Educational Achievement of Adolescents: Does Peer Network Segregation Matter?

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Short Abstract

The literature in demography and other social sciences emphasizes that schools as social institutions shape future citizens. Remarkably little attention has been paid to the role of ethnic social capital in school context as a factor of academic achievement of adolescents. Multilevel modeling on nationally representative data (the National Longitudinal Study of Adolescent Health) revealed that racial and ethnic composition of schools had no significant bearing on the academic outcomes of adolescents, while the income composition did. Moreover, the effect of network segregation not only exceeds those of school racial and ethnic composition and income composition but also figures as one of the strongest predictors of the academic achievement when all individual-level factors are controlled for. The results indicate that in schools where friendships are highly segregated by race and ethnicity students have better academic achievement than in schools where friendships are not segregated. Similarly, in schools where low-income students are concentrated the academic achievement is lower that in schools where the percentage of these students is low.

The United States is increasingly becoming ethnically diverse, most prominently so in the school-age population. Between 1986 and 1999, the White share of public school enrollment fell from 70.4% to 62.1%, while the percentages of African American, Latino, Asian, and Native American youth in the public school system rose (U.S. Department of Education, 1999). Paradoxically, at the very same time (since the late 1980s), for the first time since the historical *Brown* decision*,* racial segregation in schools began to increase. Harvard's desegregation project found that the percentage of black students attending high-percent minority schools, fell from 76.6% in 1968-69 to 62.9% in 1980-81, but by 1996-7, the figure had was back up to 68.8% (Orfield and Yun, 1999). In 2003, the same group reported that the enrollment of black students in predominantly white schools was lower than in any year since 1968 (Frankenberg, Lee, and Orfield, 2003). In fact, many of the inner city schools are more racially segregated today than in 1954 (Orfield, Eaton and Jones, 1997). Still, the most segregated minority group today is not blacks, but Latinos, with steadily rising segregation levels since federal data were first collected more than thirty years ago (Orfield and Yun, 1999). Despite the fact that many schools are ethnically segregated, there is still a great deal of diversity within their student bodies (Clotfelter, 2001). Although, according to Bankston and Caldas (1998: 534), "segregated schools are not and have never been the products of self-segregation by minority group members", the vast majority of teens are homophilic and prefer in-group associations (Joyner and Kao, 2000; Kubitschek and Hallinan, 1998; Moody, 2001). Even when schools have diverse populations, students may not be integrated in the sense that members of ethnic groups regularly interact with one another (Cohen, 1975; Epstein, 1985; Maran, 2000; Tatum, 1999). Thus, a relatively diverse student population does not ensure a high level of interracial contact among students.

Some studies that examined the effects of racial composition on student outcomes have

found that racial isolation harms academic achievement of minority students, although the authors say that it is hard to tell whether racial composition simply is a proxy for the actual social integration (or isolation) of minority students, school quality, and other effects (see Longshore and Prager 1985; Mahard and Crain 1983). Other studies have found little or no evidence linking racial segregation to academic achievement (see Bankston and Caldas 2002; Rivkin 2000). Regretfully, many of the mechanisms of how segregation affects achievement remain unknown. The intuitive explanation is that racial composition determines students' ability to make friends with students from other racial and ethnic groups. The possibility of frequent interracial contact in the integrated school, in turn, provides interracial information transfer. Thus the importance of interracial peer contact in the school has been of particular interest to social scientists as one of the rationales for pursuing desegregated schools.

This paper examines the importance of the school-level factors such as school racial/ethnic and income composition and network segregation in their combined effects on students' academic achievement while controlling for other school-related influences as well as individual and family factors such as socioeconomic status (SES). My main focus is: (1) Do youths in schools with higher percentages of minority enrollment have worse academic achievement than youths in schools with lower percentages of minority enrollment, (2) Do youths in high-SES schools have better academic achievement than youths in schools in low-SES schools, and (3) Do youths in schools that have more racially or ethnically segregated networks have worse academic achievement than youths in schools where networks are less segregated? Although previous research provides a record of attempts to examine the relationship between school social composition and educational outcomes, no prior work considered possible effects of *friendships* and *networks* that are formed in schools on academic

achievement. Thus the question of whether school-based ethnic social capital – proxied by the network segregation – can explain adolescents' academic achievement has been left open.

The significance of this study is both conceptual and empirical. First, it better captures the essence of school context by viewing adolescent networks and school composition as intertwined rather than isolated from each other. Second, I examine the school effects differentially by race-ethnicity. In particularly, I explore the tenets of the theory of oppositional culture that orientation of friendship ties towards co-ethnic and co-racial peers hurts the achievement of minorities. Third, the study draws on nationally representative data and multilevel modeling techniques well suited to these tasks. Forth, it examines the characteristics of the school while controlling not only for the family background but also for family social capital measured in terms of parent-adolescent relationships. Fifth, it examines academic performance both instantaneously and in dynamic. In other words, it controls for prior achievement. Sixth and most important, it distinguishes both class and race (components of so called "family background") as individual-level predictors of academic achievement and as school-level predictors (through the educational stratification).

PREVIOUS RESEARCH ON SCHOOL SEGREGATION

While education is viewed by many as an important mechanism for social mobility – tied to the strong belief that all children should have equal educational access and opportunity– many scholars argue that schools reproduce social inequality (Bankston and Caldas 2002; Carnevale 1999; Kahlenberg 1996; Roscigno 1998). The influences of race and social class on the academic achievement extend well beyond just family realm, they shape school attendance patterns and

contribute to the creation of highly segregated school contexts.

In the 20th century, the political issues surrounding ethnic/racial integration generally and school desegregation in particular aroused intense and bitter controversy and therefore kept social scientists busy in their continuous attempts to prove that school (de)segregation bear a certain effect on the academic achievement of both minority and majority students. So far, the evidence on the effects of desegregation has been mixed. Some studies demonstrated that the concentration of African American students in certain schools may have detrimental implications for student outcomes apart from the individual characteristics of students (Bankston and Caldas 1996). Other studies have found little or no evidence linking racial segregation to academic achievement (Ascher 1992; Leake and Leake 1992; Rivkin 2000). Although the effects of racial composition on white achievement have not received the attention devoted to implications of school desegregation on minority children, studies, in general, found little or no effect on white achievement (Coleman et al. 1966; Crain and Mahard 1978; Jenks 1972). Efforts to synthesize the research findings on the effects of desegregation have led some to conclude that the evidence is so mixed or contradictory that one can draw no reliable conclusions from it (see, for example, Bankston and Caldas 2002). One explanation for the apparent ambiguity of much of the research is that the effects of desegregation vary enormously from community to community and from school to school.

