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Adolescents' Educational Outcomes: Racial and Ethnic Variations in Peer Network Importance

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Abstract

Little attention has been paid to the role of peer social capital in the school context, especially as a predictor of adolescents' academic outcomes. This study uses a nationally representative (N = 13,738, female = 51%), longitudinal sample and multilevel models to examine how peer networks impact educational achievement and attainment. Results reveal that, in addition to those factors typically associated with academic outcomes (e.g., school composition), two individual-level peer network measures, SES and heterogeneity, had significant effects. Although educational attainment was generally worse in low SES schools, for all ethnic groups higher attainment was associated with attending schools with higher concentrations of minority students. At the individual level, however, membership in integrated peer networks was negatively related to high school graduation for Asians, Latinos, and non-Hispanic whites, and to GPA for Asians and Latinos, as only African-American achievement increased in more racially/ethnically heterogeneous peer networks. Our results suggest that co-ethnic and co-racial peer friendship networks should not be viewed as obstacles to the educational accomplishments of today's youth. In fact, in many cases the opposite was true, as results generally support the ethnic social capital hypothesis while providing little corroboration for oppositional culture theory. Results also suggest that co-racial and co-ethnic ties may mediate the negative effects of school choice, or more specifically of between-school socioeconomic segregation. Consequently, we conclude that school policies aimed at socioeconomic desegregation are likely to beneficially affect the academic outcomes of all race/ethnic groups.

Keywords

Adolescents; Educational achievement; Educational attainment; Racial variations; Peer networks; Minority status; High school activities; Add health

Introduction

Numerous studies have examined the relationship between school-level race/ethnic heterogeneity and educational outcomes. However, the literature is unclear regarding the nature of this relationship. For example, some authors have observed short-term positive

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effects of desegregation on the math and verbal scores of African-American students (e.g., Hoxby 2000; Kahlenberg 2001) while others have found little or no evidence linking racial segregation to academic achievement (Armor 1995; Jencks 1972; Rivkin 2000). Regardless of the exact nature of the relationship between school race/ethnic heterogeneity and academic achievement, one apparent oversight has been the impact of individual-level peer network factors and the ways in which they may influence academic outcomes.

In an attempt to correct this lack of attention to the role of peer networks and the ways in which they affect educational outcomes, the present study investigates the effects of two measures of school-based peer networks (i.e., socioeconomic status (SES) and heterogeneity) on educational achievement and attainment. In addition to these individual-level indicators, this study's analyses monitor school-level SES and racial/ethnic heterogeneity. By simultaneously examining both school and peer network measures of SES and heterogeneity, we hope to determine the relative importance of every factor as we ascertain their respective effects on educational performance and attempt to account for some of the inconsistency of previous findings.

The present article contributes to the research literature on school segregation and peer effects in various ways. First, we develop predictive models of achievement and attainment using nationally representative, longitudinal data, which are analyzed with multilevel modeling techniques in attempt to disentangle the effects of adolescent networks and school composition. Next, we examine school-level effects differentially for race and ethnicity. Finally, we also determine the applicability of two competing explanations of minority achievement, oppositional culture theory and the ethnic social capital hypothesis, for explaining adolescent educational performance.

School SES, School Heterogeneity and Academic Outcomes

Some authors argue that the best indicator of school quality is not the level of race/ethnic segregation, but rather the socioeconomic composition of a particular school (e.g., Kahlenberg 1996, 2001). Several studies suggest that schools with high concentrations of low-SES students reduce the educational performance of children, even when controlling for children's own class and race (e.g., Bankston and Caldas 1996; Entwisle and Alexander 1992). As such, the collective evidence accumulated by research on desegregation led Orfield (1978, p. 78) to conclude that "the basic damage inflicted by segregated education comes not from racial isolation but from the concentration of children from poor families." The influential findings of the *Coleman Report* (Coleman et al. 1966) demonstrated that the socioeconomic composition of a school's student body has a stronger effect on achievement, independent of students' own social background, than any other school factor. Thus, both poor African-Americans and whites should benefit equally from attending a middle-class African-American school, whereas poor African-Americans would not enhance their academic achievement by attending schools largely populated by poor whites.

Empirical studies subsequent to the *Coleman Report* concurred that the social class of students' classmates matters more than their race. In 1972, using the same data, Jencks repeated the Coleman analyses and found that low-SES students, regardless of race, who attended a low-SES school were academically years behind their poor peers who attended middle-class schools. In both studies, the researchers did not find significant racial differences in this regard. However, years later McPherson and Willms (1987) argued that the ways in which school composition affects the educational performance of students is not yet understood, while still others (Opdenakker and Van Damme 2001; Thrupp et al. 2002) suggested that the relationship between school composition characteristics and educational

outcomes is much more complex than formerly thought, and that school-level SES alone does not capture all of the effects of school composition (Thrupp 2004).

Scholars have yet to resolve whether school SES or racial/ethnic heterogeneity is the most important determinant of academic success (Jencks and Mayer 1990). Although these two characteristics often interrelated, those who focus on one typically fail to consider the other (Rumberger and Palardy 2000). Further, while the exact effects of heterogeneity may be unknown, racial segregation in US public schools is increasing (Clotfelter 2001, 2004), as in 2000 more than 70% of all African-American and Latino students in the US attended largely minority schools (Frankenberg et al. 2003). In an attempt to add to our understanding or how school-level heterogeneity is related to school-level SES, the relative importance of each, and how these measures differentially affect distinct groups, all of our analyses will simultaneously incorporate two school-level measures, SES and racial/ethnic heterogeneity.

