling for other attitudes and background characteristics. Students who believed they were viewed positively by their fellow students (Composite factor 1) were less likely to drop out, while students who believed they were viewed as troublemakers (Factor composite 2) were more likely to drop out, holding constant other factors.

Among the behavioral factors, moderate and high absenteeism, behavior problems, and not having any school or outside activities remained highly predictive of dropping out, even controlling for other factors (Column 7). Other behaviors, however, become insignificant. Finally, high grades and test scores still reduced the likelihood of dropping out, even controlling for a host of background and school experiences, although the predicted change was much less than in the univariate case. Interestingly, good grades are a more powerful predictor of staying in school than high test scores, suggesting that students are more influenced by their relative standing to their peers than a more absolute measure of their academic performance.

*Multivariate estimates for ethnic groups.* Previous studies have shown that the effects of many predictors of dropping out vary widely among social groups, particularly ethnic minorities (Ekstrom et al., 1986; Velez, 1989). This suggests that the predicted odds of dropping out associated with the many variables discussed above may not apply to particular groups. To test this proposition, separate regression estimates were derived for Blacks, Hispanics, and Whites.<sup>8</sup> Multivariate estimates for the final model, along with the mean values of all the independent variables used in the analysis, are shown in Table 3.

The mean values of the independent variables reveal some important differences among the groups. As suggested by the earlier estimates, mean dropout rates were much higher for Blacks and Hispanics compared to Whites. The mean socioeconomic status of Black and Hispanic families was also much lower than for White families. Black students were much more likely than other students to live in single-parent families, while Hispanic students were much more likely to be first generation (immigrant) or second generation immigrants and live in non-English-speaking households. Parents

Table 3

**Mean Values of Independent Variables and Predicted Odds Ratios  
for Dropping Out by Selected Ethnic Groups: Eighth  
Graders, 1988-1990**

Variable	Means (weighted)			Odds ratios		
	Hispanic	Black	White	Hispanic	Black	White
Dropout rate (percent)	9.13	10.04	4.76			
Demographic						
Female	.52	.51	.49	1.50	1.76*	1.68**
Immigrant	.15	.02	.01	1.08	2.62	0.77
Second generation	.36	.04	.04	0.51*	1.85	1.32
Family background						
Socioeconomic status	-.65	-.45	.18	0.48**	1.15	0.45**
Single parent family	.17	.36	.15	1.59	0.88	1.15
Step-family	.12	.14	.15	1.34	0.43*	1.53*
Non-English speaking home	.56	.02	.02	0.96	1.58	0.87
Parental Academic Support 1	-.13	.03	.01	0.90	1.06	0.75**
Parental Academic Support 2	.07	.03	-.01	1.07	0.88	0.84*
Parental Academic Support 3	.04	.05	-.01	0.94	0.94	0.85*
Parental Academic Support 4	-.15	-.03	.04	0.86	0.99	0.94
Parental Academic Support 5	.11	.18	-.05	1.11	0.65**	0.98
Parental supervision	-.11	-.03	.02	1.09	1.19	1.11
Low parental expectations	.15	.14	.12	1.48	2.05**	1.39*
Academic Background						
Held back	.26	.33	.19	3.43**	1.44	6.95**
Changed schools	1.18	1.23	1.11	0.95	1.23**	1.26**
Stop out	.02	.02	.01	0.26	2.55	0.41
Attitudes in eighth grade						
Locus of control	-.21	-.13	.06	0.85	0.86	1.04
Self-concept	-.13	.25	-.03	0.99	0.95	0.86
Low expectations	.16	.10	.11	1.46	0.86	1.33
Teacher quality	-.10	-.11	.04	0.76	0.65**	0.87
Peers 1	.16	-.15	.00	0.85	0.88	0.73**
Peers 2	.09	-.18	.03	0.89	1.18	0.89
Schoolwork useful	-.18	-.22	.07	1.05	0.94	1.00
Unsafe	.15	.18	.09	1.53	0.66	1.04
Behavior in eighth grade						
Homework	5.20	5.46	5.92	0.97	1.00	0.98
Engagement	-.06	-.05	.02	1.13	1.13	0.92
Moderate absenteeism	.14	.10	.13	1.97*	0.89	2.79**
High absenteeism	.08	.09	.07	5.06**	3.16**	3.12**
Misbehavior	.08	.24	-.06	1.13	1.66**	1.56**
No school activities	.34	.38	.24	0.83	1.18	1.42*
No outside activities	.46	.48	.31	1.28	1.79*	1.13
Academic performance in eighth grade						
Grades	2.75	2.73	2.93	0.72	0.36**	0.50**
Test scores	4.61	4.48	5.22	0.61*	0.88	0.89
N (unweighted)	2,143	1,748	12,147	2,143	1,748	12,147
-2 Log likelihood				486.04	552.34	1525.92
Improvement (%)				29.4	30.7	44.1

*Note.* Coefficients represent the estimated effects on the odds ratios [ $\exp(\beta)$ ], which are the ratios of the odds of dropping out due to a one-unit change in the independent variable to the odds of dropping out without the change.

\*Significant at .05 level.

\*\*Significant at .01 level.

of Hispanic students were less likely to be involved in the PTA and to volunteer in school (Parental Academic Support Factor 1) and less likely to help with homework (Parental Academic Support Factor 4) than other parents, while parents of Black and Hispanic students were more likely to have rules about doing homework and maintaining grades (Parental Academic Support Factor 5). Hispanic families showed much higher levels of supervision.

Black and Hispanic students were more likely to have been held back in school and to have changed schools compared to Whites. With respect to attitudes, Hispanics, Blacks, and high-risk students had lower locus of control than White students, which implies that they were more likely to attribute their situation to external rather than internal factors. On the other hand, Blacks had a higher level of self-concept than other students. Hispanic and Black students reported lower levels of teacher quality and found their academic subjects were less useful to their future than other students. Peer perceptions varied considerably among the four groups. Behaviors and academic factors did not vary greatly among the groups: All reported doing similar amounts of homework and receiving similar grades and test scores. Black students, however, reported much higher levels of misbehavior than Hispanic or White students.

The logistic regression estimates also revealed many differences among the groups. Controlling other variables in the model, females had significantly higher dropout rates among Blacks and Whites, but not among Hispanics. Higher socioeconomic status reduced the odds of dropping out among Hispanics and Whites, but not among Blacks. Students from step-families had significantly higher odds of dropping out than students from two-parent families among Whites, while students in single-parent families had significantly lower odds among Blacks. For Hispanics, there were no significant differences. Three of the academic support factors significantly reduced the predicted odds of dropping out among Whites, but not among Blacks or Hispanics, while another factor significantly reduced the predicted odds of dropping out among Blacks, but not Hispanics or Whites.