Some have argued that school racial segregation is not a problem in itself. Instead, the best indicator of the school quality is their socioeconomic composition. Much evidence shows that high-poverty schools reduce the educational performance of children, even controlling for children's own class and race (e.g., Bankston and Caldas 1996; Entwistle and Alexander 1992; Kahlenberg 1996). Indeed, when we address the question of *why* it is a disadvantage to attend a

school segregated by race or class, it becomes clear that the primary issue is one of class. Student attitudes and behaviors toward cutting classes, missing school, and doing homework – and parent attitudes toward school involvement – all are determined by class much more than race. Unsurprisingly, studies find that social class matters more than race in predicting odds of dropping out, academic achievement, and problem behaviors (Kahlenberg 1996).

Not only is socioeconomic integration important in its own right to improving academic achievement, studies find that it is more important than racial integration in this regard. Researchers have found that when looking at achievement, significant benefits of school desegregation arise only when socioeconomic, as well as racial, integration occurs (see the review of literature on the subject in Kahlenberg 1996). Indeed, for many years, sociologists have agreed that the reason racial desegregation improves the academic achievement of minority students had nothing to do with the whiteness of the classmates but rather with their economic status (see, for example, Caldas and Bankston 1997). The most voluminous study in the field up to date – the Coleman report – found that the "beneficial effect of a student body with a high proportion of white students comes not from racial composition per se but from the better educational background higher educational aspirations that are, on the average, found among whites" (Coleman et al. 1966:307). Perhaps more important, the report confirmed, that low-income students have higher levels of achievement, and/or larger achievement gains over time, when they attend middle-class schools than when they attend high-poverty schools. The study further found that the social composition of a school's student body is more highly related to achievement, independent of the student's own social background, than is any school factor. Accordingly, poor blacks or whites would benefit from attending a middle class black school, poor blacks would not benefit in achievement by attending schools with poor whites.

Numerous studies conducted after the Coleman report have reached a similar conclusion: that for achievement, the social class of a student's classmates matters more than their race. Jenks' study (1972) that reviewed the Coleman analyses found that poor sixth-grade students attending a high-poverty school were lagging years behind their poor peers from a middle-class school, with no significant difference between the races. Chubb and Moe (1990), using longitudinal data, found the average socioeconomic status (SES) of the school's student body was strongly associated with the gains in academic achievement among high school students. Sui-Chu and Williams (1996), after examining factors that influence math and reading scores of eighth-graders, concluded that the effect of the SES of a school was as strong as that of a family SES. Using a nationally representative sample of schools, Puma et al. (1997:73) observed that "the poverty level of the school (over above the economic status of an individual student) is negatively related to standardized achievement scores". Not surprisingly, the accumulated evidence in desegregation research made Orfield (1978:78) conclude: "Educational research suggests the basic damage inflicted by segregated education comes not from racial isolation but from the concentration of children from poor families."

PREVIOUS RESEARCH ON PEER NETWORKS

When we think about *how* school segregation impacts student outcomes, the most plausible answer lies in the problem of social isolation that cuts minority students off from the mainstream. According to Hallinan (1982), the racial-ethnic socioeconomic composition of a student body determines the probability of interracial friendship formation by influencing the composition of friendship pools from which students draw. Overall, interracial friendship ties are

considered by many researchers to be beneficial for minority students. The Coleman report, coming from the normative approach, explained the benefits of school integration as the transmission of values, possibly, the diffusion of socially acceptable patterns of behavior from the more privileged racial group to the less privileged that occurs *though* the interracial contact (Coleman et al. 1966; Gerard 1988). Other scholars stressed the importance of information transfer which is facilitated in integrated environments (e.g., Chubb and Moe 1990). Yet others (e.g., Hawley and Smylie 1988) argue that the interracial friendships provide minorities with access both to resources and to means of self-presentation and patterns of communication acceptable to majority. Chubb and Moe (1990:109) consider peer friendships at the school, in general, to be a critical link between families and schools because "through their peers, students are influenced by the families of other students in a school". The acquaintances and communications between students foster social capital because they make possible network connections among sets of individuals (Hallinan and Sorensen 1985; Harris et al. 2002; Kubitschek and Hallinan 1998; Morgan and Sorensen 1999). Implicit in the concept of "social capital" as it applies to adolescents is the impact of group membership (Becker, 1962; Hofferth, Boisjoly, and Duncan, 1999). Because adolescents spend many hours together, the peer group has been generally identified as one of the most important influences on individual achievement.

Peer group theory predicts that the prospects for school success of adolescents will vary depending on the peer group with whom adolescents most often come into contact – the context in which exposure to others, including role models, involves contemporaneous behavioral influences is always reciprocal (Coleman et al. 1961, Coleman 1988; Schneider and Coleman, 1993). Peer group influences are usually understood to produce some sort of imitative behavior facilitated by interdependences in information transmission, so that the behavior of others alters

the information on the effects of such behaviors available to a given individual (Berndt, 1979; Savin-Williams and Berndt, 1990). The extensive literature notes that a child's peer group influences social and academic development that these influences begin at the very start of formal education (Dishion et al., 1995; Galambos et al., 2003). Specifically, some academics argue that adolescent subcultures often challenge adult authority and students who are inclined to peer pressures tend to fail academically (Berndt and Keefe 1995; Wentzel and Caldwell, 1997). The assumption that adolescents begin to reject the values of their parents in order to follow along with their peers has led to an abundance of research which has focused on the peer influence phenomenon in terms of antisocial behaviors, such as smoking, drug use and sexual behavior (e.g., Bahr, Marcos and Maughan, 1995; Diclemente, 1991). Although peer influence has associated with adolescents' motivation on subsequent academic achievement in a number of studies (e.g., Berndt and Keefe, 1995; Epstein, 1983; Steinberg, Dornbusch and Brown, 1992), researchers have continued to examine solely the negative impact of peer influence while placing little emphasis on the positive aspects of peer socialization. Considerable literature, stemming from the theory of oppositional culture (Ogbu 1978, 1981), examined cultural patterns penalizing academic achievement. The theory of oppositional culture describes a cultural pattern within the African-American and Latino communities (*involuntary minorities*, according to Ogbu (1978)) whereby peers disparage academic achievement because it is perceived as "selling out" or "acting white" (Fordham and Ogbu, 1986; Ogbu, 1991). Black peers, as Fordham and Ogbu (1986) observed view academic success as a threat to group solidarity and negatively sanction students who perform well. Involuntary minorities, primarily blacks and Latinos, thus tend to develop a collective oppositional culture, a frame of reference that actively rejects mainstream behaviors to undermine academic achievement. In other words, children in this culture are often