Peer Networks and Academic Outcomes

We now know that adolescent friendships and peer group interactions are related to social and academic development (Crosnoe 2000; Guay et al. 1999; Newcomb and Bagwell 1996; Ryan 2001), however, pioneering research in this area (Coleman et al. 1966; Jencks 1972) typically ignored peer network effects when linking segregation and educational outcomes. What was often assumed is that school composition determines peer network composition as students are assumed to have friendship networks that reflect the race/ethnic composition of their school. Often overlooked is that school composition presents only one set of *potential* ties for students. It is neither necessary nor likely that school composition and peer network composition are identical since adolescents in ethnically diverse schools still tend to choose peers of their own ethnicity (Hamm 2000; Way and Chen 2000). In fact, students at formally integrated schools often become "substantively segregated" (Moody 2001) by preferring to engage in homophilous relationships with others from their same group (Hallinan and Williams 1987). Blau's theory of relative group size (Blau 1977, 1994; Blau and Schwartz 1984) suggests the larger the group, the more likely its members are to have a relationship between just themselves. Applied to the school environment, as the number of minority students increase these students are able to form a group unto themselves, perhaps interacting less with others. Another practical implication of Blau's theory would be that efforts to promote social diversity may have the unintended effect of promoting separatism within schools. Thus, despite increasing efforts to integrate schools, they may fail if minority and majority students simply resegregate socially within the school. Indeed, it is theoretically possible that integrated schools may experience higher levels of racial and ethnic tension and hence less interracial friendships than schools with relatively small minority populations (Rivkin 2000).

In line with the Blau's theory, the *Coleman Report* and other related studies argue that a lack of interracial contact may harm minority students' achievement and conversely that the ability to form diverse friendship networks may lead to academic success (LaFromboise et al. 1993). The *Coleman Report* (Coleman et al. 1966) explained the primary benefits of school integration as the transmission of values. This report suggested that socially acceptable patterns of behavior were diffused from the more privileged racial group to the less privileged one through interracial contact (Coleman et al. 1966; Clotfelter 2004). Others provide additional details, arguing that interracial friendships provide minorities with access to resources, means of self-presentation, and patterns of communication acceptable to the majority (e.g., Orfield and Yun 1999; Thrupp et al. 2002). In an attempt to clarify the importance of peer networks to educational performance, our complete models will employ two individual-level peer network measures, SES and racial/ethnic heterogeneity.

Oppositional Culture Theory and the Ethnic Social Capital Hypothesis

Ogbu (1978, 1981) used oppositional culture theory to describe a cultural pattern within African-American and Latino communities whereby peers disparage academic achievement because it is perceived as "selling out" or "acting white" (Fordham and Ogbu 1986; Ogbu 1991). Ogbu believed that these minority students tend to develop a collective oppositional culture, a frame of reference that actively rejects mainstream behaviors and undermines academic achievement. In other words, children in this culture are often ostracized for conforming to the educational system.

Although most prior research extols the virtues of interracial friendships and suggests they lead to improved academic performance, a few studies would suggest that co-racial friendships are academically disadvantageous. Just as negative links were established between peer influence and academic outcomes (Giordano 2003; Mathur and Berndt 2006), so too were positive ones (e.g., Epstein 2007; Steinberg 2002, 2004). For example, Carter (2003) reported that while African-American and Latino students rejected certain styles of speech, dress, and music as "acting white," they nonetheless valued behaviors conducive to academic success, such as studying hard, getting good grades, and making the honor roll.

A related way of examining the potential positive impact of co-racial and co-ethnic friendships on adolescents' academic achievement is to examine the effect of ethnic social capital on academic outcomes. Following Portes and Sensenbrenner (1993), we define ethnic social capital as resources available to members of ethnic groups through their co-ethnic networks. To date, the notion of ethnic social capital has primarily been used in studies of immigrants and assimilation (e.g., Portes 1998; Portes and Rumbaut 2001; Ryabov and Van Hook 2007). Portes and Sensenbrenner (1993) hypothesize that immigrant and/or minority children may experience increased chances of economic success when they develop in social environments with greater amounts of ethnic social capital. Ethnic groups and networks provide intergenerational transmissions of social and human capital, norms regarding educational attainment, as well as educational and employment opportunities. Portes and Zhou (1993) further argued that immigrants who become multicultural will have the best academic outcomes. That is, those immigrants who are able to maintain their membership in ethnic networks and build pan-ethnic, usually English-based, ties will be the most successful. Because minority youth are often disadvantaged regarding other forms of social and financial capital, ethnic social capital may be a beneficial type for the educational outcomes of these adolescents, especially given their occasionally strong reliance on peer based social capital which they may use to compensate for the lack of family social capital (Bankston 2004; Lin 2001; Zhou and Bankston 1998).

Although the two aforementioned alternative theoretical perspectives—oppositional culture theory and the ethnic social capital hypothesis—attempt to predict the same educational outcomes, they differ in their choice of explanatory variables. Oppositional culture theory construes race/ethnicity as a proxy for the socio-historical mode of incorporation, which distinguishes between involuntary and voluntary minorities. This theory posits that conquest, colonization, enslavement, and annexation are the main modes of involuntary minority incorporation; occurrences typical of the African-, Native- and Mexican-American experiences. In contrast to these groups, voluntary minorities, such as Filipinos, Indians or Koreans, freely entered the United States in search of better socioeconomic opportunities. We note that the voluntary and involuntary minority distinction is arguably the weakest point of oppositional culture theory. The voluntary/involuntary dichotomy, if seen through the lens of the ethnic capital hypothesis, refers not to the willingness of voluntary migrants to move, or the absence of such in the case of involuntary minorities, but to the mode of incorporation. Thus, for example, Mexican-Americans as a group are classified by Ogbu

(1978) as involuntary minorities given the fact that they were originally incorporated through conquest and annexation, or more specifically as a result of the US–Mexican War of 1848. Yet, later emigration of Mexicans to the US was voluntary and driven by the search for the same opportunities (e.g., economic and educational) sought by many voluntary minorities (e.g., Filipinos). Fordham and Ogbu (1986) eventually addressed this ambiguity by explaining that Mexican immigrants were negatively selected on SES, as their origins are predominately the lower socioeconomic strata of Mexican society. In general, Fordham and Ogbu (1986) argue that because of their migration type, involuntary minorities tend to be negatively selected on wealth and education while voluntary minorities tend to be positively selected.

Counter to oppositional culture theory, the ethnic capital hypothesis (Portes and Sensenbrenner 1993) does not use race/ethnicity as a proxy for the mode of incorporation, nor for the type of selectivity at the place of origin. Instead, their concept of race/ethnicity relates to the present ethnocultural environment based on the commonality of culture and language, and not to the socio-historical context of migration. In sum, oppositional culture theory predicts similar educational outcomes for Asians and non-Hispanic whites, on the one hand, and for African-Americans and Latinos on the other, whereas the ethnic capital hypothesis posits distinct outcomes for all four major race/ethnic groups. More specifically, the ethnic capital hypothesis suggests that, because different groups provide distinct forms of social capital, the outcomes experienced by those in different race/ethnic groups need not be the same.