Among school experiences, the other most consistent finding across the groups was the effect of high absenteeism: Students who were absent 25% of the time or more were 3 or 5 times more likely to drop out than other students. The effects of other school experiences were inconsistent among the groups. Being held back in school was a powerful predictor of dropping out for Hispanics and Whites, but not for Blacks. Changing schools predicted dropping out for Blacks and Whites, but not for Hispanics. Black students who reported higher teacher quality were less likely to drop out of school than other students. White students who reported a positive peer relationship were less likely to drop out compared to other students from those groups. Misbehavior significantly increased the odds of dropping out for Blacks and Whites, but not Hispanics. Moderate absenteeism significantly increased the odds of dropping out for Hispanic and White students, but not Black students. Not being in school activities increased the odds of dropping out for Whites

only, while not being in other organized activities greatly increased the odds of dropping out for Blacks, but not other groups. Finally, high grades greatly reduced the odds of dropping out for Blacks and Whites, but not Hispanics, while high test scores greatly reduced the odds of dropping out only for Hispanics.

Overall, these results not only reveal widespread differences in the characteristics of different groups of students but also that these characteristics differentially predict the odds of dropping out. Since recent research shows that students are increasingly attending more segregated schools (Orfield & Monfort, 1988), the educational experiences of students can differ widely. Given these differences, it is not surprising, therefore, that these factors might impact the propensity to drop out of school in very different ways. This suggests that formulating practices and policies to address the dropout problem from some universal or aggregate analysis may lead to very misguided and ineffective actions.

### **HLM Analysis**

The preceding analysis was concerned with identifying a wide array of student-level variables that predict the likelihood of an individual student's dropping out. The following analysis takes an institutional perspective which is concerned with identifying school-level variables that can predict between-school differences in dropout rates. But, just as a single student-level model may be insufficient to identify differences among groups of students, a single school-level model may be insufficient to identify differences among groups of schools. In particular, schools vary greatly in the socioeconomic status of their students, which past research has shown to be highly predictive of educational achievement. The mean socioeconomic status of students in the sample schools for this study varied from a low of  $-1.8$  to a high of  $2.0$ .<sup>9</sup> Because socioeconomic status (SES) was normalized for the entire weighted sample of students, this means that the "average" student in some schools was 2 standard deviations above the estimated population mean for SES, while the "average" student in other schools was almost 2 standard deviations below the population mean. Further analysis revealed that almost three quarters of the dropouts in the sample attended schools at or below the median level of mean SES for the entire weighted distribution of schools, which was  $-.029$ . Consequently, an additional HLM analysis was conducted on that smaller sample of lower SES schools ( $J = 471$ ).

*Estimates for the entire sample.* The first step in conducting any HLM analysis is to estimate a model without any student-level or school-level variables. This model, which is the equivalent of a one-way ANOVA with random effects, estimates variances in the outcome variable at the student and school levels and also tests whether there are significant differences in between schools (Bryk & Raudenbush, 1992, pp. 17).<sup>10</sup> The results of this analysis are shown in Table 4, Column 1.<sup>11</sup> The estimated intercept term (after being transformed using Equation 1) yields a predicted mean, school-level dropout rate of 4.55%, which is similar to the mean school-level dropout

Table 4  
 Summary of Results for Variance Explained by HLM Models

	All schools ( <i>J</i> = 981)		Lower SES schools ( <i>J</i> = 471)	
	Parameter (1)	Variance explained (2)	Parameter (3)	Variance explained (4)
Mean dropout rates ( $\beta_0$ )				
Intercept ( $\delta_{00}$ )	-3.090		-2.781	
Variance ( $\tau_{00}$ )	0.869**		0.693**	
Student-level variables only	0.554**	36.2	0.653**	5.2
+Student composition	0.540**	37.9	0.578**	16.6
+Structural characteristics	0.532**	38.8	0.574**	17.2
+Organization/climate	0.508**	41.5	0.495**	28.6
Social class differentiation ( $\beta_4$ )				
Intercept ( $\delta_{40}$ )	-0.752		-0.572	
Variance ( $\tau_{44}$ )	0.032*		0.232**	
Student composition			0.090	61.2
+Structural characteristics			0.117	40.6
+Organization/climate			0.067	71.1

\*Significant at .05 level.

\*\*Significant at .01 level.

rate of 4.72% for the weighted sample of schools. The HLM estimate is superior, however, because it adjusts for sampling error (Raudenbush, 1993). The estimated variance of the intercept term is large (0.869) and significant, suggesting considerable variation in dropout rates among schools. More specifically, the estimates suggest that school-level dropout rates would likely range from a low of at least 1.8% (one standard deviation below the mean) to a high of at least 11.5% (one standard deviation above the mean) [ $1/(1 + \exp(-3.090 \pm (.869)^{1/2}))$ ]. This is consistent with a host of reports showing dropout rates in some schools, particularly in urban areas, of over 40% (e.g., Hammack, 1986; Hess & Lauber, 1985). Of course, the present study is only looking at dropout rates over a 2-year period from 8th to 10th grade, so one would expect dropout rates to be lower over this more limited period.

The next step in the analysis involved adding the student-level predictors in the model, as specified in Equation 2. For each of the 8 student-level predictors in the model, the estimated coefficients (slopes) could either be *fixed*, which constrained them to be the same across all schools, or *random*, which allowed them to vary among schools. If the slopes are allowed to vary, one can examine the size and significance of the estimated variance to see if it is worth using the school-level model to predict between-school differences in these slopes.

In the full sample, none of the student-level predictors had estimated parameter variances that were significant. The only exception was the esti-

mated parameter variance for student socioeconomic status, which indicates the extent to which the predicted odds of dropping out associated with socioeconomic status vary from school to school (social class differentiation). As shown in Table 4, the estimated variance for this variable was significant at the .05 level, but it had a value of only .032. This suggests that the odds ratios associated with socioeconomic status only vary from about .394 [ $\exp(-.752 - (.032)^{1/2})$ ] to about .565 [ $\exp(-.752 + (.032)^{1/2})$ ] among schools. Therefore, in subsequent analyses, the slope for socioeconomic status was fixed.

Since the student-level variables in the HLM analyses were centered around their grand means, the intercept term for each school provides an adjusted mean dropout rate for that school, assuming it enrolled students with mean values on all the student-level variables for the entire sample (see Bryk & Raudenbush, 1992, p. 26). As a result, the estimated parameter variance for the intercept in the fixed-slope model with grand-mean centering was much smaller than the estimated parameter variance in the ANOVA case (.554 versus .869). In other words, controlling for differences in the background characteristics of students accounted for 36% of the estimated differences in mean dropout rates among schools (Table 4, Column 2).