ostracized for conforming to the educational system. As a result, Steinberg et al. (1992) argue that minority students receive less support for achievement from their peers of the same ethnic background, and do not fare as well in school as European American students. Just as a link has been established between negative peer influence and academic outcomes (Berndt, Laychak and Park, 1990; Berndt and Keefe, 1995), a similar link may be established between positive peer influence and academic outcomes (e.g., Epstein, 1983). There are examples of research that defies the oppositional culture theory. Carter (2003), for example, reported that black and Latino students rejected certain styles of speech, dress, and music as "acting white" but nonetheless valued behaviors conducive to academic success, such as studying hard, getting good grades, and making the honor roll.

In thinking about ways in which peers can impact the academic achievement of adolescents, it is important to investigate the impact of positively oriented peer influences as related to academic achievement. One way to think about this issue is to examine the effects of ethnic social capital on adolescents' academic outcomes. The notion of "ethnic social capital" has been developed by Borjas (1992, 1995) and applied primarily by him and other theorists (e.g., Portes, 1998; Portes and Rumbaut 2001) in the field of immigration and assimilation. Borjas (1995) locates ethnic social capital in the ethnic group and its networks. He hypothesizes that minority children can enjoy increased chances of economic success when they develop in social environments with larger amounts of ethnic capital. The ethnic groups and networks provide intergenerational transmissions of social and human capital, norms regarding educational attainment, educational and job information, and employment opportunities. Those ethnic groups that maintain strong ethnic solidarity and resist acculturation provide better opportunities for their younger generation through the creation of ethnic social capital. Moreover, as Portes and

Rumbaut (2001) pointed out, minority groups may have more opportunities to form and maintain informal social networks and relationships among themselves. Thus ethnic social capital can be exceptionally important for minority youth, particularly in the school context. However, this circumstance was neglected by many scholars because co-racial and co-ethnic peer influences for minority adolescents were traditionally viewed as a liability, not an asset.

DATA AND METHOD

The dataset used is the 1995 National Longitudinal Study of Adolescent Health (commonly known as Add Health). It is a nationally representative dataset that provides extensive information on schools, family background of individual students. The possibilities are especially noteworthy given Add Health's large sample size. Additionally, this dataset provides extensive information on a broad array of topics related to school social composition, peer networks, behavioral and family dynamics that are of interest to an empirical research.

The total sample size of the Wave 1 In-Home sample consists of 20,745 students from 132 schools. The sample for this study was created by applying two selection filters to the full longitudinal In-Home sample (Waves 1 and 2). First, since all of my analysis is based on weighted data with the intention of taking into account unequal probability of selection survey nonresponse, the cases without valid weights were excluded from my analyses. Second, owing to the small number of respondents within some schools, the calculated school racial-ethnic

composition measure for these schools was not statistically reliable, for this reason these schools were dropped from the sample. This further reduction in the sample size was insignificant (final n=13,738 students from 129 schools). Table 1 presents descriptive statistics for each stage of the selection process. Although the criteria of selection were necessary to analyze the processes at the heart of this study, the loss of cases introduced by these filters did not introduce any bias. Weighted means and standard deviations for the variables in the sample are presented in Table 2.

[Table 1 is about here]

[Table 2 is about here]

This dataset is visibly distinguished by a hierarchical structure. Thus, student achievement may be described as a function of individual-level characteristics (e.g., SES, sex, age), school-level factors (e.g., school racial and ethnic composition). Hierarchical Linear Models (HLMs) incorporates such factors in a manner better than ordinary least squares since HLMs take into account error structures at each level. HLMs allow for the analysis of relationships on a number of levels (see Bryk and Raudenbush (1992) for more information on HLMs). The intraclass correlation coefficient (Bryk and Raudenbush, 1992; results not shown here) indicates that approximately 10% of the variance in the dependent variable is due to between-school differences in the mean of the dependent variable, a relatively small but significant amount.

DEPENDENT VARIABLE

The dependent variable of this study is academic achievement measured as GPA in Wave 1 and Wave 2. **A**dolescents reported their grades in four subjects (math, science, English, and social studies) in the past year. These responses, ranging from 1 (D or F) to 4 (A), were averaged across subjects and then converted to a standard 4-point grade point average for each year. Although slightly inflated, self-reported grades are highly correlated with grades reported on official transcripts (Dornbusch et al. 1990). Table 2 shows that the average GPA in both Waves was about 2.8 (SD=0.76 in Wave 1 and 0.73 in Wave 2).

INDIVIDUAL-LEVEL VARIABLES

The individual-level variables are intended to control for individual-level factors that might have an impact on academic achievement. Because my primary focus is on the school composition and peer networks that might affect achievement, I have no specific hypotheses about the gender and age variables. Gender has a reference category "female" and age is measured in years at the date of the interview. As it can be seen from Table 2, the sample's sex ratio is balanced, with equal proportions of male and female students, and the average age of adolescents at the date in the Wave 1 interviews, which took place during the summer of 1995, was 15 years (SD=1.65). Students were asked to identify their own race and ethnicity. From these responses, I created a series of dichotomous variables for Asian, Latino, African American, and Non-Hispanic White (reference) race-ethnicity, with the latter used as the reference category in the analyses. In the data set, 68% reported they were non-Hispanic White, 17% were African American, 15% were Hispanic, and 5% were Asian (Table 2).

Students who spend less time learning outside of school also spend less time engaged in learning in school. Typically, high-achieving students spend more time engaged in learning activities in school and outside of school than lower-achieving students (Blum and Reinhart 1997). These activities include reading, writing, arts and crafts and other extracurricular activities. The question on extracurricular activities comes from asking: "During the past week, how many times did you do hobbies, such as collecting baseball cards, playing a musical instrument, reading, or doing arts and crafts?" The answers vary from 0 "not at all" to 3 "5 or more times".