Hypotheses

Our initial supposition is that the school compositional effects hypothesis remains as valid today as it did in the 1960s. We base this hypothesis on findings of the *Coleman Report* (Coleman et al. 1966) and numerous studies since. More specifically, we expect that the heterogeneity of a school's student body, independent of peer effects, is the single most important factor related to academic performance and that it will have a direct positive effect. Similarly and based on the results of other studies (e.g., Bankston and Caldas 2002; Entwisle and Alexander 1992; Kahlenberg 1996, 2001), we expect that school SES will also be positively associated, independent of peer network influences, with the academic performance of all students.

Our full models also employ two individual-level peer network variables, SES and heterogeneity. We hypothesize that for all students both peer-level factors will be positively related to both academic performance and the likelihood of graduating from high school. At the individual peer network level, we expect the less economically privileged groups (i.e., African-Americans and Latinos) to benefit the most from heterogeneous networks. However, we expect all race/ethnic groups to have a positive association with peer-level SES. When analyzed together, our results will reveal how relevant each school- and individual-level characteristic is for explaining students' academic performance. We also expect our full models to reveal significant group differences (a finding that would provide further support for the ethnic social capital hypothesis) regarding the precise ways in which school- and peer-level measures affect educational performance.

This study also evaluates two alternative explanations for peer effects. The first argument, oppositional culture theory (Ogbu 1978, 1981; Fordham and Ogbu 1986), suggests distinct outcomes for minorities characterized as voluntary and involuntary (Ogbu and Simons 1998). If the tenets of oppositional culture theory are correct, then homogeneous peer networks among involuntary migrants (i.e., African-American and Latino students) would lead to their lower academic performance. Hence, if correct, we would expect to find a

negative relationship between homogeneity of peer networks and individual-level academic outcomes for African-Americans and Latinos, and a positive relationship among the voluntary migrants, Asians and non-Hispanic whites.

The other explanation for peer network effects to be evaluated is the ethnic social capital hypothesis (e.g., Portes and Sensenbrenner 1993). In contrast to oppositional culture theory, this argument does not differentiate between voluntary and involuntary minorities and instead suggests that intra-group friendships will have a more positive effect on adolescents' academic achievement and attainment than inter-group ties. If this argument is correct, then homogeneity of peer networks would be positively related to academic performance. Building on the ethnic social capital hypothesis, we further expect that there will be significant variations in effects across the four groups because different groups provide varying amounts and types of social capital to their members which should lead to unique results for each race/ethnic group; and we expect that these differences will be especially prevalent for the individual peer-network measures.

Methods

Data

The data used to investigate the aforementioned hypotheses is the National Longitudinal Study of Adolescent Health (hereafter, the Add Health). This nationally representative data set was administered in three waves, in 1994–1995, 1996, and 2001–2002, respectively (Add Health 2008). The in-school sample (Wave 1) includes all students that attended their school on the day of the survey in each of 132 high schools and middle schools (grades 7–12, $N = 90,118$). This sample was used as the basis for the construction of all the friendship network measures (including those used in this study). The in-home sample (Wave 1) was a random subset of about 20,000 of these students who were later interviewed at home. The Wave 2 in-home sample was the same as the Wave I in-home interview sample. The Wave 3 in-home sample consisted of those Wave I respondents who could be located and reinterviewed 6 years later. More specifically, Wave 3 consists of 15,170 original Wave I respondents and 27 Wave 2 special genetic respondents (the latter were not included in our sample because the information for them is fragmentary). Because our focus is on peer networks, we limited our sample to those adolescents who participated in both the in-school and in-home surveys and for whom valid network and weighting information is available. This results in a final sample of 13,738. Multiple imputation (SAS *proc mi*) was used to fill in missing values for all the independent variables used in this study.

Models and Measures

These detailed data enable us to rigorously measure peer networks in ways not possible with earlier datasets (e.g., Haynie 2001, Haynie and Osgood 2005). The hierarchical structure of the Add Health data enable us to use multilevel modeling procedures that prior studies have shown produce more accurate estimates of school-level effects (Raudenbush and Bryk 2002; Raudenbush and Willms 1995). The specific technique we use in SAS is the *mixed* procedure which takes into account the error structures present at each level.

Our multivariate regression models will consist of four sets of group specific analyses designed to predict educational achievement and attainment. There are several reasons why we opted to do this instead of a single analysis that combines all students and works with group specific interaction terms. First, preliminary analyses indicated that there are intergroup differences. Second, as mentioned above, we hypothesize that the observed differences will be significant across the four groups. As such, analyses collapsing all groups could be misleading. Each set of group analyses will consist of a pair of parallel analyses

comprised of two models. The first will examine the effects of two school-level measures, SES and race/ethnic heterogeneity, and the individual-level controls earlier discussed. The second will incorporate the two individual-level peer network factors. Examination of the school-level measures will enable us to determine if Coleman's et al.'s (1966) assertions about SES and heterogeneity are still applicable today. Likewise, the peer network effects will enable us to determine the effectiveness of the Ogbu (1991) and Portes and Sensenbrenner (1993) arguments when using nationally representative data.

Dependent Variables

Our analyses will estimate both short- and long-term school effects on the educational progress of students. Accordingly, this project's dependent variables are educational achievement, measured as GPA in Wave 1, and attainment, measured as the odds of high school graduation at Wave 3. These two variables are theoretically distinct. Although attainment, as conceptualized by Blau and Duncan (1967) and Sewell and Hauser (1975), is a function of family background, and, to some degree, intellectual abilities, achievement is also related to one's ability to adapt to their educational context (Sadker et al. 2008; Lareau 2000). More importantly, the aforementioned classical studies (Blau and Duncan 1967; Sewell and Hauser 1975) document that educational achievement has a long-term effect on attainment, which in turn, has a profound effect on one's children's attainment and so forth. Therefore, while achievement may affect attainment, the opposite is not true. Because of these conceptual differences between achievement and attainment, distinct analyses will focus on each dependent variable.