The remainder of the HLM analysis involved testing a series of models that introduced different classes of school-level variables sequentially to examine their effects on differences in adjusted mean dropout rates across schools. The first model examined the effects of student composition variables, the second model examined the effects of structural variables, and the third model examined the effects of organizational and climate variables. At each stage of the analysis, only those variables that were significant at the .05 level were retained, and then the model was re-estimated. All variables that were still significant at one stage were retained in the next stage. This technique has been used previously to explain differences between public and Catholic schools in student achievement, absenteeism, and dropout rates (Bryk & Thum, 1989; Lee & Bryk, 1989). The final estimates for each of the three models conducted on the full sample of schools are shown in Table 5, Columns 1–3. As was done in the case of the logistic regression estimates, the coefficients have been transformed ( $e^{\beta}$ ), so that they represent the ratio of the school-level mean of the predicted odds of dropping out with a one-unit change in the independent variable to the school-level mean of the predicted odds without the one-unit change.

In the first school-level model, which introduced student composition variables, only the coefficients for school mean socioeconomic status and a dichotomous variable indicating a high-minority school (greater than 40% minority) were significant. This suggests that students in schools with high socioeconomic students have lower odds of dropping out (34%), even after controlling for differences in the individual characteristics of students, including individual socioeconomic status. This finding confirms the importance of the social composition of students on student achievement (Gamoran, 1992). The results also indicate that students in high-minority schools have

Table 5

**HLM Estimates of Adjusted School Mean Dropout Rates and Social Class Differentiation by School SES: Eighth Graders, 1988-1990**

School-level variables	All schools ( <i>J</i> = 981)			Lower SES schools ( <i>J</i> = 471)		
	(1)	(2)	(3)	(4)	(5)	(6)
Mean dropout rates <sup>a</sup>						
Student composition						
Mean socioeconomic status	0.66**	0.70*	0.74*			
Mean held back				2.54*	2.23	1.78
High minority	1.57*	1.62*	1.60*	2.12**	1.98**	1.87**
Structural characteristics						
Other religious school		0.27**	0.24**			
Size					1.09**	1.09*
Student/teacher ratio					0.95**	0.96*
Organization/climate						
Mean homework						0.90*
Percent fair discipline			0.25**			0.22**
Social class differentiation <sup>b</sup>						
Intercept				0.41**	0.53**	0.82
Student composition						
High poverty				1.96**	1.97**	1.92**
Structural characteristics						
Grade span K/1-8					0.73**	0.76**
Size					1.09*	1.07*
Student/teacher ratio					0.96*	0.97**
Organization/climate						
Mean homework						0.91*

\*Significant at .05 level.

\*\*Significant at .01 level.

<sup>a</sup>Coefficients represent the estimated effects on the odds ratios [ $\exp(\delta_{0k})$ ], which are the ratios of the odds of dropping out due to a one-unit change in the independent variable to the odds of dropping out without the change. Estimates control for student-level variables for Black, Hispanic, second generation, socioeconomic status, parental supervision, parental educational expectations, held back in school, school changes.

<sup>b</sup>The intercept term represents the estimated odds ratio for social class differentiation [ $\exp(\delta_{40})$ ], while the other coefficients represent the change in the odds ratio due to a one-unit change in the independent variable. Estimates control for student-level variables for Black, Hispanic, second generation, parental supervision, parental educational expectations, held back in school, school changes.

higher odds of dropping out (57%) even after controlling for all the other variables in the model, including socioeconomic status and ethnicity. The earlier study of high school sophomores who dropped out between 1980 and 1982 did not find that either school mean socioeconomic status or high-minority school status significantly predicted school mean dropout rates after controlling for other factors (Bryk & Thum, 1989), although a similar study using the same national data set found that those two variables did predict school mean test scores (Lee & Bryk, 1989).

The second model introduced variables measuring the structural characteristics of schools. After controlling for individual differences in students and student composition, the only structural variable that was significant was a dummy variable indicating that the school was a non-Catholic religious school (Column 2). The earlier study of 1980 high school sophomores using regular HLM analysis found that Catholic schools had lower mean dropout rates than public schools even after controlling for differences in similar types of variables used here (Bryk & Thum, 1989). But another study based on the same data found that students in Catholic schools were more likely to transfer to a public school than drop out (Lee & Burkam, 1992), suggesting comparisons in dropout rates between public and private schools may not adequately reveal the extent to which these schools are effective in getting their students to complete school. These earlier studies did not examine other, non-Catholic, private schools.

The final model introduced school organization and climate variables. Only one variable was significant, one that measured the percent of students who reported that they thought the discipline policy in the school was fair (Column 3). A one-standard deviation increase in the proportion of students who report a fair discipline policy (.17) reduced the mean odds of dropping out by 21%.<sup>12</sup> This suggests that students attending schools where they report a fair discipline policy have much lower odds of dropping out. Since the earlier results confirm that behavior problems predict school dropout, it is not surprising that school discipline policy might influence whether that behavior leads to students' leaving school or not. These results also support Wehlage and Rutter's contention "that social factors related to discipline are significant in developing a tendency to drop out" (Wehlage & Rutter, 1986, p. 385). Interestingly, the earlier HLM analysis of dropout students found higher dropout rates in high schools where students reported a fair discipline, which Bryk and Thum viewed as an "anomalous result" (Bryk & Thum, 1989, p. 370).

*Estimates for lower SES schools.* The same procedures used on the full sample were applied to the sample of lower SES schools. First, a one-way ANOVA model with random effects was estimated. The results of this analysis are shown in Table 4, Column 3. The estimated intercept term (after being transformed using Equation 1) yields a predicted mean, school-level dropout rate of 7.27%, which is much higher than the predicted mean for the entire sample. The estimated variance of the intercept term remains large (0.693) and significant, which suggests considerable variation in dropout rates even among lower SES schools. More specifically, the estimates suggest that school-level dropout rates among lower SES schools would probably range from a low of at least 3.2% (one standard deviation below the mean) to a high of at least 16.7% (one standard deviation above the mean) [ $1/(1 + \exp(-2.622 \pm (.693)^{1/2}))$ ].

The second step involved introducing the student-level model, allowing the estimated slopes to vary randomly, and checking to see whether the estimated parameter variances were meaningful and significant. In this case,

the estimated parameter variance for social class differentiation (socioeconomic status) was large (.232) and significant, while the other variances were not. The average estimated odds of dropping out associated with student socioeconomic status had a mean value of  $-.572$  across all the lower SES schools, which suggests higher social class differentiation among lower SES schools than among the entire population of middle schools. In addition, the estimated parameter variance suggests that the odds ratios of dropping out associated with socioeconomic status among lower SES schools vary widely, from about  $.349[\exp(-.572 - (.232)^{1/2})]$  to about  $.913[\exp(-.572 + (.232)^{1/2})]$ .