Prior research shows that the educational outcomes of adolescents are associated with their immigrant generational status (e.g., Kao and Tienda 1995, Orfield and Yun 1999). Two immigrant generations are created – "generation 1.0" and "generation 1.5" – while simultaneously controlling for the effect of age at arrival. Adolescents who are foreign-born and who were less than 6 years of age at the time of the interview are coded as first-and-half generation immigrants. Six-year olds and older foreign-born adolescents are coded as first-generation immigrants. Preliminary analyses showed that arrival by age 6 is associated with a markedly different schooling. I further distinguish "generation 2.0" – U.S.-born children with at least one foreign-born parent – and "generation three" – both adolescents and their parents being U.S.-born.

Family Structure and Size. Family structure is indicated by a set of dummy variables obtained from the household roster that contrasts youth who live with biological or adoptive parents (reference), single parent, and other relatives. Family structure is believed to affect well-being by influencing family functioning (McLanahan and Sandefur 1994; Thomson, Hanson, and McLanahan. 1994). A measure of household size is represented by a dummy variable (family of

four is considered small and taken as a reference). Research on household composition (e.g., Bridge et al. 1979, Nelson et al. 2001) suggests a link between household size and adolescent well-being with adolescents in smaller size households exhibiting better well-being, especially with regard to educational achievement.

Socioeconomic Status (SES). Household income, and parents' education are included to control for SES, a factor is often linked to adolescent academic achievement (e.g., Bridge et al. 1979, Cogner et al. 1997; Lareau, 1989; McLoyd 1998). Income is obtained from the response by parents to the question: "About how much total income, before taxes did your family receive in 1994? Include your own income, the income of everyone else in your household, and income from welfare benefits, dividends, and all other sources." Responses are coded in units of 1000 and range from 0 to 999. Those cases with negative income were recoded as zeros because reports of negative household income, as opposed to individual income, may indicate debt and, thus, differ from the income measure in nature.[1] Parents' education comes from items asking: "How far did she [mother] go in school?" or "How far did he [father] go in school?" This is a measure of the highest level of education completed. Response categories range from "eighth grade or less" (coded 1) to "graduate training beyond a four-year college or university" (coded 9). Both parents' occupational prestige and education are recoded to account for family structure and capture the highest level of prestige and education achieved.

Family Social Capital Measures. There is much evidence that family capital is associated with the educational achievement of adolescents (e.g., Tienda and Angel, 1982; Hetherington,

[1] To reduce the skewness of the original income variable in the Add Health Parents data set, family income was transformed using Box-Cox family of transformations $Transformed\ \ Income = \frac{(Income+1)^{0.2}-1}{0.2}$. Fore more on Box-Cox transformations, see Box and Cox (1964).

1998; Israel, Beaulieu and Hartless, 2001; Morgan and Sorensen 1999; Patterson Reid, and Dishion, 1992). Components of family capital such as parents' expectations for further education of their children, parental supervision and involvement have been documented to influence educational outcomes of adolescents (e.g., Conger et al. 1994; Israel et al. 2001; Laosa 1992; Lee 1993; McLoyd 1998; McNeal 2001; Patterson et al. 1992). Parents' educational expectations is the index created from two items asked separately about mother's and father's expectations. Respondents were asked how disappointed each of their parents would be if they failed to graduate from (1) college, and (2) high school. Responses range from 1 (low disappointment) to 5 (high disappointment). The reliability coefficient for the four items is 0.82. Responses are averaged to create an index. Parental educational expectations capture cultural variation in the family's emphasis on educational achievement, a family context characteristic that is often linked to immigrant academic success (Vernez and Abrahamse 1996). Parents' involvement is constructed out of nine items that inquire into the activities that parents and adolescents do together within a 4-week period. Adolescents were asked if they had done each of the following with each parent: (1) gone shopping, (2) played a sport, (3) attended a religious service or related event, (4) talked about life, (5) talked about a date or party attended, (6) attended a movie, sports event, concert, play, or museum, (7) talked about a personal problem, (8) discussed grades or school work, (9) worked on a school project, and (10) talked about other school activities. Response choices are "yes" and "no". The activities in which the adolescent and at least one parent had engaged are summed to form the index. The scale has a Cronbach's alpha of 0.72. Parents' supervision is a count variable ranging from 0 to 3 indicating whether a parent is present in the home most or all of the time when the adolescent (1) goes to school in the morning, (2)

comes home from school in the afternoon, and (3) goes to bed at night (Cronbach's alpha of 0.68).

SCHOOL-LEVEL VARIABLES

In this article, I focus primarily on two features of the composition of the student body in the school: racial and ethnic composition, and socioeconomic composition. Although the measures of school racial and ethnic composition – percentage Hispanic, percentage Asian, etc. – are not directly given by the Add Health, they can be calculated directly from the student race-ethnicity responses. Race-ethnicity for these calculations is defined using the same coding as for individuals. Specifically, I construct the race and ethnicity composition variable to measure the proportion of minority students in the schools. Considering the fact that Latinos attend schools with far higher average black populations than whites do, and that blacks attend schools with much higher average Latino enrollments, while Asians, the nation's most highly educated racial group, attend the most integrated schools and experience less linguistic segregation than Latinos (Orfield and Yun 1999), I considered Latinos and blacks only as minority students when I constructed my measure of racial and ethnic composition. My further analyses (Table 4) confirm that the academic achievement of Asians is higher than that of Non-Hispanic white students.

To gain a better grasp of the construct *SES,* the present study examines two variables that respectively measure particular socioeconomic and educational characteristics of the student bodies' families. These are family income and parents' education. I consider it important for the purposes of the present study to measure and analyze them separately at the individual level, because some immigrant groups, especially Latinos, report very low levels of educational

attainment, and in part because the jobs (and therefore income) available to immigrants often do not correspond well to their educational attainment. At the school level, however, these variables are strongly intercorrelated (Cronbach's alpha = 0.90). Thus I constructed aggregate school-level SES measure as a sum of the standardized scores of its components.