During Wave 3 data collection respondents, then young adults between the ages of 18 and 26, were asked to indicate the highest grade of regular school they completed. Their answers ranged from "6th grade" (the lowest score) to "5 or more years of graduate school" (the highest score). Note that this measure is cohort-specific and censored from above and below. In other words, attainment and age are inextricably linked. Controlling for age alone does not eliminate the problem of cohort-specificity. In addition, the median and mode for Wave 3 attainment approximates graduation from high school. Based on this statistical information, we transformed the original Add Health measure into a dichotomous outcome variable with at least high school graduation equal to 1 and less than high school graduation equal to 0. Thus, in contrast to achievement, which monitors GPA, educational attainment provides information about a key educational transition that members of this cohort may have experienced. When approaching the question of constructing 2-level hierarchical models, we used linear models with fixed effects to predict academic achievement. Because the other dependent variable—academic attainment—has a dichotomous outcome, a logistic regression function was used to estimate the chance of graduation from high school.

Independent Variables

Individual-Level Measures

Race/Ethnicity: Students' responses are used to determine their race and ethnicity. To enhance accuracy, we matched adolescents' responses with those of their parents, whenever possible. From these responses we created a series of dichotomous race/ethnicity variables for the categories African-American, Asian, Latino, and non-Hispanic white. The latter serves as the reference category in these analyses. The race/ethnicity of multiracial adolescents (3.2% of our sample) was assigned to different groups via multiple imputations. Approximately 65% of this sample were non-Hispanic white, 16% African-American, 14% Hispanic, and 5% Asian (see Table 1).

Control Variables: Because all assimilation theories underscore the significance of generational status, we created three dummy variables to monitor respondents' generational

status. Foreign-born adolescents are coded as immigrant generation 1. US-born children with at least one foreign-born parent are distinguished as generation 2 and generation 3 is comprised of those born in the US with two US-born parents. In our sample, generation 3 adolescents predominate—84%. Nevertheless, only 9% of Latinos and 3% of Asians fall into this category. At the same time, 91% of African-Americans and 94% of non-Hispanic whites belong to generation 3. Hence, immigrant youth are disproportionately Asian and Latino, which corresponds to the national trend (Portes and Rumbaut 2001).

We control for family structure effects, as adolescents from non-traditional (i.e., single-parent and non-parent or guardianship) families are known (e.g., Coleman 1990; McNeal 2001; Teachman et al. 1996) to do less well academically than adolescents from two-parent families, which serves as the reference category. We also expect that the quality of parent-child relationships (i.e., parental expectations, involvement and supervision) will have a positive effect on students' academic achievement (Giordano et al. 2008). All measures of parent-child relationships are based on similar measures that Bankston and Zhou (2002) created to examine the Add Health data. All are constructed as averages of their component parts and these scales, along with their reliability and validity measures, are presented in Appendix.

To understand the importance of school-level SES, this study employs a composite measure of average SES, which was created by combining two school-level characteristics. More specifically, the standardized scores for parental income and education were averaged to create the resulting SES measure. Because these two variables are strongly intercorrelated, this procedure is an appropriate correction. The adolescents' answers were matched with their parents' answers, when constructing the SES measures. The parents' educational attainment measure was generated from the adolescent report and reflects the highest level of education completed by either parent. In order to account for family structure, all family social capital measures, except parents' education, were constructed as the average response for both parents, if available, and as a simple measure when the response from only one parent was available. Multiple imputations were used to fill in missing values for both parental income and education.

Gender and age are two other individual-level variables examined in an attempt to control for personal factors that might impact educational outcomes. Gender is a dummy variable with male serving as the reference category. Age is measured in complete years at the time of the interview.

Peer Network Attributes: In this study, we employ two measures that capture the structural component of peer networks. These are race/ethnic heterogeneity of the peer network and mean network SES. One of the advantages of using the Add Health data in this study is that the data allow for the analysis of network effects, as both the Add Health in-school and in-home questionnaires asked students to list their five best male and female friends (including girlfriends and boyfriends). For each participating school, the Add Health obtained a roster of its students and assigned them identification numbers. These rosters enabled students to find friends in their school and a sister school. These identification numbers permit the direct determination of the race/ethnicity and SES of adolescents' friends. On the basis of friendship preferences, the Add Health constructed heterogeneity measures with respect to race/ethnicity, grade level, and sex. In our analyses, we used the race/ethnicity heterogeneity measure made available to users of the survey. It is defined as:

$$\text{Heterogeneity}=1-\sum_{1}^{4}\left(\frac{R_{\text{C}}}{4\times I}\right),$$

R is the number of peers in a network belonging to a certain C race/ethnic category, *I* is the total number of peers in a peer network, and 4 is the number of race/ethnic categories used in the analyses (i.e., African-American, Asian, Latino, and non-Hispanic white). Note that heterogeneity ranges from 0 (i.e., the situation when all members of a network share the same race/ethnicity) to 1 (i.e., the situation when all four race/ethnic categories are equally represented in a network).

While obtaining the index of race/ethnic heterogeneity was quite straightforward, calculating average SES was more technically complicated. If constructed as a weighted average of one's peers' SES, average SES of peer network does not account for unequal network sizes. In other words, in those cases where networks are relatively small, peer network SES is likely to approximate an individual student's SES, thereby creating a source of collinearity with the individual student's achievement. To eliminate this bias we transformed the peer network SES measure according to the following formula:

$$\text{New Network SES}=\frac{\text{UNSES} \times \text{NS} - \text{Individual Student's SES}}{\text{NS} - 1},$$

where UNSES = untransformed network SES and NS = network size.

School-Level Variables—The school-level variables examined monitor two fundamental aspects of each school's student body, its race/ethnic heterogeneity and its socioeconomic composition. Although the Add Health data do not provide a measure of school race/ethnic heterogeneity, one can be directly calculated from the race/ethnicity responses of the student body. The formula for this calculation is the same as for the calculation of peer network heterogeneity. Note, however, that we used all students, regardless of their membership in peer networks, for the basis of calculations. Likewise, our school-level SES variable was obtained by aggregating the corresponding individual-level SES measure.

