Friendship and Racial Disparities in Academic Achievement

Jennifer Flashman
Postdoctoral Associate
Center for Research on Inequalities and the Life Course
Department of Sociology
Yale University

3/8/2012

Word Count: 8,437

*Please do not cite without permission from the author. I would like to thank Robert Mare, Judith Seltzer, Meredith Phillips, Renee Reichl Luthra and the UCLA Demography, Family, and Social Stratification Research Group for their advice and comments on previous drafts. A previous version of this article was presented at the RC28 meeting at the University of Essex in 2010. Correspondence should be directed to Jennifer Flashman, Yale University, P.O. Box 208265, New Haven, CT 06520, email: jennifer.flashman@yale.edu. This research was supported by a National Institute of Child Health and Human Development traineeship through the California Center for Population Research and by a grant from the American Educational Research Association which receives funds for its "AERA Grants Program" from the National Science Foundation and the National Center for Education Statistics of the Institute of Education Sciences (U.S. Department of Education) under NSF Grant #DRL-0634035. Opinions reflect those of the author and do not necessarily reflect those of the granting agencies. This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 (addhealth@unc.edu). No direct support was received from grant P01-HD31921 for this analysis.

Abstract

Disparities in educational achievement exist across race and ethnicity in the United States. How do differences in the friendships made by adolescents from different race and ethnic backgrounds contribute to observed achievement disparities? Using data from Add Health and an instrumental variable approach, this article estimates the causal effect of friends' average achievement on adolescents' transcript GPA. I find that the size of friend effects on achievement vary dramatically across race/ethnicity. Friends have a modest effect on White adolescents' GPAs. However, among Black adolescents, friend achievement has no significant effect on GPA. By contrast, Latino's friends exert large effects on achievement. The consequence of these patterns is that differences in the size of friend effects help to create achievement disparities between Black and White students but diminish differences between Latino and White students.

1. Introduction

Disparities in educational achievement exist across race and ethnicity in the United States. Friends may play an important role in diminishing these disparities by providing support, resources, and information that adolescents do not receive elsewhere (Coleman 1988; Portes 1998). Indeed, several recent studies focus on friends as a source of positive enforcement and resources, and most sociological studies show that friends have a large and important effect on these outcomes. High-achieving friends protect against failure, pull low achieving students up, and encourage more advanced course taking (Altermatt and Pomerantz 2005; Crosnoe, Cavanagh and Elder 2003; Riegle-Crumb, Farkas and Muller 2006).

However, recent work suggests that the characteristics of adolescents' friends vary systematically by race and ethnicity (Flashman forthcoming; Fryer and Torelli 2010). Black and Latino adolescents, on average, have friends with lower levels of academic achievement compared to white and Asian adolescents. While friends may help to diminish disparities, they may also help to explain the racial differences in achievement observed in test scores and grades. This paper addresses this issue, asking: How do differences in the friendships made by adolescents from different race and ethnic backgrounds contribute to observed achievement disparities by race and ethnicity?

Complicating matters, individuals select their friends, tend to choose friends similar to themselves, and affect one another simultaneously (Manski 2000; McPherson, Smith-Lovin and Cook 2001). As a result, although I may observe that two friends are similar with respect to academic achievement, I cannot know the degree to which this pattern is the consequence of the influence of friend 1 on friend 2, friend 2 on friend 1, or selection based on similarity in academic achievement. To address these issues and establish a causal relationship between friends' academic achievement and an individual's academic achievement, I use a set of instrumental variables that, I argue, predict an individual's friends' characteristics but are independent of the unmeasured characteristics that predict individual academic achievement: the race, ethnicity, and achievement characteristics of adolescents' friends' friends.

This analysis is carried out using data from the National Longitudinal Study of Adolescent Health (Add Health). Predicting respondents' transcript grade point average, the instrumental variable analysis shows that controlling for background characteristics, course-taking patterns, and educational expectations, on average adolescents' friends' characteristics significantly impact academic achievement. Although the size of these effects are comparable to several family characteristics widely accepted to have important effects on children's achievement and achievement differentials, a simple decomposition shows that friend effects provide at best a modest explanation for achievement differentials. Of course, this model assumes that friend effects are the same across race/ethnic groups. Relaxing this assumption, I find that the size of

friend effects on academic achievement vary dramatically across race and ethnicity. Among Black adolescents friends have no impact on their academic achievement, while among Latino adolescents friends exert large effects on achievement. The consequence of these patterns is that differences in the size of friend effects help to create achievement differences between Black and White students but help to diminish achievement differences between Latino and White students.