According to Blau (1994), students cannot form friendships with students of other racial and ethnic groups if schools are homogenous. Interracial contact is a prerequisite for the formation of interracial friendships. For this reason, I included a measure of the network segregation of the school that the student is attending. Many students named as friends are also members of the sample. This allows friends to be matched and to determine the characteristics of friends based on their responses to the survey. The Add Health in-school and in-home questionnaires both ask students to list their five best male friends and, in a separate question, their five best female friends (including their girlfriends and boyfriends). For each participating school, the Add Health obtained a roster of its students and assigned identification numbers to them. These rosters enabled students to find their friends in their school and a sister school. These identification numbers can directly determine the race-ethnicity of adolescents' friends. On the basic of friendship preferences, the Add Health constructed the modified Freeman's (1978) race segregation index. This index is calculated as follows:

$$Segregation\ \ Index\ \ = \frac{Expected\ \ \ Ties\ \ \ -\ \ \ Observed\ \ \ Ties}{Expected\ \ \ Ties}$$

where *ties* refers to the total number of ties sent from a network member sharing one characteristic (such as race or ethnicity) to all other network members not sharing that charactersitic, summed across all characteristics. The segregation index has a theoretical minimum of -1 (pure out-group preference) and a theoretical maximum of 1 (pure in-group

preference, or total segregation). A value of 0 indicates no group-preference: ties are set randomly with respect to this categorical attribute.

Table 3 presents the means of the dependent variable (GPA at Waves 1 and 2) by three levels (high, medium, and low) of the school-level independent variables.[2] The descriptive statistics demonstrate that students in schools with low levels of SES and peer network segregation and high percentages of minority students are likely to have a lower GPA in both Waves of the Add Health. The analyses in Table 3 also show that two school-level variables in my analyses are slightly skewed – the percentage of minority students and racial segregation index. The difference in the means between schools with low and medium levels of the percentage minority and high and medium levels of the segregation index is only slightly visible as compared to that between high and medium levels of the percentage minority and low and medium levels of the segregation index. Therefore, I transformed these variables using the Box-Cox family of log-linear transformations (Box and Cox 1964) after testing the effects of several alternatives. As a matter of fact, skewed variables can produce heteroscedasticity and inflated standard errors of the estimates in regression analysis. These problems reduce the statistical power of significance tests which result in larger confidence intervals and make the rejection of the null hypotheses more difficult (Stevens 1996).

[Table 3 is about here]

[2] 25th and 75th percentiles of the distributions of the school-level independent variables were used to delineate schools with high, medium, and low percentages of SES, minority students, and segregation index.

RESULTS

I present four sets of analyses. The first is a between-school analysis, where the effects of school contextual characteristics and network segregation on academic achievement are examined with and without individual-level controls (Table 4). The second analysis determines whether family social capital helps to explain any association between school-level factors and achievement (Table 5). In the third analysis, I examine the possibility of whether the apparent connection between school racial-ethnic composition and achievement is "explained away" by network segregation (Table 6). Finally, I explore some cross-level interactions (Table 7). The Wave 1 predictors of the GPA were estimated first and then the very same procedure was repeated for the predictors of the Wave 2 GPA.

[Table 4 is about here]

Table 4, Model 1 shows the effects of school-level variables on GPA while allowing individual-level effects to vary randomly. Not only the average SES of the school has a significant impact on the academic achievement of an individual adolescent, but it clearly supercedes the effects of other school-level factors. The second model of Table 4 adds in the individual-level measures. Model 2 shows that the effect of network segregation is greatly strengthened by the addition of the individual-level controls while the school composition effects seem to subside, as in case of average SES of school, or nearly disappear, as in case of the percentage of minority enrollment. Comparison of the deviance statistics shows that the percentage of minority students was adding very little to the explanatory power of the model.

Thus, after controlling for family background and other individual and family characteristics, only two school-level factors are found to be important predictors of academic achievement (and its change over time, as evidenced by the analysis of Wave 2 GPA while controlling for Wave 1 GPA) – school socioeconomic composition and network segregation. Moreover, the association between these two school-level measures, on the one hand, and academic achievement, on the other, is positive. In other words, the higher SES of schoolmates and the more segregated are their networks, the higher the academic achievement of the student.

Table 4, Model 2 also demonstrates the effects of the individual-level variables, controlling for the school-level variables. The presence of so-called "race gaps" in achievement is evident (Jencks and Phillips, 1998), with predicted GPAs of Latino and black students at 95 and 96% of Non-Hispanic white GPAs, respectfully. Asian GPAs are higher than those of Non-Hispanic whites. More important, the gaps in achievement between racial-ethnic groups have a tendency to widen with time as it can be seen from the change in GPA between Waves 1 and 2. Thus, Asians tend to outperform other groups, while blacks and Latinos seem to be lagging further behind Non-Hispanic whites and Asians. With the school-level variables controlled, male students are more likely than female students to have higher GPA. Indeed, gender seems to be one of the strongest predictors of achievement at the individual level. There is a significant positive association between achievement and immigrant generational status (generations 1 and 2, but not 1.5). The immigrant advantage over natives in all likelihood is due to the effective ethnic resilience mechanisms and ethnic social capital present in immigrant networks (see Ogbu, 1981; Bankston, Caldas, and Zhou, 1997; Borjas, 1992). It should also be noted that achievement (and its change over time) and frequency of involvement in extracurricular activities are positively associated.

[Table 4 is about here]

Consistent with earlier research (Cox et al. 2001, Muller 1995, Nelson et al. 2001), family structure has a significant impact on achievement. Specifically, educational outcomes of children in single-parent families, large families and guardian families (headed by other relatives than parents) are worse than those of children reared in two-parent families. Both Wave 1 GPA and Wave 2 GPA are strongly influenced by family SES, particularly income, and family social capital, particularly parents' educational expectations and parents' involvement. As expected, parents' SES as well as close bonds between adolescents and their families and instrumental parenting behaviors (e.g., parents' involvement) associated with these bonds are associated with higher achievement.