Results

Tables 2, 3, 4, and 5 present our multivariate analyses. In order to contrast the assertions of oppositional culture theory with those of the ethnic social capital hypothesis, we present group specific multivariate results. As discussed above, we opted to conduct group specific analyses rather than a single analysis with race/ethnic interaction terms.

Tables 2, 3, 4, and 5 model the effects of individual-level controls, school compositional characteristics, and peer network attributes on the educational achievement and attainment of African-Americans, Asians, Latinos, and non-Hispanic whites, respectively. Model 1 documents the effects of two school-level measures, SES and race/ethnic heterogeneity, and the individual-level controls earlier discussed. For reasons of parsimony, the coefficients for these control measures are not presented. However, these variables generally conformed to expectations, as strong and positive associations were noted between the two dependent variables and immigrant generation measures, family SES, the parent-child relationship measures, and female gender. Complete results are available upon request from the authors. Model 2 incorporates the two individual-level peer network factors. Parallel analyses are estimated for both dependent variables, the results of which are presented in panels 1 and 2 of each table.

To determine whether changes across models are statistically significant, we employ the method suggested by Clogg et al. (1995). This method tests the change in the coefficients between the full and reduced models. The statistical significance of the difference in

coefficients across models can be represented as $t = d/s(d)$, where d is the difference between the coefficient in a reduced model and the coefficient in a fuller model and $s(d)$ is the standard error of the difference between the slopes. The standard error $s(d)$ is calculated using the formula

$$s(d) = \sqrt{s^2(F) - s^2(R) \times \frac{SE^2(F)}{SE^2(R)}}$$

where $s^2(F)$ and $s^2(R)$ are the squares of the standard errors of the relevant coefficient in the fuller and the reduced models, correspondingly, while $SE^2(F)$ and $SE^2(R)$ are mean-squared errors of the fuller and the reduced models, respectively.

African-American Students

Model 1 of panel 1 (see Table 2) shows that for African-American students both school-level SES and school-level race/ethnic heterogeneity are positive and significant predictors of achievement. As earlier predicted, both of these results correspond with the findings of Coleman et al. (1966). In model 2, which incorporates the individual-level peer network attributes, the only significant predictor of achievement is peer network race/ethnic heterogeneity. The highly significant ($p < .001$) positive coefficient suggests that African-American students, at least in terms of grades, are more likely to benefit from membership in heterogeneous peer networks. Note also that both school-level effects became insignificant once the peer network measures were introduced. Model 1 of panel 2, which predicts African-American attainment, reveals that both school-level measures are highly significant ($p < .001$) positive predictors of high school graduation. This significance remains in model 2, except that school-level heterogeneity declined slightly in magnitude and in significance. However, the amount of this decrease ($d = 0.13$) is not statistically significant ($t = 1.37$). Thus the mediating effect of individual-level heterogeneity on school-level heterogeneity is not supported by formal test. Model 2 also reveals that the effect of individual-level peer network SES is positive and modestly significant. However, in this model peer network heterogeneity is insignificant and does not impact high school graduation, a finding which is in contrast to its just noted significant effect on achievement. In sum, while integrated peer networks positively affect the GPAs of African-American high school students, do not appear to affect their chances of graduating from high school.

Asian Students

Model 1 of panel 1 (see Table 3) indicates that both school-level measures are positive and significant predictors of achievement for Asian–American students. The relationship between school-level race/ethnic heterogeneity and GPA is strong, but not robust, as evidenced by the fact that this measure becomes insignificant when the individual-level peer network factors are added in model 2. However, school-level SES continues to exert a positive and significant ($p < .01$) influence on the achievement of Asian students, even in the complete model. Nonetheless, both the magnitude and significance of school-level SES are diminished once peer network factors are introduced (the unstandardized coefficient declines from 1.04 to 0.43, $d = 0.61$, $t = 8.52$, $p < .001$). Hence, peer network attributes do exert a mediating effect on school-level SES. This suggests that some of the positive influence school-level SES exerts on Asian achievement is explained by the characteristics of their peer networks, a result that will emerge as common to all four race/ethnic groups. In addition, peer network heterogeneity is a significant ($p < .01$) and negative predictor of GPA. This is in sharp contrast to the African-American results where a positive and highly significant effect was observed for educational achievement. Panel 2 of Table 3 repeats the

above exercise for educational attainment, where the attainment of at least a high school degree is the dependent variable. In model 1 both school-level measures, SES and race/ethnic heterogeneity, are positive and highly significant ($p < .001$), indicating Asian students are more likely to graduate from high school when attending schools that are more integrated and likely better funded. Model 2 adds the peer network effects of SES and race/ethnic heterogeneity. Of these, only the heterogeneity effect is significant ($p < .001$) and in the negative direction. Thus, for Asians the effects of individual-level peer network heterogeneity are negative and highly significant for both achievement and attainment. As such, Asian–Americans are more likely to benefit from homogeneous peer networks for both measures of academic success, an observation that is largely consistent with the ethnic social capital hypothesis.

Latino Students

Panels 1 and 2 of Table 4 show the regression results predicting Latino achievement and attainment. Model 1 of panel 1 reveals that the only significant ($p < .001$) coefficient is school-level SES. While this measure positively affects GPA, school-level race/ethnic heterogeneity had no impact on Latino achievement. The introduction of the individual-level peer network effects in model 2 reduced the significance of school-level SES ($p < .05$). The other significant ($p < .01$) measure in this model was peer network heterogeneity, which was negative. Thus, on the one hand the effect of school-level SES is positive, as earlier predicted, while on the other, the negative association between Latino grades and peer network heterogeneity suggests that the more homogeneous Latino student networks are, the higher Latino grades are likely to be. Thus like Asians, Latinos benefit from attending well funded schools but also from being part of a co-ethnic network. Recall that earlier results revealed the same effect of heterogeneity on Asian grades, while the opposite was observed for African-Americans. The results presented in model 1 of panel 2 also confirm that school-level SES and race/ethnic heterogeneity are strong positive predictors of Latino high school graduation, just as they are for every other race/ethnic group. Model 2 reveals that when including the peer network variables both school-level effects remain significant and positive, although the coefficient for mean school SES declined from 3.20 to 1.55 ($d = 1.65$, $t = 43.81$, $p < .001$). Clearly, the strong positive effect of school SES on attainment is partially explained by peer network factors. Of the peer measures, only race/ethnic heterogeneity is significant ($p < .01$) and negative, a result that is also common to all groups except African-Americans. In sum, Latinos and Asian-Americans are both more likely to do better in school and to graduate when their friendship networks are more homogeneous; observations that are largely consistent with the ethnic social capital hypothesis.