2. Background

Racial Differences in Academic Achievement

Racial disparities in academic achievement exist and persist across time (Gamoran 2001; Jencks and Phillips 1998; Kao and Thompson 2003). Whether measured by grades in school or test scores, Black and Latino children score lower on tests and have lower grades on average. A persistent question in social science is why do these differences exist and how can we diminish them? Differences in family background explain approximately 30% of the variation in achievement between race and ethnic groups, leaving another 70% to be explained by other differences (Jencks and Phillips 1998). Popular explanations include differences in schools (Arum 2000; Hanushek and Rivkin 2009), neighborhoods (Card and Rothstein 2007), early/pre-school education (Entwisle and Alexander 1993), course-taking and track placement (Arum 2000; Gamoran and Mare 1989; Lucas 1999), and educational expectations (Kao and Tienda 1998). An often cited but rarely directly studied explanation for racial disparities in achievement is that adolescents from different race and ethnic backgrounds have different peers and friends.

Friend Influences on Academic Achievement

Social scientists believe that friends play an important role in individuals' lives, particularly in adolescence (Coleman 1961; Furman and Burhmaster 1992; Hartup 1996). Friends and peers affect delinquent behavior (Giordano, Cernkovich and Pugh 1986; Kandel 1978), sexual behavior (Billy and Udry 1985), and academic behavior and decisions (Coleman 1988; Frank et al. 2008; Riegle-Crumb, Farkas and Muller 2006; Vaquera and Kao 2008). These decisions and behaviors impact life-course trajectories and future stratification, suggesting that who ones friends are will have important consequences in the short and long term.

Past research identifies two channels through which friends affect behaviors and outcomes. First, friends create and reinforce common norms and expectations of behavior (Coleman 1988). A group of friends that includes a number of high-achieving students may develop norms relating to high achievement. Members of the group may enforce and strengthen this norm by

studying together, encouraging each other to take advanced courses, inquiring about performance on assignments, or by praising hard work and good grades. Through these norms, friends affect each other's achievement, maintaining or boosting the level of achievement in the group. Friends may also create and reinforce negative norms of achievement. For example, Fordam and Ogbu (1986) argue that black adolescents create and reinforce norms of low-achievement through friendships. High-achieving black students are shunned by their black peers and lower their level of achievement to be accepted.

Second, friendships provide channels for the diffusion of information[1] (Coleman 1988; Granovetter 1973; Portes 1998). As information is shared, particularly between individuals with different resources, the set of possible choices changes and leads adolescents to potentially make different choices. Friends may discuss plans and information about college, for example. Adolescents whose parents attended college are more likely to understand the college admissions process, successfully navigate financial aid requirements, and attend college (Cabrera and La Nasa 2001). If these adolescents share knowledge and information with their friends, their friends should also be more likely to attend college.

Research from the 1960s and 1970s tries to understand the role that friends (discussed as significant others) play in the status attainment process (see for example, Duncan, Haller and Portes 1968; Sewell, Haller and Portes 1969; Sewell and Hauser 1975). This research shows that the educational expectations of one's friends are correlated with an individual's own educational expectations. Although early work relied on cross-sectional data, later longitudinal status attainment research also showed a strong association between friends' educational expectations and educational attainment (Sewell and Hauser 1975). The focus of research on friends shifted in the early 1980s from their effect on educational expectations and attainment to delinquent behaviors. Again using a longitudinal design, this research showed a similarly strong association between friend characteristics and delinquent behavior (Elliot, Huizinga and Ageton 1985; Patterson and Dishion 1985; Thornberry et al. 1994).

Although social scientists tend to believe that friends affect both adolescents' positive and negative behaviors, the vast majority of recent research on friend effects focuses on friends as sources of negative influence (Asteline 1995; Billy and Udry 1985; Elliot, Huizinga and Ageton 1985; Evans, Oates and Schwab 1992; Giordano, Cernkovich and Pugh 1986; Matsueda and Anderson 1998; Patterson and Dishion 1985). A few recent studies focus on friends as a source of positive enforcement. On the one hand, friends appear to have important and large effects on adolescents' academic outcomes. Crosnoe et al (2003), for example, find that individuals with academically inclined friends have fewer academic problems than individuals with less academically inclined friends. Altermatt and Pomerantz (2005) find that the effects of friends'

[1] Coleman (1988) argues that information and resource sharing is a product of norms.

academic achievement varies by the respondent's academic achievement. Low achieving students with high achieving friends perform better than low achieving students with low achieving friends, while high achieving students are generally unaffected by their friends' achievement. Finally, Riegle-Crumb et al (2006) study the role of friends' academic achievement on advanced course taking. Adolescents with high achieving friends experience a greater probability of enrolling in advanced courses, though this result is stronger among females than males.

On the other hand, other work is more skeptical of friends' impact on positive outcomes. Duncan et al (2001) find a positive correlation between friends' academic achievement that is much smaller than the correlation between siblings. They suggest that friends have limited influence over individuals' academic achievement, compared to families. Similarly Davies and Kandel (1981) find that parental influences on adolescent educational aspirations are much stronger than friends' influence.

Although both Crosnoe et al (2003) and Altermatt and Pomerantz (2005) use panel data to analyze the relationship between friends and positive outcomes, the above research does little to address the methodological issues inherent in studying friend effects.