Table 5 tests for possible mediating effects of family social capital. For parsimony, the regression coefficients of control variables are not shown. Table 5, Model 1 does not include family social capital measures, while Model 2 does which means it is identical to Model 2 in Table 4. Table 4 demonstrates that family social capital does help to explain the associations between school-level factors and achievement. After controlling for family social capital, the positive effect of the average school SES on Wave 1 GPA strengthens while that of the percentage of minority students declines. The effect of the racial segregation index on GPA stays the same, whether in case Wave 1 or Wave 2, implying that the effects of network segregation and family social capital are independent from each other. The effects of race-ethnicity do not seem to be influenced by the presence of the family social capital measures in the model too. The only exception is Asian GPA at Wave 1 which declines once the effects of social capital factors

are included in the analyses. This may mean that family-level social capital makes up for the attendance in low-SES schools for Asians and whites (because the latter are reference category). The likely implication is that Asian and white advantage in achievement over other racial-ethnic groups can be explained by the protective and supportive influences of their families.

[Table 5 is about here]

Table 6 explores whether the racial segregation index moderates the impact of school composition on achievement. In order to verify the possibility that the relationship between school racial-ethnic composition and GPA is spurious, I first estimate Model 1 with two factors at the school-level (average school SES and percentage minority) and all individual-level controls and then add in the racial segregation index (Model 2). The results indicate that the relationship between the racial-ethnic composition of the school and the educational achievement of its students is indeed spurious. The regression coefficients of the percentage of minority students shift between Models 1 and 2 from -0.17 to -0.04 in case of Wave 1 GPA and from -0.11 to 0.00 in case of Wave 2 GPA. Thus it is not the racial-ethnic composition that matters but the level of segregation of peer networks in school. Moreover, the coefficients of the average school SES go up once the segregation index is controlled for. As it was demonstrated by the analyses in Tables 4-5, class turns out to matter more than race as a measure of school composition. Consequently, the analyses presented in Table 5 prove that students attending high-SES schools and schools with more segregated peer networks are likely to have better academic outcomes.

[Table 6 is about here]

Finally, Table 7, Model 2 introduces cross-level interactions between the segregation index and average SES of the school, on the one hand, and, and individual-level race-ethnicity variables. In case of Wave 2 GPA, the interactions are not significant. I case of Wave 1, however, the interactions of African-American race-ethnicity and both of the school-level measures are significant. Particularly, the results from the cross-level interaction reveal the negative impact of average SES of the school on the academic achievement of black adolescents. In contrast, the impact of network segregation for blacks is positive. In other words, the interactions show that blacks, unlike adolescents of other race-ethnic groups, are likely to have better outcomes in low-SES schools and schools with more segregated peer networks. Figures 1 and 2 demonstrate these findings graphically. As one can see from Figure 1, the predicted GPA of blacks is remarkable different from predicted GPA of all other adolescents, which is evident from the signs and angle of slopes (with blacks having a much steeper slope). The difference in predicted values in Figure 2 between blacks and other adolescents is less notable because the slopes signs are the same, yet the academic achievement of blacks in schools with more segregated peer networks is even higher than that of other students.

[Figure 1 is about here]

[Figure 2 is about here]

These findings contradict the commonly held assumptions about the influence of the school context and peer influence on black achievement (see, for example, Bankston and Caldas 2002 on socioeconomic segregation and Ogbu 1974; 1991 on peer effects). First, it appears that an adverse effect of attending a low-quality school (if the school quality can be defined in terms of its social class composition) applies to all other adolescents, but not to blacks. The explanation, most likely, rests in the nature of GPA as a measure of educational achievement. Grades are strongly influenced by school policies, tracking, and teachers' expectations and attitudes. Since the information on all these factors is not available in the Add Health questionnaire it was impossible to control for them in this study. Second, contrary to the tenets of the theory of oppositional culture (Ogbu 1974, 1991), the co-racial friendships do not harm the academic achievement of black adolescents. In fact, blacks in the schools with a higher degree of segregation of peer networks by race-ethnicity are predicted to have better academic outcomes. Even in the most complete model, however, there is still a significant portion of variance at the school level, roughly 80%, remaining to be explained. Future research could address this remaining variance by considering three sources of difference among schools: administrators' attitudes, teachers' attitudes, tracking and school policies. Unfortunately, data were not available for any of these measures in the Add Health.

CONCLUSION

The major finding is that, when it comes to the educational outcomes, the socioeconomic composition of students and peer network segregation matter much more than the school racial-

ethnic composition. In particular, white, Asian and Latino adolescents in low-SES schools are more likely to have poorer academic achievement than their co-racial counterparts in high-SES schools. The opposite, however, is true for black students. Most likely due to the teachers grading policies and other school factors, blacks have lower academic achievement in high-SES schools. Moreover, all adolescents, but especially blacks, in schools where friendships are formed mainly *within* racial-ethnic groups are predicted to have better academic achievement than students in schools where friendships are formed *between* racial-ethnic groups. This is exactly the opposite of what can be inferred from the previous studies and what the desegregation caucus argues for (Hallinan and Williams 1989; Bankston and Caldas 1996; Orfield and Yun 1999; Hoxby 2000).

Among the individual-level factors, those related to race-ethnicity and family background are by far the most influential. As expected, the academic achievement of children from low-SES families is lower than those from high-SES families. Non-Hispanic white and Asian students have been shown to have much better academic achievement than Latino and black students. The family social capital factors are equally important as predictors of achievement and mediators of the effects of race-ethnicity. Non-Hispanic whites and Asians seem to receive more support from their families, while Latinos and black do not. Moreover, if we consider a person who is female, minority (either black or Latino), low SES, has low levels of family social capital, and attends a school with highly segregated networks, this person, according to my analysis, is expected to have the lowest academic achievement.

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Table 1. Unweighted Means of Some Independent Variables for Each Stage of the Sample Selection Process.

Measures	Means		
	Wave 1	**Filter 1[a]**	**Filter 2[b]**
Age (in years)	15.66	15.65	15.30
Gender (male)	0.86	0.86	1.00
Asian	0.10	0.10	0.09
Black	0.24	0.25	0.23
Latino	0.20	0.20	0.20
Non-Hispanic White	0.54	0.53	0.55
Parents' Education (Wave 1)	5.47	5.45	5.50
Family Income [c]	5.27	5.24	5.28
N	20,745	14,738	13,738

[a] Valid sample weights. [b] Valid measure of school racial-ethnic composition. [c] Family income was transformed by the Box-Cox method in order to satisfy the multilevel normality condition of HLM (see more on HLM in Raudenbush Bryk 2002).

Table 2. Means and Standard Deviations of Study Variables (N=13,738).