Unlike the case for the full sample, introducing the student-level model had little effect on the estimated parameter variance for mean dropout rates. Controlling for differences in the individual characteristics of students explained only 5.2% of the variance in mean dropout rates among lower SES, while these controls explained 36.2% of the variance in mean dropout rates among the entire population of middle schools (Table 4, Columns 2 and 4).

The last step of the analysis involved using school-level models to predict differences in adjusted mean dropout rates and social class differentiation among lower SES schools. The remaining student-level variables were fixed. The results are displayed in Table 5, Columns 4–6.

With respect to adjusted mean dropout rates (intercept term), the first school-level model found that students attending both high-minority schools and schools with high concentrations of students held back had higher odds of dropping out (Column 4). Students in high-minority schools were twice as likely to drop out as students attending schools with low concentrations of minorities. A one-standard deviation increase in the proportion of students held back (.14) increased the mean odds of dropping out by 14%.

The second school-level model introduced structural variables. Restricting the analysis to lower SES schools eliminated all of the non-Catholic private schools in the sample—except one—so essentially only Catholic and public schools are represented in the lower SES school population. Attending a Catholic school did not significantly predict dropping out of school. But two other structural variables did: school size and the student–teacher ratio. Students attending larger schools had higher odds of dropping out, while students attending schools with a larger student–teacher ratio had lower odds of dropping out. The earlier HLM study of dropping out did not find any direct relationship between school size and dropping out in high schools, but it did find an indirect relationship in such factors as faculty resources, staff problems, and student discipline problems (Bryk & Thum, 1989, Table 10). The finding related to the student–teacher ratio is counterintuitive. After controlling for these two structural variables, the coefficient for the proportion of students held back was no longer significant.

The final model introduced organizational and climate variables. Two were significant: the mean hours of homework reported by students and the percent of students reporting the discipline as fair (Column 6). A 1-hour

increase in the average amount of homework performed by students reduced the odds of dropping out by 10%. A one-standard deviation increase in the proportion of students who reported a fair discipline policy (.17) reduced the odds of dropping out by 23%. These results confirm those found in the earlier study of dropout rates in high schools (Bryk & Thum, 1989). The findings suggest that, just as students' behavior and academic performance predict individual differences in the propensity to drop out of school, school-level academic press and discipline policies predict school differences in the mean propensity to drop out of school.

Turning to social class differentiation, the first school-level model found that the predicted odds of dropping out associated with social class are much lower in high-poverty schools than in low-poverty schools (Column 4). In low-poverty schools, the odds of dropping out are 60% lower for students whose socioeconomic status is one standard deviation above the mean. In high-poverty schools, however, the odds of dropping out for higher SES students are only 20% lower.<sup>13</sup> This suggests that individual socioeconomic status is less likely to predict academic success or failure in high-poverty schools—perhaps because such schools may have a “culture of failure” that affects all students, regardless of their individual characteristics.

The second school-level model demonstrated that three structural characteristics influenced social class differentiation in lower SES schools: grade span, size, and the student–teacher ratio. In middle schools that include elementary grades, the odds ratio for socioeconomic status is lower, which means that social class differentiation is greater. Larger schools have somewhat lower social class differentiation, while schools with larger student–teacher ratios have greater social class differentiation.

The final school-level model produced one significant estimate: mean hours of homework. Schools with higher mean hours of homework had a lower odds ratio and therefore higher social class differentiation.

*Overall adequacy of HLM analysis.* The estimated variance components for all the models are shown in Table 4. In the full sample, the final school-level model explained 42% of the variance in mean dropout rates among schools, although the majority of variance was explained by differences in the individual characteristics of students and student composition. The addition of structural, organizational, and school climate measures only increased the explained variance from 38% to 42% (Column 2). But this is not surprising given how heterogeneous schools are with respect to socioeconomic status, one of the key factors associated with school achievement. In contrast, controlling for differences in the individual and social composition of students only explained about 17% of the variance among lower SES schools (Column 4) because such schools are much more homogeneous with respect to the socioeconomic status of students. In lower SES schools, the final school model explained 29% of the total variance between schools. In both samples, the significant differences remained between schools after introducing the final school-level model. The final school model explained fully 71% of variance in social class differentiation among lower SES schools, with most

of the variance explained by student composition. The remaining variance was not significant.

These results compare favorably with earlier HLM studies. The final model in the earlier study of high school dropouts using regular HLM analysis accounted for 26% of the variance in mean dropout rates and 42% of the variance in the SES slope (Bryk & Thum, 1989), while models of high school achievement in earlier studies using HLM analysis have accounted for up to 75% of the variance in mean achievement and 30%–50% of the variance in the differential effects of race, social class, and academic background (Lee & Bryk, 1989).

### Summary and Conclusions

This study examined dropping out of middle school from both an individual and institutional perspective using the National Educational Longitudinal Survey of 1988. A logistic regression analysis was used to more fully examine a wide range of individual, family, and school factors on individual dropout rates. To better identify the effects of these factors on ethnic differences in dropping out, separate analyses were conducted for Whites, Blacks, and Hispanics. And a new, nonlinear version of HLM analysis was used to examine the effects of both student-level and school-level attributes on between-school differences in dropping out. The findings confirmed many of the factors that earlier qualitative and quantitative studies have shown to influence dropping out at both the individual and institutional levels. They also identified other factors, particularly process-related factors, that have not been frequently analyzed in dropout studies.

At the individual level, the results demonstrated that a wide range of individual, family, and school-related factors are associated with dropping out. Consistent with previous studies, the sizable, observed differences in dropout rates among ethnic groups can be explained largely by differences in family background—particularly, socioeconomic status (Fernandez, Paulsen, & Hirano-Nakanishi, 1989; McMillen et al., 1993; Rumberger, 1993). And, as found in virtually every study of academic achievement, family socioeconomic status is highly predictive of dropping out. Even controlling for a host of other factors, students from low social class families were twice as likely to drop out as students from average social class families. The analysis also revealed that several family process factors—such as, parental academic support, parental supervision, and parents' educational expectations for their children—predicted dropout rates as other studies have shown they do with other measures of educational achievement (Astone & McLanahan, 1991; Dornbusch et al., 1987; Rumberger et al., 1990).

Several school-related factors were significant predictors of dropping out. The single most powerful predictor was whether a student was held back in an earlier grade. This factor has been identified in several earlier studies of high school dropouts, both qualitative and quantitative (Fine, 1991; Lee & Burkam, 1992). A recent study of eighth-grade dropouts using the

same NELS data as in this study also found that being held back in the upper grades was more predictive of dropping out than being held back in the early elementary grades (Kaufman & Bradby, 1992). Changing schools also increased the odds of dropping out, which supports the findings of another recent study that found that frequent moving was related to a host of educational problems for children (Wood, Halfon, Scarla, Newacheck, & Nessim, 1993). The other important school-related factors that were predictive of dropping out were high absenteeism, misbehavior, and poor academic performance. The existence of these problems in the elementary grades as well as in the secondary grades is predictive of dropping out of middle and high schools (Barrington & Hendricks, 1989; Ekstrom et al., 1986; Ensminger & Slusacick, 1992; Lee & Burkam, 1992).