If minority adolescents have friends with systematically different characteristics from white adolescents, as recent research suggests (Flashman forthcoming; Fryer and Torelli 2010), these differences may contribute to the observed differences in academic achievement. Indeed, figure 1 shows that the grades of black and Latino adolescents' friends are significantly lower than those of white and Asian adolescents. The average black adolescent has friends with an average grade point average .27 grade points lower than the average white adolescent, and the average Latino adolescent's friends have GPA .23 points lower. However, in order for this pattern to explain achievement differentials, I need to show that an individual's friends' achievement characteristics affect her achievement outcomes. Establishing this causal relationship between friends' behaviors and adolescents' behaviors is challenging to say the least.

[INSERT FIGURE 1 ABOUT HERE]

Methodological Challenges

Two serious methodological problems plague research on friend effects: selection bias and endogeneity. First, research on friend effects is subject to a selection problem. Individuals tend to make friends with individuals similar to themselves. Bias is introduced into estimates of friend effects because many unmeasured characteristics that determine friendships also

determine academic achievement. For example, if an individual has an underlying propensity to succeed, this propensity may lead to more academically inclined friends and higher grades in school. Although prior grades, educational expectations, and parental education capture some of this propensity, unmeasured characteristics that affect both friendship choices and achievement remain. In other words, I may overestimate the effect that friends' academic achievement has on grades because some underlying characteristic of the individual that predicts both is not fully accounted for in the model.

Second, individual behaviors and friend behaviors are endogenous. Friends and outcomes are determined simultaneously. As a result, it is impossible to determine whether achievement affects friend choices, friends affect achievement, or both. Furthermore, friends affect one another simultaneously (Hanushek et al. 2003; Manski 2000). When two friends are both academically successful, is friend 1 affecting friend 2, friend 2 affecting friend 1, both, or neither? If I ignore this endogeneity, I again overstate friend effects, attributing all similarities between friends to the effect of one friend on the other.

The best way to address both problems is to find an instrument that predicts friends' characteristics but is independent of the error term (Manski 2000). The instrumental variable approach, however, requires strong assumptions that, if violated, will lead to as biased estimates as basic cross-sectional models. Instruments must be correlated with the endogenous variable, in this case friend characteristics, but be uncorrelated with unmeasured characteristics that affect the outcome, in this case academic achievement. The first is easy to show, the latter is more difficult to show but can be tested if more than one instrument exists. This is the approach taken in the current analysis.

Research Questions

I ask two questions:

1. After accounting for endogeneity and selection, how do the academic characteristics of friends influence an individual's academic achievement?
2. To what extent do differences in the academic characteristics of Black and Latino adolescents' friends explain achievement differences between Black and Latino students on the one hand and white students on the other?

In light of the methodological challenges presented by the study of friends, this paper makes two contributions to the literature. First, I provide a better estimation of the influence of friends' academic characteristics on academic achievement. Second, I decompose these estimated effects by race and ethnicity to determine what portion of the observed racial difference in achievement is explained by differences in the friendships made.

3. Methods

Equation 1 describes the academic achievement, *Y*, of individual *i* with friends *n* as a function of individual characteristics *X*, friend characteristics *A*, and error term *ε*, or

$$Y_{in} = \beta_1 X_i + \beta_2 A_{in} + \varepsilon_i \quad (1)$$

Two problems occur when estimating equation 1. First, if A_{in} is correlated with ε_i, then the estimation of β_2 will be biased. In other words, unmeasured characteristics that determine both the outcome and the friend characteristics will be attributed incorrectly to the friend characteristics, thus over or under estimating their importance. Because adolescents tend to make friends with similar others, the error term should be positively correlated with the friend characteristics and lead to an over estimation of friend effects.

Second, equation 1 imposes a causal order. According to the model, the friend characteristics, A_{in}, affect individual *i*'s achievement, Y_{in}. However, if the outcome of each friend is *also* governed by equation 1, then A_{in} would also be determined by Y_{in} through individual *i*'s influence, or

$$A_{in} = \beta_1 X_i + \beta_2 Y_{in} + \varepsilon_i \quad (2)$$

If Y_{in} and A_{in} occur simultaneously, the causal order goes in *both* directions at once. As a result, adolescents will appear more similar and that similarity will be attributed to the influence of A_{in}, upwardly biasing estimates of the effect of friend characteristics, β_2.

Instrumental Variables

A promising approach for dealing with both selection and endogeneity problems is an instrumental variable that can predict the characteristics of friends but is uncorrelated with the error term. In other words, for equation 1, I need to identify a variable, Z_{in}, that predicts A_{in} but is not correlated with ε_i.

I use the characteristics of the respondents' friends' friends (indirect friends) who are not the respondents' friends as an instrument for the academic characteristics of adolescents' friends.[2]

[2] I carried out a parallel analysis using an alternative set of instruments: the characteristics of the individuals who nominate the respondent as a friend but who are not nominated by the respondent (unreciprocated nominators). The unreciprocated nominators are not the respondents' friend choices and are potentially independent of the unmeasured characteristics that affect friendship choice. Because this set of instruments provided similar results but presented more theoretical problems, I only discuss and present results for the instrument of indirect friends.