	Wave 1		Wave 2	
	Weighted Mean	Standard Deviation	Weighted Mean	Standard Deviation
School-Level Factors				
Average SES	0.84	0.02		
Percentage of Minority Students [a]	0.28	0.20		
Racial Segregation Index [a]	0.24	0.11		
Race-Ethnicity				
African-American	0.17	0.37		
Asian	0.05	0.23		
Latino	0.15	0.36		
Non-Hispanic Whites	0.68	0.47		
Individual-Level Controls				
Age	15.02	1.65	15.96	1.66
Male	1.00	0.01		
Immigrant Generation 1	0.04	0.19		
Immigrant Generation 1.5	0.02	0.13		
Immigrant Generation 2	0.10	0.30		
Extracurricular Activities	1.36	1.61		
Family Structure				
Two-Parent Household	0.57	0.50	0.58	0.49
Single-Parent Household	0.25	0.43	0.33	0.47
Non-Parent Household	0.18	0.38	0.18	0.38
Large Household	0.21	0.40	0.19	0.39
SES				
Parents' Education	5.35	2.27	5.28	1.91
Family Income [a]	5.22	1.50		
Family Social Capital				
Parents' Educational Expectations	4.33	0.90	4.27	0.93
Parents' Involvement	0.44	0.30	0.33	0.16
Parents' Supervision	3.84	0.71	3.79	0.75
GPA	2.79	0.76	2.79	0.73

[a] Percentage of minority students, race segregation index, and family income were transformed by the Box-Cox method in order to satisfy the multilevel normality condition of HLM (see more on HLM in Raudenbush and Bryk 2002).

Table 3. Average GPA at Waves 1 and 2 in Schools with High, Medium and Low School SES, Percentages of Minority Youth and Racial Segregation Index.

School-Level Variable	GPA, Wave 1	GPA, Wave 2
School SES		
High	2.96	2.95
Medium	2.80	2.79
Low	2.65	2.65
Percentage Minority in School		
High	2.71	2.73
Medium	2.81	2.83
Low	2.85	2.83
Segregation Index		
High	2.87	2.88
Medium	2.85	2.84
Low	2.63	2.62

Table 4. HLM Regression Coefficients of Individual-Level School-Level Predictors of GPA.

	GPA (Wave 1)		GPA (Wave 2)	
	Models			
	1	2	1	2
School-Level Factors				
Average SES	5.98 ***	1.47 *	2.26 **	0.45 +
Percentage of Minority Students	-0.19 +	-0.04	-0.14 +	0.00
Racial Segregation Index	0.01	0.15 *	0.02	0.12 *
Race-Ethnicity				
African-American		-0.10 ***		-0.09 ***
Asian		0.05 +		0.06 *
Latino		-0.14 ***		-0.08 ***
Individual-Level Controls				
Age		-0.04 ***		0.00
Male		3.65 ***		0.16
Immigrant Generation 1		0.29 ***		0.01
Immigrant Generation 1.5		-0.03		0.03
Immigrant Generation 2		0.07 **		0.00
Extracurricular Activities		0.09 ***		0.05 ***
Family Structure				
Single-Parent Household		-0.09 ***		-0.04 **
Non-Parent Household		-0.09 ***		-0.04 **
Large Household		-0.04 *		0.01
SES				
Parents' Education		0.04 ***		0.00
Family Income		0.07 ***		0.03 ***
Family Social Capital				
Parents' Educational Expectations		0.09 ***		0.03 ***
Parents' Involvement		0.09 ***		0.14 ***
Parents' Supervision		0.04 ***		0.01
Wave 1 GPA			0.60 ***	0.54 ***
Constant	2.79 ***	2.76 ***	2.76 ***	2.77 ***

***p<0.001; **p<0.01; *p<0.05; $^{+}$ p<0.1.

Table 5. HLM Regression Coefficients of Race-Ethnicity School-Level Factors with and without Family Social Capital Measures. [a]

	GPA (Wave 1)		GPA (Wave 2)	
	Models			
	1	2	1	2
School-Level Factors				
Average SES	1.30 +	1.47 *	0.64 +	0.45 +
Percentage of Minority Students	-0.08	-0.04	0.04	0.00
Racial Segregation Index	0.17 *	0.15 *	0.12 *	0.12 *
Race-ethnicity				
African-American	-0.10 ***	-0.10 ***	-0.09 ***	-0.09 ***
Asian	0.08 *	0.05 +	0.05 *	0.06 *
Latino	-0.14 ***	-0.14 ***	-0.08 ***	-0.08 ***
Family Social Capital				
Parents' Educational Expectations		0.09 ***		0.03 ***
Parents' Involvement		0.09 ***		0.14 ***
Parents' Supervision		0.04 ***		0.01

***p<0.001; **p<0.01; *p<0.05; + p<0.1.

[a] Both Models 1 and 2 control for all individual-level factors. Regression coefficients of the control variables are not shown for the sake of the space.

Table 6. HLM Regression Coefficients of Percentage of Minority Students in School and Average School SES with and without Racial Segregation Index. [a]

	GPA (Wave 1)		GPA (Wave 2)	
	Models			
	1	2	1	2
School-Level Factors				
Average SES	0.89	1.47 *	-0.11	0.45 +
Percentage of Minority Students	-0.17 *	-0.04	-0.11 *	0.00
Racial Segregation Index		0.15 *		0.12 *

***p<0.001; **p<0.01; *p<0.05; + p<0.1.

[a] Both Models 1 and 2 control for all individual-level factors. Regression coefficients of the control variables are not shown for the sake of the space.