When the analysis was disaggregated by ethnic group, a more complicated picture arose. Some factors predicted dropout rates for some groups, but not others. For example, socioeconomic status significantly predicts dropout rates for Hispanics and Whites, but not Blacks. Misbehavior, changing schools, and low grades all increased the odds of dropping out for Blacks and Whites, but not Hispanics. Yet high absenteeism greatly increased the odds of dropping out in all groups. The inability to generalize about the effects of many individual, family, and school-related factors on the propensity to drop out across ethnic groups is consistent with other quantitative studies of dropouts (Fernandez, Paulsen, & Hirano-Nakanishi, 1989; Velez, 1989) and demonstrates one of the inherent limitations of research studies that ignore the interplay of race, gender, and social class (Grant & Sleeter, 1986). It also supports the argument that cultural and other factors that are the focus of many qualitative studies are important in developing a better understanding of differences within and among ethnic groups in the propensity to finish high school (Ogbu, 1992; Trueba, Spindler, & Spindler, 1989).

At the institutional level, the analysis revealed widespread differences in the average dropout rates among middle schools. These differences exist, in part, because of differences in the socioeconomic status of students. So, a separate analysis was conducted on lower SES schools where the majority of dropouts attended eighth grade. The results revealed both similarities and differences between the full population of middle schools and lower SES schools. Mean socioeconomic status of students explained differences in dropout rates among the full population of schools, but not among lower SES schools, which were more similar in the SES composition. In both sets of analyses, students attending schools with high concentrations of minorities had much higher odds of dropping out, while students attending schools with fair discipline policies had much lower odds of dropping out. After controlling for characteristics of students, students attending religious schools were less likely to drop out between 8th and 10th grades than students attending public schools. Attending a Catholic school or private nonreligious school, however, did not significantly affect the odds of dropping out.

This contrasts with earlier studies which reported that students attending Catholic schools were less likely to drop out and have higher achievement

levels (Bryk & Thum, 1989; Coleman & Hoffer, 1987; Lee & Bryk, 1989). But those studies analyzed high schools, while the present study examined middle schools. A more fundamental concern is that institutional dropout rates provide an inadequate measure of school effectiveness because they ignore students who transfer. For example, institutional attrition rates are more similar between public and Catholic high schools than dropout rates because Catholic school students are more likely to transfer schools than public school students (Lee & Burkam, 1992). This could explain why there appear to be no differences in dropout rates among Catholic and public middle schools: Students may have fewer alternatives.

There was little social class differentiation in the full population of schools, but widespread social class differentiation among lower SES schools. Social class differentiation was much smaller in high-poverty schools than low-poverty schools, but much greater in middle schools containing elementary grades. Lower SES schools, where students spent more time on homework, had lower mean dropout rates, yet higher social class differentiation.

The results of this study have important implications for educational practice. They illustrate that school policies and practices have important implications for student dropout behavior. Although schools cannot do anything about the demographic and social characteristics of their students, they can change their own practices that have a direct bearing on whether students remain in school. In particular, discipline policies, grade retention policies, and policies affecting school transfer all affect whether students are more likely to stay in school. These policies have more to do with behavior issues than academic learning and, as such, are often ignored in the school reform debate. Yet they may be critically important if schools want to become committed to improving the education of all students.

Schools can also improve dropout behavior by trying to address parenting practices—especially those that directly involve the school, such as participating in the PTA and attending school events and meetings. At the same time, the results suggest that schools need to pay particular attention to ethnic and cultural differences among students if they are to be effective with ethnic minorities, which have the largest dropout rates.

Although the present study was able to identify a wide range of factors that were predictive of dropping out of eighth grade at both the individual and institutional levels, it provides only a piece of the larger puzzle of school dropouts. Dropping out is increasingly being viewed as a long-term process of disengagement from school that often begins in the elementary grades and continues through the time a student formally withdraws from school, often in the upper secondary grades (Ensminger & Slusacick, 1992; Hess, Lyons, Corsino, & Wells, 1989). Moreover, dropout status is measured at some arbitrary point in time, which also ignores the process after students withdraw. Many students reenter school after dropping out or find an alternative means to finish high school (Kolstad & Kaufman, 1989), although some recent evidence suggests that alternative forms of completing high school, such as getting a GED, do not have the same economic value as a regular

high school diploma (Cameron & Heckman, 1993). These issues need to be acknowledged and addressed to better understand the complex phenomenon of dropping out.

**APPENDIX**  
**Means and Factor Loadings of Multiple-Factor Composites**

			<u>I. Parental support</u>		
Variable	Mean	SD	Description		
			<i>Since the beginning of the school year, have either of your parents (1 = yes, 0 = no):</i>		
BYS37A	.51	.50	Attended a school meeting		
BYS37B	.58	.49	Spoken to your teacher or counselor		
BYS37C	.28	.45	Visited your classes		
BYS37D	.64	.48	Attended a school event		
BYS38A	1.93	1.00	<i>How often parents check homework (1 = often, 4 = never)</i>		
			<i>Since last fall, have you or your spouse/partner contacted school (1 = none, 4 = more than four times) about your eighth graders:</i>		
BYP58A	1.72	.85	Academic performance		
BYP58B	1.41	.64	Academic program for this year		
BYP58C	1.36	.69	Behavior in school		
			<i>Do you and your spouse/partner (1 = yes, 0 = no):</i>		
BYP59A	.33	.47	Belong to a parent-teacher organization		
BYP59B	.37	.48	Attend meetings of a parent-teacher organization		
BYP59C	.27	.44	Take part in the activities of a parent-teacher organization		
BYP59D	.20	.40	Act as a volunteer at the school		
			<i>Family rule about (1 = yes, 0 = no):</i>		
BYP65A	.71	.45	Maintaining grade average		
BYP65B	.91	.28	Doing homework		
BYP68	3.21	.75	<i>How often (1 = not at all, 4 = regularly) do you talk with your eighth graders about experiences in school?</i>		
BYP69	2.22	.98	<i>How often (1 = seldom or never, 4 = almost daily) do you help your eighth graders with homework?</i>		

**Factor loadings:**

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
BYS37A	.34775	.02008	.60685	.12996	-.07013
BYS37B	-.00676	.37407	.54816	-.04610	.04415
BYS37C	.05679	-.01629	.75032	.02339	.03693
BYS37D	.24928	-.13126	.23456	.37409	-.20377
BYS38A	.09921	.01617	-.21178	-.60683	-.09871
BYP58A	.13061	.83111	.07826	.15287	.01599
BYP58B	.14711	.75283	.02659	.20866	-.05154
BYP58C	-.03544	.73579	.04698	-.14507	.10364
BYP59A	.74444	.01974	.07063	.05869	.04115
BYP59B	.75139	.07099	.09869	-.04174	.11513