Three assumptions must hold for this set of instruments to be a valid: 1) a respondent's friends' characteristics must be correlated with her indirect friends' characteristics, 2) a respondent is not influenced by her indirect friends except through her direct friends or other measured characteristics, and 3) a respondent does not affect the characteristics of her indirect friends except through her friends or other measured characteristics. The first assumption is relatively easy to establish and is discussed in the next section after the specific measures are described. However, I can imagine circumstances when assumptions 2 and 3 are violated.

Christakis, Fowler, and colleagues argue that second and even third degree friends directly influence behaviors. (Cacioppo, Fowler and Christakis 2009; Christakis and Fowler 2007; Christakis and Fowler 2008; Fowler and Christakis 2008a; Fowler and Christakis 2008b; Rosenquist et al. 2010). This work shows for example, that an individual's friend's friend's weight is positively correlated with that individual's weight, net of his or her friend's weight. They found similar results for depression and smoking behavior. If these relationships are in fact causal—in other words that one's friends' friends directly affect one's own behaviors—these relationships could undermine the proposed set of instruments in this analysis. However, as Cohen-Cole and Fletcher (2008a; 2008b) demonstrate, this work does not sufficiently account for selection and contextual effects. They show, using a similar but nationally representative dataset that the network effects claimed by Christakis and Fowler to affect obesity disappear after controlling for context and selection. Indeed, using the methods of Christakis and Fowler, Cohen-Cole and Fletcher find "social network" effects on characteristics that could in no way be influenced by social networks, including acne, headaches, and height. This work introduces doubt in the proposed relationship between indirect friends and behaviors. Nonetheless, this potential relationship can be tested directly and is done after the data and measures are described below.

Although it seems unlikely that indirect friends are directly influencing the achievement behavior of adolescents, adolescents may directly affect their friends' friend choices and their characteristics in several ways. For example, adolescents may encourage their friends to be friends with one another. However, as long as the friend choices of A's friend, B, are affected by A's current friend choices only, this does not present a problem for the IV estimation. Respondents may also affect their friends' friend choices by stigmatizing or popularizing their friends. If the respondent is perceived by others as unpopular, his friends may be stigmatized by association, affecting the friend options available to the stigmatized friend. If the characteristics that stigmatize a respondent are measured in the model (i.e. prior achievement, club membership, attachment to school), the effect of the respondent on his friends' friend choices is accounted for. Finally, adolescents may directly affect their friends' friend choices by affecting their activities and course taking patterns, in other words by affecting the group of people to which their friends are exposed. Including a rich set of controls to account for the

respondents' club membership, course-taking, and sports teams, will help to account for this form of influence over indirect friends.[3]

Given multiple instruments for the endogenous variable of interest—in this case, friends' average academic achievement—I am able to test the latter assumptions indirectly using the Hansen J statistic test of overidentifying restrictions, and the Cragg-Donaldson F-Statistic (Baum, Schaffer and Stillman 2003; Baum, Schaffer and Stillman 2007; Hayashi 2000). The results of these tests are discussed in section 4 below, after I introduce the specific measures of indirect friends' characteristics that are used to instruments friends' average academic achievement. Although the instruments proposed for this analysis are not truly exogenous instruments[4], given a strong set of controls, they potentially provide unbiased estimates of friend characteristics and friend effects on achievement.

4. Data and Measures

Data

Data for this analysis come from the National Longitudinal Study of Adolescent Health (Add Health). Add Health provides the only nationally representative survey of adolescents and their in-school friends. Add Health surveyed 7-12th grade students in 144 sampled schools in 1994/1995 (N=89,940). All students completed a short survey including basic socioeconomic and demographic information as well as self-reported grades. Students were also asked to nominate their five closest male friends and five closest female friends. Because nearly all students at sampled schools participated in the in-school survey, Add Health provides a unique dataset from which to characterize the academic composition of students' in-school friends. A subsample of students from sampled schools was followed-up in the wave 1 in-home survey in 1995, an average of 6 months after the in-school survey (N=20,745). These students were randomly selected from sampled schools. This survey included more detailed background and health information. In 1996, wave 2 data were collected for all wave 1 respondents in 7-11th

[3] An additional source of bias comes from the limits placed on adolescents' friend nominations in the data (up to 5 male friends and 5 female friends). A consequence of this measurement error is that the respondent may in fact have chosen these indirect friends as friends were they able to nominate more friends, and as a result their characteristics are subject to the same selection bias and endogeneity as the nominated friends. To account for this possibility, I ran this IV analysis only for the individuals who nominate fewer than 5 male friends and fewer than 5 female friends. These individuals do not nominate the maximum number of friends and therefore are not limited by the restricted number of friend nominations. Results do not differ dramatically for this limited sample compared to the full sample of students, providing good evidence that these survey restrictions do not interfere with the measurement of the instrument. These results are available upon request from the author.