Non-Hispanic White Students

Table 4 presents the regression results for non-Hispanic white students, who, recall, constitute the majority of our sample. The school-level effects of SES and race/ethnic heterogeneity are positive and significant in all four models predicting the achievement and attainment of non-Hispanic whites. However, as in the Asian and Latino cases, race/ethnic heterogeneity is the most significant school-level predictor ($p < .001$) in both full models. This important finding suggests that all three of these groups are more likely to complete high school when they attend a school with a diverse student body. We return to the implications of this finding below. Further, the introduction of individual-level measures in both complete models resulted in an important decrease in the significance of school SES, a finding observed in all of the preceding tables. In both cases, these declines were very significant (panel 1: $d = 0.43$, $t = 8.25$, $p < .001$, panel 2: $d = 2.44$, $t = 31.12$, $p < .001$), suggesting that peer network attributes account for some of the school SES effect. The complete models also document that individual-level peer network heterogeneity has a pronounced negative effect on high school graduation, a result earlier observed among

Latino and Asian students. However, unlike all of the other groups, peer network heterogeneity has no effect on the GPA of non-Hispanic whites. The other individual-level measure, peer network SES, is a very significant ($p < .001$) positive predictor of non-Hispanic white GPA, a finding that is somewhat echoed among Asians, while it has no effect on the achievement of this group.

A comparison of Tables 2, 3, 4, and 5 reveals that: (1) in the absence of peer network measures school-level SES and race/ethnic heterogeneity almost uniformly produce positive and significant effects on the achievement and attainment outcomes of all adolescents regardless of their race/ethnic background; (2) the peer network SES effect on achievement is positive and significant for Asians and non-Hispanic whites, but not African-Americans and Latinos; (3) peer network SES is a significant but modest positive predictor ($p < .05$) of attainment for only African-Americans, and (4) peer network heterogeneity is negatively associated with the academic outcomes of Asian, Latino, and non-Hispanic white students (i.e., only attainment for this group), while it is positively associated with the educational achievement of African-Americans.

The picture that emerges from a comparison of these results is complex and harkens back the results of others who have also found significant group differences (Faircloth and Hamm 2005; Hamm et al. 2005). Every race/ethnic group differs from the others in some way with respect to the outcomes of the school- and individual-level predictors analyzed. Similarities exist, but they are clearly overshadowed by the differences. The differences are most pronounced for the individual-level effects, as the school-level measures affect all adolescents in similar ways, especially when predicting achievement. Recall that oppositional culture theory predicts similar outcomes for Asians and non-Hispanic whites, on the one hand, and African-Americans and Latinos, on the other. Although some similarities were observed between Asians and non-Hispanic whites, there were fewer commonalities shared by African-Americans and Latinos. These dissimilar results suggest that either: (1) the predictions of oppositional culture theory about the harmful influence of co-ethnic friendships on achievement is only valid for African-Americans, or (2) that the predictions of oppositional culture theory are incorrect. We believe the latter conclusion to be the most plausible since even after controlling for generational status our results continue to demonstrate that US-born Latinos are more likely to benefit from co-ethnic friendships than their African-American counterparts.

Our main substantive finding reveals that African-Americans clearly stand apart from all other race/ethnic groups. More specifically, this is the only group for which the effect of peer-level heterogeneity on achievement is positive and statistically significant. In fact, for Asians and Latinos such diverse networks may result in significantly worse grades. While these findings provide some support for the ethnic capital hypothesis, they provide none for oppositional culture theory, which assumes similar outcomes for Latino and African-American students. Finally, for Asians, Latinos, and non-Hispanic whites heterogeneous peer networks reduce the likelihood of high school graduation, while the more heterogeneous the student body at the school attended, the greater the likelihood of their graduation.

Discussion

This research used the nationally representative and longitudinal Add Health data, combined with multi-level modeling techniques, to investigate the importance of peer effects on the academic achievement and attainment of adolescents. Separate analyses were undertaken for the nation’s four largest race/ethnic groups. Our results not only document group differences, but also assess the effectiveness of two alternative theoretical arguments,

oppositional culture theory and the ethnic social capital hypothesis, often used to explain how peer networks affect academic performance. In addition, we reconsider several of Coleman et al.'s (1966) main findings to determine if they remain applicable to recent educational experiences. While results generally support both the ethnic social capital hypothesis and Coleman et al.'s (1966) conclusions, several findings also diverge in important ways.

Our findings provide little corroboration for oppositional culture theory (e.g., Ogbu 1978; Fordham and Ogbu 1986; Ogbu and Simons 1998) which predicts that involuntary minorities (i.e., African Americans and Latinos) will experience similar educational outcomes. However, models predicting educational achievement and attainment reveal that this is not the case. For example, among Latinos, peer network heterogeneity is a significant negative predictor for both educational outcomes, while it is positive and highly significant for African-American educational achievement. Stated another way, African-Americans benefit academically from ethnically diverse peer networks while Latinos (Asians and non-Hispanic whites) do not.

Proponents of the ethnic social capital argument would explain these differences in the academic outcomes of African-Americans, Asians and Latinos by highlighting differences in the ethnic capital of the various social networks. They would argue that while participation in more integrated peer networks generates greater rewards for African-American youth, the benefits derived from membership in co-ethnic networks, including accumulated social capital, are more advantageous to the academic progress of Asian and Latino youth. Unlike oppositional culture theory, which highlights the socio-historical past, the ethnic capital hypothesis emphasizes the strength of social networks, suggesting that co-ethnic and co-racial friendships should not be viewed as obstacles to the educational accomplishments of minority youth. This argument also suggests that segregated peer networks may be positively related to academic performance, an assertion that received some empirical support in this study. Thus, of the two theoretical arguments examined the ethnic capital hypothesis, which posits that networks differ in the amount of social capital which consequently leads to different outcomes, appears the more plausible.