## APPENDIX (continued)

## Factor loadings:

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
BYP59C	.79646	.05805	.04851	.04215	.01555
BYP59D	.57967	.07885	.06921	.12143	-.09762
BYP65A	.03411	.01824	.00453	.07248	.80348
BYP65B	.01412	.04004	.01893	.18768	.75792
BYP68	.16105	.06641	-.10354	.51085	.14345
BYP69	.03807	.14080	-.04085	.65987	.09139
Eigenvalue	2.97045	1.84484	1.46946	1.18018	1.00366
Percent of var.	18.6	11.4	9.2	7.4	6.3

## II. Peers

*How do you think other students in your classes see you (1 = very, 3 = not at all)?*

BYS56A	2.01	.59	As popular
BYS56B	1.98	.72	As athletic
BYS56C	1.74	.61	As good student
BYS56D	1.94	.58	As important
BYS56E	2.67	.57	As troublemaking

## Factor loadings:

	PEERSF1	PEERSF2
BYS56A	.83041	-.06696
BYS56B	.70087	-.04381
BYS56C	.23105	.77512
BYS56D	.75032	.26883
BYS56E	.15999	-.80959
Eigenvalue	1.87332	1.28437
Percent of var.	37.5	25.7

## Notes

An earlier version of this article, titled "Why Kids Drop Out of Middle School," was presented at the Annual Meeting of the American Educational Research Association, San Francisco, April 20-24, 1992. This research was supported by a grant from the American Educational Research Association which receives funds for its AERA Grants Program from the National Science Foundation and the National Center for Education Statistics (U.S. Department of Education) under NSF Grant No. RED-9255347. Opinions expressed reflect those of the author and do not necessarily reflect those of the granting agencies. I would like to thank Doug Willms, Mike Slater, and the referees and editors for their valuable comments on an earlier draft of this article; Steve Raudenbush for his assistance in using and understanding the nonlinear-HLM program; and Scott Thomas for his invaluable research assistance.

<sup>1</sup>Although this study examines students who drop out between the 8th and 10th grades, only some of those students actually drop out of the school they were attending in 8th grade, which is referred to as their *middle school*. In reality, students dropped out in either 8th grade, 9th grade, or 10th grade, and some of those students could have gone on to one or more high schools before actually dropping out. In fact, it is not uncommon

for dropouts to transfer among schools before dropping out (Lee & Burkam, 1992). Because dropping out is a long-term, cumulative process (Fine, 1991; Rumberger, 1987), examining the influence of student-level and school-level factors in the eighth grade on dropping out will further contribute to researchers' knowledge of this process. The NELS data does not identify the last school that the student attended before dropping out, so this study examines the effects of student-level and school-level factors on dropouts between the 8th grade and 10th grade and refers to them as middle school dropouts.

<sup>2</sup>In the student-level analysis, the full sample of 17,424 was used. Analyses done with a smaller number of students with nonmissing data did not reveal any substantial differences in the results presented here.

<sup>3</sup>The total number of schools attended by the 17,424 students was 1,014. Of those, 17 schools were excluded because they did not have weights, and another 16 were excluded because of missing data, resulting in a final sample of 981. In the school-level analysis, the student sample size was reduced to 16,973 students who attended the 981 schools.

<sup>4</sup>In some cases, the data could have been used to create either continuous or dichotomous variables. Sometimes the decision was arrived at through experimenting with the data to determine which provided more revealing results. In some cases, a continuous measure might adequately reflect a linear relationship between the variable and dropping out, while, in other cases, it was determined that a particular level reflected a critical threshold on dropout behavior. In the latter case, such critical values can be considered risk factors that help to predict dropout behavior.

<sup>5</sup>In order to improve their accuracy, the climate variables were computed from the full base-year sample of students attending those schools. Parental participation was computed from a single factor composite based on those variables (BYP59A-D) that represented the principle factors in the first student-level factor composite.

<sup>6</sup>NCES created a panel weight (PNLWT) for the 17,424 cases which had valid information for the base year and the first follow-up. As recommended by NCES, the sampling weight was adjusted to take account of the nonrandom sampling in NELS because the SPSS program used in this analysis does not adjust for such a sampling technique. Specifically, an adjusted panel weight was computed:

$$STUWTADJ = PNLWT / (\sum PNLWT / n) * 1.96,$$

where 1.96 is the mean value of the mean design effect for the panel. For detailed information on the survey design and the weighting scheme, see Ingles et al., 1992, pp. 48-58.

<sup>7</sup>Only variables from the demographic, family background, and academic background factors were used, because they could be considered truly independent variables. The only significant predictor excluded from these groups was parental academic support, which could be influenced by the middle school and thus was not a truly independent variable.

<sup>8</sup>Other groups (Asians, Native Americans, and immigrants) were not investigated because either they did not have high dropout rates or the sample sizes were too small.

<sup>9</sup>As explained in Note 5, the school-level measures of the student variables were computed from the entire base-year sample, with the average sample size of 24 students per school.

<sup>10</sup>When the outcome variable is continuous, the estimates can be used to show the proportion of total variance in the outcome variable that exists across schools. When the outcome variable is dichotomous, as in the this case, the variance at the student level cannot be calculated. (See Raudenbush, 1993).

<sup>11</sup>The nonlinear version of the HLM program produces three sets of estimates: one unit-specific set, which is similar to those produced in the regular HLM program; and two population-average sets, which provide more accurate estimated intercepts for the population, with the last estimate based on robust variances to provide more accurate standard errors (see Raudenbush, 1993). The latter estimates are reported in this article.

<sup>12</sup>The transformed coefficients cannot be translated directly into marginal effects. The formula is  $\exp[\ln(\exp(\gamma_{0k})) * 1 \text{ sd}(X_k)]$ . In this case,  $\exp[\ln(.25) * (.17)] = .79$ .

<sup>13</sup>For social class differentiation, the transformed coefficients should be interpreted as a change in the odds ratio for social class differentiation due to a one-unit increase in

the independent variable. In this case, the transformed coefficient is almost 2, which means the odds ratio for socioeconomic status in high-poverty schools is almost twice as large as in low-poverty schools ( $1.96^* .41 = .80$  versus  $.41$ ), meaning that social class differentiation is half as much.