[4] I explored several truly exogenous instruments including friends' birth weight and number of siblings. Neither was significantly correlated with friends' academic achievement once other covariates were controlled, according to the Cragg-Donaldson F-statistic.

grade at the time of the wave 1 interview. In 2000, these students were surveyed again (wave 3) (Bearman, Jones and Udry 1997; Chantala 2006). High school transcripts were gathered from all wave 3 participants (Adolescent Health and Academic Achievement study, AHAA), providing course-taking information and actual rather than self-reported grades for approximately 12,000 participants (Riegle-Crumb et al. 2005). A combination of these data is used throughout this analysis. Specific measures and samples are described below.

Measures

Below I describe the key dependent and independent variables used in this analysis. A summary and description of all variables including controls not discussed in the text is presented in table 1.

Dependent Variables

The goal of this analysis is to show how differences in friend characteristics affect race and ethnic achievement differentials. I use the transcript reported GPA from respondents' 1994-1995 school year to capture academic achievement. This measure, from the AHAA supplementary data, is available for those respondents participating in the Wave 3 in-home survey. Because transcripts were collected only from respondents' high schools, those who were in 7th and 8th grades during the 1994-1995 school year are excluded from the analysis. Furthermore, transcripts were collected from the subset of individuals who participated in the Wave 3 follow-up survey. This sample therefore also excludes those who were in the 12th grade during the 1994-1995 school year.

Key Independent Variables

The goal of this analysis is to identify how differences in friend characteristics explain race/ethnic differentials in academic achievement. To identify friend effects on academic achievement, I focus on friends' average academic achievement. Respondents report their average grades in math, English, social studies, and science at the time of the in-school survey. I average reports, giving A 4 points, B 3 points, C 2 points, and D 1 point, to create an overall grade point average. Of course, self-reported grades do not necessarily capture actual levels of achievement. Nonetheless, they provide a measure of the kind of student each respondent believes he or she is. Because all students were surveyed in each sampled school, this measure is available for all of respondents' nominated in-school friends. These self-reported GPAs are averaged across friends.

Instruments

I use several measures of respondents' friends' friends' characteristics as instruments to purge the average self-reported GPA of respondents' friends of its selection bias and endogeneity. I focus on adolescents' indirect friends' self-reported achievement, the proportion of indirect friends who are Black, and the proportion of indirect friends who are Latino. These three variables are used as instruments for friends' self-reported GPA.

Control Variables

Ideally the instruments described above deal with selection and endogeneity of adolescents' friends. However, as I discussed earlier, these are not truly exogenous instruments. They may be correlated with respondents' characteristics in important ways. The issue is that individual characteristics associated with academic achievement may also be associated with indirect friends' characteristics. It is therefore vital that a rich set of controls are included in the model. These controls fall into three categories: demographic and family background characteristics, course-taking and school involvement, and attitudes and expectations towards school. Self-reported achievement at the time of the in-school survey is also included to control for prior achievement. Controls are taken from the in-school survey—when friend nominations occur. Because the in-school survey is more limited in scope than the proceeding waves of the survey, some variables that would otherwise be controlled are not included because they are endogenous to the variable of interest. These include respondents' educational expectations and self-reported intelligence. Both are reported at the time of the in-home survey *after* friend characteristics are measured. They may therefore be a consequence of friend characteristics. Self-reported GPA should capture aspects of both educational expectations and intelligence. A description of all variables is included in table 1 and their means overall and by race/ethnicity are included in table 2.

[INSERT TABLE 1 ABOUT HERE]

[INSERT TABLE 2 ABOUT HERE]

The Sample

This analysis focuses on the longitudinal sample of students who participated in the in-school, waves I, II, and III surveys for whom transcript data are available. Because transcript data are only available for the time when respondents are in high school, and because 12th graders at the time of the in-school survey were excluded from the transcript study, this sample includes only the 9th, 10th, and 11th graders from the 1994-1995 school year. Respondents missing basic demographic characteristics including gender, race, and both parents' education are excluded from the analysis. Approximately 3% of each sample is excluded as a result of these exclusions. Additionally, I exclude all individuals who are missing self-reported grades at the time of the in-school survey. Finally, respondents who nominate 0 in-school friends are excluded from the

analysis. The resulting estimates are therefore the average treatment effects on the treated rather than the entire population. These restrictions lead to a sample of 4,884.

Corrections for survey design are implemented using STATA's svy command set. These corrections adjust standard errors to account for sampling and clustering within schools. Instrumental variable models implement two-stage least squares regressions. All estimates are weighted using the transcript panel weight available with the AHAA transcript data.