Another key assertion of oppositional culture theory also received no empirical support. More specifically, oppositional culture theory predicts that the outcomes of voluntary migrants will be different from those of involuntary migrants. However, that was not the case in this study as school-level factors (i.e., SES and race/ethnic heterogeneity) affected voluntary (Asian) and involuntary (Latino) students in similar ways. In an attempt to more carefully analyze the assertions of this theory our regression models controlled for generational status, given that many Latinos could be characterized as voluntary migrants due to their recent US arrival. However, even with the inclusion of these generational controls, we were unable to explain the observed differences or to provide support for oppositional culture theory.

Numerous findings herein reinforce the pioneering research of Coleman et al. (1966) and suggest their conclusions are still relevant today. Like them, we also found that a school's SES and race/ethnic heterogeneity positively and significantly affect the educational attainment of all students, regardless of background. However, when predicting students' academic achievement or GPA some significant group variations emerged. One key finding is that the effect of school-level SES on achievement is positive and significant for all groups except African-Americans. This suggests that among Asians, Latinos, and non-Hispanic whites, the higher the concentration of middle- and upper-SES students in a school, the better their predicted grades, regardless of their own SES. Another key finding is that the effect of school-level heterogeneity is positive and significantly ($p < .001$) related to non-

Hispanic white educational achievement, while it is insignificant for African-Americans, Asians and Latinos. This implies that the group whose grades would benefit the most from attending heterogeneous schools is non-Hispanic whites. This is an important finding because most prior research viewed desegregation as a vehicle for enhancing the educational outcomes of minority students with few, if any, benefits for their non-Hispanic white colleagues (e.g., Armor 1995).

Coleman et al. (1966) long ago suggested that adolescents would benefit from attending schools that were both wealthier and more racially diverse. When predicting attainment, our empirical results concurred as the effects of both school-level factors (i.e., SES and race/ethnic heterogeneity) were significant and positive for all race/ethnic groups. These results suggest that even today the rewards of attending diverse schools extend to all groups, as all are more likely to complete high school the more heterogeneous the composition of their school. The importance of this finding cannot be overstated since: (1) the long-term effects of desegregation on academic standing remain under examined (Rivkin 2000); and (2) high school graduation continues as one of the key academic outcomes targeted by numerous federal and state initiatives (Teachman et al. 1996). Although we found that school-level heterogeneity is often a significant and positive predictor of educational outcomes, our results diverge from Coleman's and suggest that at the individual-level peer network diversity can lead to lower grades and a lower likelihood of graduating from high school for Asians, Latinos and non-Hispanic whites. Still, this finding is generally consistent with the ethnic capital hypothesis (e.g., Portes and Sensenbrenner 1993; Portes and Zhou 1993) which suggests that having co-ethnic friends positively affects group educational outcomes.

Although these results have important implications, this study also has several limitations. First, this research relied on pan-ethnic categories (e.g., Asian, Latino) that can obscure important differences by ethnicity and/or country of origin. Unfortunately, our sample size (which is determined by the Add Health Wave 3 data) does not allow us to make statistically significant inferences about smaller ethnic groups. Nevertheless, we suggest that future research examine the ways in which peer networks may influence the educational outcomes of specific ethnic groups such as Cubans, Puerto-Ricans, Chinese Americans, etc.

Second, the Add Health Wave 1 survey sampled adolescents within a large age/grade range. This presents some interpretative difficulties. For one, those adolescents who were older when Wave 1 data were collected have a better chance of completing high school than do those who were much younger at the time of initial data collection. Additionally, it is possible that some of the relationships examined in this study vary depending on a student's age. Given the sample's relatively large size, one potential way of dealing with these possibilities is to restrict the age range analyzed or to examine models separately for different ages. Nonetheless, until that is accomplished, the results of the present study will serve as an important baseline from which to gage the results of similar future studies.

Although this research revealed significant group variation, it suggests that co-ethnic and co-racial peer friendship networks should not be viewed *a priori* as obstacles to the educational accomplishments of today's youth. Rather, in many cases such ties enhance educational outcomes. Co-racial and co-ethnic ties may also mediate the negative effects of school choice, or more specifically of between-school socioeconomic segregation. Our results also reveal that attendance at schools with heterogeneous student bodies positively affects the likely of graduation for all students and perhaps also enables them to develop tolerance and empathy for individuals from a variety of racial/ethnic and socioeconomic backgrounds; part of a skill set that will continue to benefit all long after their graduation.

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Appendix

Scale name	Questions	Cronbach's alpha
Parents' educational expectations	How disappointed would your mother/father be:	0.82
	if you didn't graduate from college?	
	if you didn't graduate from high school?	
Parents' involvement	Done any of the following together with your parent(s):	0.77
	Gone shopping?	
	Played a sport?	
	Attended a religious service or related event?	
	Talked about life?	
	Talked about a date or party attended?	
	Attended a movie, sports event, concert, play, or museum?	
	Talked about a personal problem?	
	Discussed grades or school work?	
	Worked on a school project?	
	Talked about other school activities?	
Parents' supervision	A parent is present in the home most or all of the time when the adolescent:	0.73
	goes to school in the morning,	
	comes home from school in the afternoon,	
	goes to bed at night.	