Table 7. HLM Regression Coefficients of School-Level Factors, Race-Ethnicity and Their Intercations. [a]

Part A. Interaction Effects of Race-Ethnicity and Average School SES		**GPA (Wave 1)**		**GPA (Wave 2)**	
		Models			
		1	**2**	**1**	**2**
School-Level Factors					
Average SES		1.47 *	1.23 +	0.45 +	0.58 *
Percentage of Minority Students		-0.04	-0.07	0.00	0.02
Racial Segregation Index		0.15 *	0.15 *	0.12 *	0.14 **
Race-ethnicity					
African-American		-0.10 ***	-0.13 ***	-0.09 ***	-0.09 ***
Asian		0.05 +	0.06	0.06 *	0.06 *
Latino		-0.14 ***	-0.14 ***	-0.08 ***	-0.07 **
Interactions of:					
African-American	Average SES		-2.89 *		1.27
Asian	Average SES		1.88		-0.76
Latino	Average SES		-1.78 +		0.91
Part B. Interaction Effects of Race-Ethnicity and Race Segregation Index					
School-Level Factors					
Average SES		1.47 *	0.63	0.45 +	0.23
Percentage of Minority Students		-0.04	-0.17	0.00	-0.04
Racial Segregation Index		0.15 *	0.11	0.12 *	0.10 +
Race-ethnicity					
African-American		-0.10 ***	-0.10 ***	-0.09 ***	-0.09 **
Asian		0.05 +	0.03	0.06 *	0.03
Latino		-0.14 ***	-0.15 ***	-0.08 ***	-0.07 **
Interactions of:					
African-American	Racial Segregation Index		0.34 **		0.08
Asian	Racial Segregation Index		-0.20		-0.16
Latino	Racial Segregation Index		-0.07		0.10

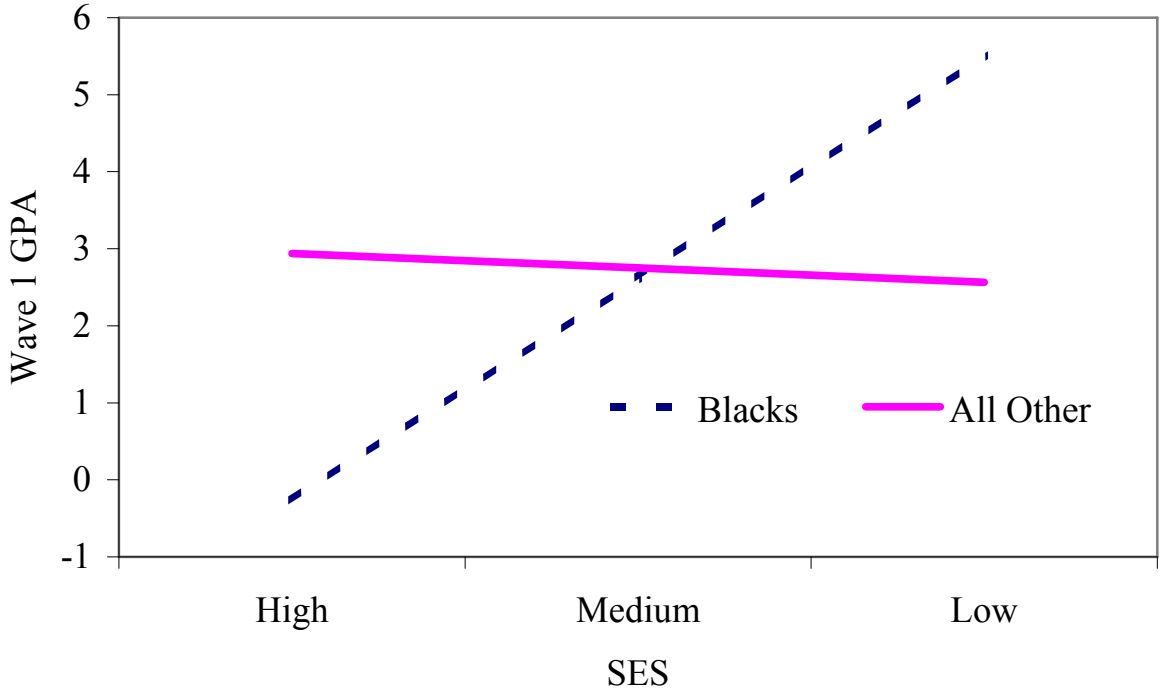

Figure 1. Predicted Values of GPA (Wave 1) by Race-Ethnicity and Average SES in School.

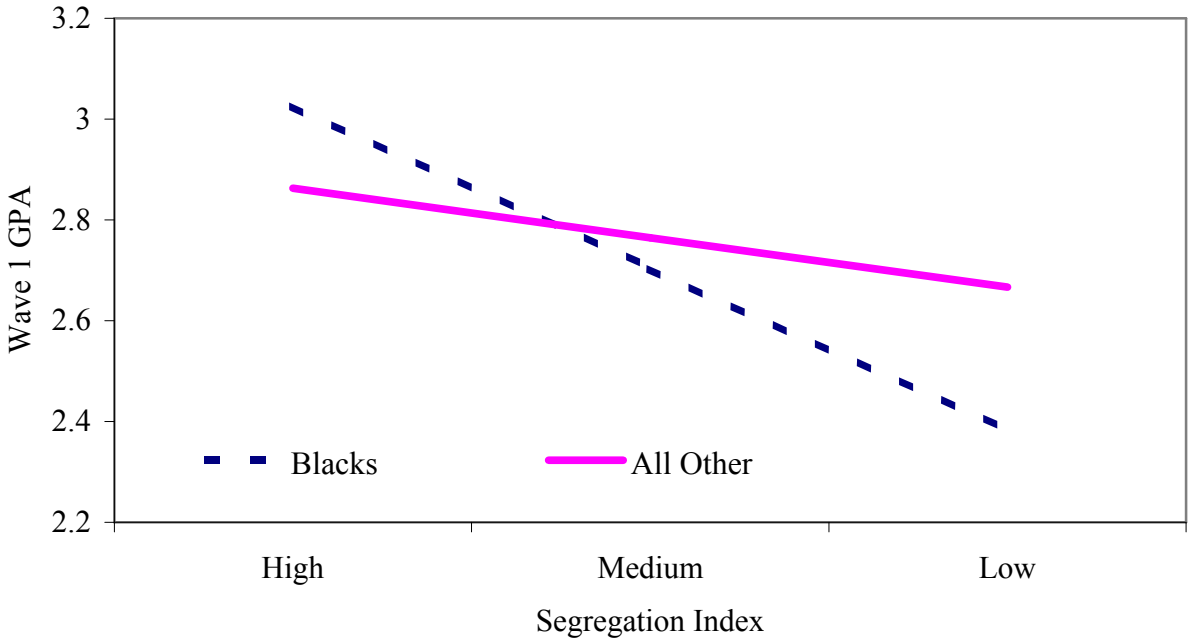

Figure 2. Predicted Values of GPA (Wave 1) by Race-Ethnicity and Racial Segregation Index.