Testing the Validity of Instruments

Hausman tests confirm that friends' average academic achievement is endogenous and that the IV estimation is preferred to a cross-sectional estimation with endogenous friend characteristics.[5]

Two assumptions must be met for the instruments used in this analysis to be valid: 1) the instruments must significantly predict friends' average GPA, and 2) the instruments must be uncorrelated with the error term. Given multiple instruments, both assumptions can be tested. The first is tested using the Cragg-Donald F-Statistic, which tests whether the instruments underidentify the endogenous regressor. Statistical significance indicates a rejection of the null hypothesis that the instruments under-identify the endogenous regressor. The second assumption is tested using the Hansen J over-identification test statistic. A rejection of the null hypothesis—that the set of instruments are independent of the error term—casts doubt on the validity of the instruments. (Baum, Schaffer and Stillman 2003; Baum, Schaffer and Stillman 2007; Hayashi 2000)

The results of both tests are included at the bottom of table 3 for the set of instruments described above. According to standard thresholds for the F-statistic, the set of instruments significantly predicts friends' academic achievement, conditional on the other regressors in the model, and are not weak instruments. According to the J-statistics, the set of instruments is also independent of the error term, again conditional on the set of controls included in the models. In addition to these tests I estimated the direct relationship between transcript GPA and the set of instruments, net of the control covariates, to test whether there is a significant relationship between indirect friends' characteristics and transcript GPA. I found no significant relationship between any of the instruments and transcript GPA. None of the instruments have a direct effect on transcript GPA. Based on these test statistics, the models estimated using these instruments provide valid causal estimates of the effect of friends' academic achievement on adolescents' academic achievement.

[5] Cross-sectional estimates with endogenous friend characteristics are available from the author upon request.

Results

The Effect of Average Friendship Group GPA

Table 3 presents the coefficient estimates for the effect of average friends' GPA on respondents' self-reported GPA, controlling for the individual and friend characteristics discussed above. The first two columns show the results of the first stage regression predicting friends' average self-reported GPA. The second two columns show results from the second stage regression predicting transcript GPA using indirect friends' proportion black, proportion Latino, and average self-reported GPA as instruments for friends' average self-reported GPA. Assuming that the set of instruments is valid, the estimated effect of friends' average self-reported GPA in column 3 is a causal effect and represents the average treatment effect on the treated. In other words, it is the average effect of in-school friends' academic achievement on the academic achievement of those with in-school friends.

A one point increase in friends' average self-reported GPA results in a .123 point increase in transcript GPA. Given that a student takes 6 courses, this effect is approximately equivalent to increasing the grade in one course by one letter grade. If an individual's friends have an average self-reported GPA of 2.0 and she changes her friends such that their achievement increases to 3.0, then her GPA should increase .123 grade points. This result is statistically significant at the $p<.05$ level.

[INSERT TABLE 3 HERE]

How does this effect compare to other commonly studied characteristics associated with academic achievement? Rows 14-17 show the effect of mother's education on transcript GPA. The effect of a one point increase in friends' average GPA is approximately equivalent to increasing mother's education from less than high school to some college. The effect is somewhat larger than living in a two parent household (row 24) or taking honors/advanced placement English (row 44).[6]

The goal of this article is to understand the impact that friend effects might have on race and ethnic differentials in academic achievement. As figure 1 shows, adolescents from different race and ethnic background have friends with different levels of academic achievement. Whereas the average White adolescent's friends have an average GPA of 2.92, the average Black adolescent's friends have an average GPA of 2.58. Given the estimated effect of friends' average self-reported GPA on an adolescents' actual GPA, what proportion of the race/ethnic

[6] The coefficients of the control variables in this model should not be interpreted causally.

gap in academic achievement can be explained by differences in the characteristics of adolescents' chosen friends?

Table 4 shows the results of a simple decomposition of race and ethnic differences in transcript reported GPA. Given the estimated effect of friends from table 3 and assuming that friend effects do not vary across race/ethnicity, the White/Black and White/Latino differences in transcript GPA can be decomposed to show how much of the difference is explained by differences in the characteristics of chosen friends. If Black adolescents had friends with the GPA characteristics that White adolescents had (2.92 instead of 2.58), the resulting change in transcript GPA for Black adolescents would be .033 grade points. This represents 7% of the GPA gap between Black and White adolescents in the Add Health data. Similarly, if Latino adolescents had friends with the same academic characteristics as White adolescents, the achievement gap would decrease by 11%.

[INSERT TABLE 4 HERE]

Of course there are many things at play here and simply changing the achievement level of friends is a somewhat simple-minded exercise. However, the point is to demonstrate the potential impact that friends have (or don't have) on achievement differentials. Differences in friend characteristics explain 7-11% of achievement differences between White adolescents and Black/Latino adolescents. And 7-11% is actually fairly small. For Black adolescents, this represents .033 grade points or, for a student taking 6 courses, increasing the grade in one course from a B to a B+. While these are non-zero effects, they provide only a small part of the story for achievement gaps across race and ethnicity.