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Biographies

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Table 1

Descriptive statistics of study variables

	Weighted mean	SD	Minimum	Maximum
School-level variables				
Average SES	3.34	0.86	0.76	6.11
Racial/ethnic heterogeneity	0.31	0.43	0.01	0.86
Individual-level variables				
Dependent variables				
Educational achievement	2.82	0.76	0.77	4.17
Educational attainment	0.86	0.35	0.00	1.00
Peer network attributes				
Peer network SES	0.85	0.02	0.96	0.65
Peer network heterogeneity	0.39	0.16	0.00	0.92
Race/ethnicity				
African-American	0.16	0.36	0.00	1.00
Asian	0.05	0.23	0.00	1.00
Latino	0.14	0.35	0.00	1.00
Non-Hispanic whites	0.65	0.45	0.00	1.00
Family structure				
Two-parent household	0.59	0.50	0.00	1.00
Single-parent household	0.24	0.43	0.00	1.00
Non-parent household	0.17	0.38	0.00	1.00
SES				
Parents' education	6.84	2.11	0.00	10.85
Family income	5.27	1.48	0.26	14.21
Family SES	0.00	1.00	−3.17	3.92
Parent–child relationships				
Parents' educational expectations	4.33	0.89	1.00	6.58
Parents' involvement	0.43	0.29	0.02	1.82
Parents' supervision	3.83	0.70	1.00	5.67
Other individual-level controls				
Age	14.98	1.66	11.00	21.00
Male	0.49	0.01	0.00	1.00
Immigrant generation 1	0.05	0.21	0.00	1.00
Immigrant generation 2	0.10	0.30	0.00	1.00
Immigrant generation 3	0.85	0.36	0.00	1.00
Extracurricular activities	1.39	1.56	0.00	22.00

[*N*] = 13,738

All variables are from wave 1 except for educational attainment, which is from wave 3

Table 2

Unstandardized coefficients and standard errors [in brackets] of selected predictors on educational achievement (standardized coefficients and attainment (odds ratios in parenthesis), African-American students

	Models[a]			
	Panel 1: achievement		**Panel 2: attainment**	
	1	**2**	**1**	**2**
School-level factors				
Average SES	0.16*	−0.10	5.19***	1.86***
	(0.09)	(0.08)	(34.51)	(6.15)
	[0.04]	[0.07]	[0.26]	[0.21]
Racial/ethnic heterogeneity	0.38***	0.11	0.52***	0.39**
	(0.34)	(0.03)	(1.66)	(1.23)
	[0.02]	[0.06]	[0.12]	[0.15]
Peer network attributes				
Peer network SES		0.15		0.22*
		(−0.07)		(1.31)
		[0.08]		[0.04]
Peer network heterogeneity		0.21***		0.11
		(0.24)		(1.00)
		[0.02]		[0.07]
Standard error	0.88	0.85	0.92	0.89
Model comparison test[b]		293**		314**

*$p < 0.05$;

**$p < 0.01$;

***$p < 0.001$

[a]Because of space limitations the regression coefficients of individual-level controls are not shown

[b]The test is analogous to the nested *F*-test for OLS regression models. It is based on the difference between the full maximum likelihoods of the models contrasted

Table 3

Unstandardized coefficients and standard errors [in brackets] of selected predictors on educational achievement (standardized coefficients and attainment (odds ratios in parenthesis), Asian students

	Models[a]			
	Panel 1: achievement		Panel 2: attainment	
	1	2	1	2
School-level factors				
Average SES	1.04***	0.43**	2.90***	1.29*
	(0.35)	(0.06)	(13.47)	(1.18)
	[0.09]	[0.05]	[0.21]	[0.23]
Racial/ethnic heterogeneity	0.26**	0.05	0.64***	0.50***
	(0.11)	(−0.02)	(1.44)	(1.41)
	[0.04]	[0.06]	[0.12]	[0.11]
Peer network attributes				
Peer network SES		0.16*		0.11
		(0.05)		(1.00)
		[0.03]		[0.10]
Peer network heterogeneity		−0.15**		−0.25***
		(−0.07)		(0.64)
		[0.01]		[0.06]
Standard error	0.67	0.65	0.70	0.67
Model comparison test[b]		246**		370***

*$p < 0.05$;

**$p < 0.01$;

***$p < 0.001$

[a]Because of space limitations the regression coefficients of individual-level controls are not shown

[b]The test is analogous to the nested *F*-test for OLS regression models. It is based on the difference between the full maximum likelihoods of the models contrasted

Table 4

Unstandardized coefficients and standard errors [in brackets] of selected predictors on educational achievement (standardized coefficients and attainment (odds ratios in parenthesis), Latino students

	Models[a]			
	Panel 1: achievement		Panel 2: attainment	
	1	2	1	2
School-level factors				
Average SES	0.29***	0.21*	3.20***	1.55**
	(0.21)	(0.10)	(27.09)	(4.18)
	[0.02]	[0.02]	[0.10]	[0.11]
Racial/ethnic heterogeneity	0.10	0.09	0.82**	0.86***
	(0.01)	(−0.01)	(1.19)	(1.65)
	[0.04]	[0.07]	[0.11]	[0.06]
Peer network attributes				
Peer network SES		0.10		0.19
		(0.00)		(1.00)
		[0.06]		[0.14]
Peer network heterogeneity		0.16**		−0.37**
		(−0.03)		(0.87)
		[0.05]		[0.11]
Standard error	0.73	0.70	0.70	0.68
Model comparison test[b]		184**		252**

*$p < 0.05$;

**$p < 0.01$;

***$p < 0.001$

[a] Because of space limitations the regression coefficients of individual-level controls are not shown

[b] The test is analogous to the nested *F*-test for OLS regression models. It is based on the difference between the full maximum likelihoods of the models contrasted

Table 5

Unstandardized coefficients and standard errors [in brackets] of selected predictors on educational achievement (standardized coefficients and attainment (odds ratios in parenthesis), non-Hispanic white students

	Models[a]			
	Panel 1: achievement		Panel 2: attainment	
	1	2	1	2
School-level factors				
Average SES	0.69***	0.26*	4.11***	1.67*
	(0.31)	(0.09)	(47.06)	(1.18)
	[0.03]	[0.06]	[0.31]	[0.29]
Racial/ethnic heterogeneity	0.13**	0.15***	0.54*	0.82***
	(0.11)	(0.14)	(1.13)	(1.51)
	[0.02]	[0.00]	[0.13]	[0.09]
Peer network attributes				
Peer network SES		0.22***		0.11
		(0.14)		(1.00)
		[0.02]		[0.08]
Peer network heterogeneity		−0.17		−0.39***
		(−0.02)		(0.83)
		[0.10]		[0.10]
Standard error	0.93	0.92	0.97	0.94
Model comparison test[b]		367***		405**

*$p < 0.05$;

**$p < 0.01$;

***$p < 0.001$

[a] Because of space limitations the regression coefficients of individual-level controls are not shown

[b] The test is analogous to the nested *F*-test for OLS regression models. It is based on the difference between the full maximum likelihoods of the models contrasted