### References

- Astone, N. M., & McLanahan, S. S. (1991). Family structure, parental practices and high school completion. *American Sociological Review*, *56*, 309-320.
- Barrington, B. L., & Hendricks, B. (1989). Differentiating characteristics of high school graduates, dropouts, and nongraduates. *Journal of Educational Research*, *82*(6), 309-319.
- Bryk, A. S., Lee, V. E., & Holland, P. B. (1993). *Catholic schools and the common good*. Cambridge, MA: Harvard University Press.
- Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models: Applications and data analysis methods*. Newbury Park, CA: Sage.
- Bryk, A. S., & Thum, Y. M. (1989). The effects of high school organization on dropping out: An exploratory investigation. *American Educational Research Journal*, *26*, 353-383.
- Cairns, R. B., Cairns, B. D., & Neckerman, H. J. (1989). Early school dropout: Configurations and determinants. *Child Development*, *60*, 1437-1452.
- Cameron, S. V., & Heckman, J. J. (1993). The nonequivalence of high school equivalents. *Journal of Labor Economics*, *11*(1), 1-47.
- Catterall, J. S. (1987). On the social costs of dropping out of school. *The High School Journal*, *71*(1), 19-30.
- Clark, R. L. (1992). *Neighborhood effects on dropping out of school among teenage boys* (Discussion paper). Washington, DC: The Urban Institute.
- Coleman, J. S. (1961). *The adolescent society*. New York: Free Press.
- Coleman, J. S., Campbell, E., Hobson, C., McPartland, J., Mood, F., Weinfeld, F., & York, R. (1966). *Equality of educational opportunity*. Washington, DC: U.S. Government Printing Office.
- Coleman, J. S., & Hoffer, T. (1987). *Public and private high schools: The impact of communities*. New York: Basic.
- Coleman, J. S., Hoffer, T., & Kilgore, S. B. (1982). *High school achievement: Public, Catholic, and private schools compared*. New York: Basic.
- Crane, J. (1991). The epidemic theory of ghettos and neighborhood effects on dropping out and teenage childbearing. *American Journal of Sociology*, *96*(5), 1226-1259.
- Cusick, P. A. (1973). *Inside high school: The student's world*. New York: Holt, Rinehart & Winston.
- Delgado-Gaitan, C. (1988). The value of conformity: Learning to stay in school. *Anthropology and Education Quarterly*, *19*(4), 354-381.
- Delgado-Gaitan, C. (1990). *Literacy for empowerment*. New York: Falmer.
- Dornbusch, S. M., Ritter, P. L., Leiderman, P. H., Roberts, D. F., & Fraleigh, M. J. (1987). The relation of parenting style to adolescent school performance. *Child Development*, *58*, 1244-1257.
- Dornbusch, S. M., Ritter, P. L., & Steinberg, L. (1991). Community influences on the relation of family statuses to adolescent school performance: Differences between African-Americans and Non-Hispanic Whites. *American Journal of Education*, *99*(4), 543-567.
- Ekstrom, R. B., Goertz, M. E., Pollack, 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.

- Ensminger, M. E., & Slusacick, A. L. (1992). Paths to high school graduation or dropout: A longitudinal study of a first-grade cohort. *Sociology of Education*, 65, 95-113.
- Epstein, J. L. (1990). School and family connections: Theory, research, and implications for integrating sociologies of education and family. *Marriage and Family Review*, 15(1-2), 99-126.
- Fehrman, P. G., Keith, T. Z., & Reimers, T. M. (1987). Home influence on school learning: Direct and indirect effects of parental involvement on high school grades. *Journal of Educational Research*, 80(6), 330-337.
- Fernandez, R. M., Paulsen, R., & Hirano-Nakanishi, M. (1989). Dropping out among Hispanic youth. *Social Science Research*, 18, 21-52.
- Fine, M. (1991). *Framing dropouts: Notes on the politics of an urban public high school*. Albany, NY: State University of New York Press.
- Finn, J. D. (1989). Withdrawing from school. *Review of Educational Research*, 59, 117-142.
- Finn, J. D. (1993). *School engagement and students at risk*. Washington, DC: National Center for Education Statistics.
- Gamoran, A. (1992). "Social factors in education." In M. C. Alkin (Ed.), *Encyclopedia of Educational Research* (6th ed., pp. 1222-1229). New York: Macmillan.
- Garner, C. L., & Raudenbush, S. W. (1991). Neighborhood effects on educational attainment: A multilevel analysis. *Sociology of Education*, 64, 251-262.
- Grant, C. A., & Sleeter, C. E. (1986). Race, class, and gender in educational research: An argument for integrative analysis. *Review of Educational Research*, 56, 195-211.
- Grisson, J. B., & Shepard, L. A. (1989). Repeating and dropping out of school. In L. A. Sheppard & M. L. Smith (Eds.), *Flunking grades: Research and policies on retention* (pp. 34-63). New York: Falmer.
- Hallinan, M. T., & Williams, R. A. (1990). Students' characteristics and the peer-influence process. *Sociology of Education*, 63, 122-132.
- Hammack, F. M. (1986). Large school systems' dropout reports: An analysis of definitions, procedures, and findings. *Teachers College Record*, 87(3), 324-341.
- Hanushek, E. A. (1986). The economics of schooling: Production and efficiency in public schools. *Journal of Economic Literature*, 24, 1141-1177.
- Hess, G. A., Jr., & Lauber, D. (1985). *Dropouts from the Chicago public schools*. Chicago: Chicago Panel on Public School Policy and Finance.
- Hess, G. A., Jr., Lyons, A., Corsino, L., & Wells, E. (1989). *Against the odds: The early identification of dropouts*. Chicago: Chicago Panel on Public Policy and Finance.
- Hess, A. G., Jr., Wells, E., Prindle, C., Liffman, P., & Kaplan, B. (1986). *Where's Room 185? How schools can reduce their dropout problem*. Chicago: Chicago Panel on Public School Policy and Finance.
- Ingles, S. J., Scott, L. A., Lindmark, J. T., Frankel, M. R., & Myers, S. L. (1992). *National Education Longitudinal Study of 1988, first follow-up: Student component data file user's manual*. Washington, DC: U.S. Department of Education.
- Jencks, C., Smith, M., Bane, M. J., Cohen, D., Gintis, H., Heyns, B., & Michelson, S. (1972). *Inequality: A reassessment of the effects of family and schooling in America*. New York: Basic.
- Jessor, R. (1993). Successful adolescent development among youth in high-risk settings. *American Psychologist*, 48(2), 117-126.
- Kaufman, P., & Bradby, D. (1992). *Characteristics of at-risk students in the NELS:88*. Washington, DC: U.S. Government Printing Office.
- Kolstad, A., & Kaufman, P. (1989, March). *Dropouts who complete high school with a diploma or GED*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