Heterogeneous Effects

As I said above, these effects represent the average treatment effects on the treated. I assume that friend influence does not differ across race/ethnicity. However, race/ethnic achievement differentials may result not only from differences in the characteristics of adolescents' friends across race but differences in effects of friends' average characteristics. Several prominent theories predict that friend effects will differ in important ways across race and ethnicity. For example, an implication of oppositional culture theory (Fordham and Ogbu 1986; Ogbu 1978) is that Black adolescents should be more negatively affected by their friends compared to white adolescents. If oppositional norms exist and are encouraged by black adolescents' peers, the result should be, on average, a greater negative impact of friends on achievement related behaviors and as a result on academic achievement.

Furthermore, the structural characteristics of Black adolescents' networks systematically differ from those of White adolescents. A simple look at the ego-centered networks of the analysis sample by race shows several important patterns. Black adolescents' friendships are

reciprocated less often, they nominate fewer in-school friends, and are less central in their in-school networks, on average. Social network theory argues that these differences will have important impacts on the extent to which friends influence behaviors (Moody and White 2003). Each of these network characteristics affects both information sharing within a network of friends and general norm creation. A less cohesive network of friends where the influencee is on the periphery of the network will minimize information sharing and weaken norms, ultimately leading to less influence as Calvo-Armengol, Patacchini, and Zenou (2009) show.

Table 5 shows the results of the instrumental variable analysis separated by race/ethnicity. Although only the relationships between the instruments and friends' GPA, and the instrumented friends' GPA and transcript GPA are shown, each model includes the full list of controls from table 1 (minus race/ethnicity). In all cases the F-statistics confirm that the instruments are not weak and the overidentification tests suggest that the set of instruments are not significantly correlated with the error term. The first two columns show the results of the instrumental variable analysis for White respondents. Given that White respondents make up the majority of the population, it is not surprising that the results remain relatively constant, compared to the pooled results from table 3. A one point increase in friends' mean self-reported GPA increases the respondent's transcript GPA by .131 grade points. Once again, this change is approximately equivalent to increasing the grade in one course by one letter grade (assuming 6 courses are taken).

[INSERT TABLE 5 ABOUT HERE]

Among Black respondents, friends have no significant effect on their transcript GPA. Increasing or decreasing friends' average GPA does not lead to any significant changes in Black adolescents' academic achievement. By contrast, Latino respondents' friends have strong and important effects on their academic achievement. A one point increase in Latino adolescents' friends' mean self-reported GPA increases transcript GPA by .435 grade points. This change represents a very large increase in achievement. For example, .435 grade points can make the difference between being admitted to a selective college/university and being rejected. It represents increasing grades in three of six courses by almost 1 letter grade. In other words, for Latino adolescents, friends exert a strong and important influence on their academic achievement.

Again, the goal of this article is to understand how friends contribute to achievement differentials across race and ethnicity. Table 4 shows, assuming homogenous effects across race and ethnic groups, that differences in the mean characteristics of adolescents' friends across race/ethnicity explain a very modest amount of the race/ethnic gap in GPA. Of course, the above analysis reveals important differences in the average effect of friends' mean self-reported GPA across race/ethnicity. As a result, *three* different forces could be contributing to

race/ethnic achievement difference: differences in means, differences in effects, and the interaction between differences in means and differences in effects. Table 6 shows the results of the decomposition of friend effects and characteristics by race/ethnicity. The decomposition follows Blinder (1973) and Oaxaca (1973), decomposing the difference in means between two groups into the part explained by differences in effects, the part explained by differences in means, and the part explained by the interaction between means and effects. This decomposition can be expressed as:

$$\bar{y}_2 - \bar{y}_1 = (\propto_2 - \propto_1) + (\beta_2 - \beta_1) \cdot \bar{x}_1 + \beta_1 \cdot (\bar{x}_2 - \bar{x}_1) + (\beta_2 - \beta_1) \cdot (\bar{x}_2 - \bar{x}_1) \quad (3)$$

Where $(\propto_2 - \propto_1)$ represents the portion of the difference in outcomes unexplained by differences in means $(\beta_2 - \beta_1)$, differences in effects $(\bar{x}_2 - \bar{x}_1)$, and their interaction.

[INSERT TABLE 6 ABOUT HERE]

Focusing first on the Black-White column, these numbers represent the difference in expected transcript GPA that would result if 1) the effects of friends among Black and White adolescents were the same but their means remained different, 2) mean levels of achievement among friends were the same but effects remained different, and 3) the added impact of on GPA given the interaction between different effects and different means. For example, if Black adolescents' friends had the same impact on Black achievement as White adolescents' friends had on White achievement (but Black adolescents continued to have friends with the same academic characteristics), their transcript GPAs would be .193 grade points higher, given that all other measured characteristics are equal. This is equivalent to 40% of the GPA gap between Black and White adolescents. By contrast, if Black adolescents' friends had the mean academic characteristics of White adolescents' friends but their effects on academic achievement remained at the estimated level from table 5, the achievement gap between Black and White adolescents would be reduced by only .016 grade points or 3%. Ultimately, because friends' academic characteristics have no estimated effect on Black students' GPA, changing the mean characteristics of their friends will do little to change their overall levels of achievement. Similarly, the interaction between means and effects does little to explain the Black-White achievement gap.