- Kominski, R. (1990). Estimating the national high school dropout rate. *Demography*, 27, 303-311.
- Lamborn, S. D., Mounts, N. S., Steinberg, L., & Dornbusch, S. M. (1991). Patterns of competence and adjustment among adolescents from authoritative, authoritarian, indulgent, and neglectful families. *Child Development*, 62(5), 1049-1065.
- Lareau, A. (1989). *Home advantage: Social class and parental intervention in elementary education*. New York: Falmer.
- Lee, V. E., & Bryk, A. S. (1989). A multilevel model of the social distribution of high school achievement. *Sociology of Education*, 62(3), 172-192.
- Lee, V. E., & Burkam, D. T. (1992). Transferring high schools: An alternative to dropping out? *American Journal of Education*, 100(4), 420-453.
- Lee, V. E., & Smith, J. B. (1993). Effects of school restructuring on the achievement and engagement of middle-grade students. *Sociology of Education*, 66(2), 164-187.
- Levin, H. M. (1986). *Educational reform for disadvantaged students: An emerging crisis*. West Haven, CT: National Educational Association.
- McMillen, M. M., Kaufman, P., Hausken, E. G., & Bradby, D. (1993). *Dropout rates in the United States: 1992*. Washington, DC: U.S. Government Printing Office.
- Mehan, H. (1992). Understanding inequality in schools: The contributions of interpretive studies. *Sociology of Education*, 65(1), 1-20.
- National Center for Education Statistics. (1992). *Are Hispanic dropout rates related to migration* (Issue brief)? Washington, DC: National Center for Education Statistics.
- National Research Council. (1993). *Losing generations: Adolescents in high-risk settings* (Panel on High-Risk Youth). Washington, DC: National Academy Press.
- Natriello, G. (Ed.). (1986). *School dropouts: Patterns and policies*. New York: Teachers College Press.
- Natriello, G., McDill, E. L., & Pallas, A. M. (1990). *Schooling disadvantaged children: Racing against catastrophe*. New York: Teachers College Press.
- Newmann, F. M. (1991). Student engagement in academic work: Expanding the perspective on secondary school effectiveness. In J. R. Bliss, W. A. Firestone, & C. E. Richards (Eds.), *Rethinking effective schools: Research and practice* (pp. 58-75). Englewood, NJ: Prentice-Hall.
- Newmann, F. M., Wehlage, G. G., & Lamborn, S. D. (1992). The significance and sources of student engagement. In F. M. Newmann (Ed.), *Student engagement and achievement in American secondary schools* (pp. 11-39). New York: Teachers College Press.
- Ogbu, J. U. (1989). The individual in collective adaptation: A framework for focusing on academic underperformance and dropping out among involuntary minorities. In L. Weis, E. Farrar, & H. G. Petrie (Eds.), *Dropouts from school: Issues, dilemmas, and solutions*, (pp. 181-204). Albany: State University of New York Press.
- Ogbu, J. U. (1992). Understanding cultural diversity and learning. *Educational Researcher*, 21(8), 5-14.
- Orfield, G., & Monfort, F. (1988). *Racial change and desegregation in large school districts: Trends through the 1986-87 school year*. Chicago: National School Boards Association.
- Pittman, R. B., & Haughwout, P. (1987). Influence of high school size on dropout rate. *Educational Evaluation and Policy Analysis*, 9(4), 337-343.
- Raudenbush, S. W. (1993). *Posterior modal estimation for hierarchical generalized linear models with application to dichotomous and count data*. Unpublished manuscript.
- Raudenbush, S. W., & Bryk, A. S. (1986). A hierarchical model for studying school effects. *Sociology of Education*, 59(1), 1-17.

- Rumberger, R. W. (1983). Dropping out of high school: The influence of race, sex, and family background. *American Educational Research Journal*, 20, 199-220.
- Rumberger, R. W. (1987). High school dropouts: A review of issues and evidence. *Review of Educational Research*, 57, 101-121.
- Rumberger, R. W. (1990). Second chance for high school dropouts: The costs and benefits of dropout recovery programs in the United States. In D. E. Inbar (Ed.), *The second chance in education* (pp. 227-250). New York: Falmer.
- Rumberger, R. W. (1991). Chicano dropouts: A review of research and policy issues. In R. R. Valencia (Ed.), *Chicano school failure and success: Research and policy agendas for the 1990s* (pp. 64-89). New York: Falmer.
- Rumberger, R. W., Ghatak, R., Poulos, G., Ritter, P. L., & Dornbusch, S. M. (1990). Family influences on dropout behavior in one California high school. *Sociology of Education*, 63, 283-299.
- Stevenson, D. L., & Baker, D. P. (1987). The family-school relation and the child's school performance. *Child Development*, 58, 1348-1357.
- Summers, A. A., & Wolfe, B. L. (1977). Do schools make a difference? *American Economic Review*, 67, 639-652.
- Tinto, V. (1987). *Leaving college: Rethinking the causes and cures for student attrition*. Chicago: University of Chicago Press.
- Toles, R., Schulz, E. M., & Rice, Jr., W. K. (1986). A study of variation in dropout rates attributable to effects of high schools. *Metropolitan Education*, 2, 30-38.
- Trueba, H. T., Spindler, G., & Spindler, L. (1989). *What do anthropologists have to say about dropouts?* New York: Falmer.
- U.S. Bureau of the Census. (1990). *School enrollment—Social and economic characteristics of students: October 1988 and 1987*. Washington, DC: U.S. Government Printing Office.
- U.S. Bureau of the Census. (1992). *Workers with low earnings*. Washington, DC: U.S. Government Printing Office.
- U.S. Department of Education. (1990). *National goals for education*. Washington, DC: U.S. Department of Education.
- Velez, W. (1989). High school attrition among Hispanic and Non-Hispanic white youths. *Sociology of Education*, 62(2), 119-133.
- Wehlage, G. G., & Rutter, R. A. (1986). Dropping out: How much do schools contribute to the problem? *Teachers College Record*, 87, 374-392.
- Wehlage, G. G., Rutter, R. A., Smith, G. A., Lesko, N., & Fernandez, R. R. (1989). *Reducing the risk: Schools as communities of support*. New York: Falmer.
- Weis, L., Farrar, E., & Petrie, H. G. (Eds.). (1989). *Dropouts from school: Issues, dilemmas, and solutions*. Albany: State University of New York Press.
- Wilson, W. J. (1987). *The truly disadvantaged: The inner city, the underclass, and public policy*. Chicago: University of Chicago Press.
- Witte, J. F., & Walsh, D. J. (1990). A systematic test of the effective schools models. *Educational Evaluation and Policy Analysis*, 12(2), 188-212.
- Wood, D., Halfon, N., Scarla, D., Newacheck, P., & Nessim, S. (1993). Impact of family relocation on children's growth, development, school function, and behavior. *Journal of the American Medical Association*, 270(11), 1334-1338.

Manuscript received March 8, 1994

Revision received December 28, 1994

Accepted February 3, 1995