Although friends have the potential to seriously affect the Black-White achievement gap, it is only through changes in friend effects that any real change could be accomplished.

Among Latino students, the story is quite different. Differences in friend effects are compensating for achievement differences between Latino and White adolescents. If Latino adolescents' friends had the same effect as White adolescents' friends, their transcript GPA would be .822 grade points *lower*. In other words, the greater effect that Latino adolescents' friends have on their academic achievement compared to Whites brings Latino and White

achievement closer together. By contrast, differences in the mean characteristics of White and Latino adolescents' friends account for 38% of the difference, or .098 grade points. If Latino adolescents' friends had the academic characteristics of Whites, but continued to experience the estimated effects of friends from table 5, they would do better, on average, in school.

This exercise demonstrates two important patterns. First, that merely changing the academic characteristics of Black adolescents' friends will do little to affect the Black-White achievement gap. By contrast, changing the academic characteristics of Latino adolescents' friends so that they are more like White adolescents' friends would significantly decrease the Latino-White achievement gap. Second, this result is driven by the dramatic differences in estimated friend effects across race/ethnic groups. On the one hand, friends' average academic achievement has little to no effect on Black students' academic achievement. On the other hand, among Latino adolescents, friends' average academic achievement has strong and important effects on Latino academic achievement, and helps to dramatically offset Latino-White achievement differences.

Discussion

This article had two goals: 1) to provide a better estimate of the effect that friends have on academic achievement, and 2) to use these estimates to explore the role that friends play in affecting achievement differentials across race and ethnicity. With an instrumental variable approach, I show that the academic achievement of one's friends significantly affects one's own academic achievement, *on average*. This result is consistent with past research but significantly more modest in size. Assuming that race and ethnic groups experience the same effects of friends, differences in the academic characteristics of friends explains approximately 7% of the Black-White achievement gap and 11% of the Latino-White achievement gap. However, when effects of friends are allowed to vary across race/ethnic groups, this story of friend effects changes dramatically. While friend effects among White adolescents remain fairly modest, among Black adolescents friend achievement has no significant effect on transcript GPA. Changing the academic characteristics of Black adolescents' friends would have almost no effect on Black-White achievement differences. Rather, friends contribute to this achievement differential by *differentially* affecting achievement outcomes. Among Latino adolescents, by contrast, estimated friend effects are quite large and help to moderate Latino-White achievement differentials. If Latino students' were affected by their friends at the level of White students, their achievement differential would grow dramatically such that Latino students would have significantly lower levels of achievement than they currently have.

The question that I am left with is: Why do average friend effects differ so widely across race/ethnic groups? The friendship networks of Black students differ in important structural

ways from both White and Latino adolescents' friendship networks. Black adolescents tend to be less central within their networks, have more out-of-school friends, fewer reciprocated friends, and fewer transitive ties. These characteristics could have important impacts on norm creation and information sharing, leading Black students to be "outside of the loop" so to speak. Furthermore, it is not necessarily the case that Black adolescents are not affected by their friends, rather their academic achievement is not affected by their *in-school* friends' academic characteristics on average. Black students have more out of school friends than other adolescents. If their friendships are centered in their neighborhoods rather than in their schools, then friend effects could be alive and well among Black adolescents but not captured in this analysis. Understanding the importance of out-of-school friends will require systematic data collection of adolescent friendships beyond the school walls.

Similarly, I can only speculate as to why Latino adolescents' friends would have such strong effects on their achievement. Faced with more limited educational resources at home, Latino adolescents may turn to their friends for advice, help, and information. These strong friend influence effects could also be driven by the unique immigrant experience of many Latinos. First and second-generation immigrants have strong ties with extended family networks and co-ethnic communities (Borjas 1992; Portes and Rumbaut 2001). These networks provide important resources and information for migration decisions (Massey and Espinosa 1997; Palloni et al. 2001), the labor market (Nee and Sanders 2001), and educational decisions (Kastinitz et al. 2008). Children in immigrant communities, observing the central role of networks, may similarly turn to their own social networks for support, information, and resources.

Ultimately, friends are impacting achievement differentials across race and ethnicity in important and contrasting ways. Friends are increasing Black-White achievement gaps while decreasing Latino-White achievement gaps. However, a simple-minded reshuffling of adolescents' friends and their characteristics would do little to affect achievement gaps across race and ethnicity. Rather, a focused study of the mechanisms that lead to differences in the *size* of friend effects both across and within race and ethnic groups is a necessary and important next step in understanding the root of achievement disparities.

References

Altermatt, E. R., and E. M. Pomerantz. 2005. "The implications of having high-achieving versus low-achieving friends: A longitudinal analysis." *Social Development* 14:61-81.

Arum, R. 2000. "Schools and communities: Ecological and institutional dimensions." *Annual Review of Sociology* 26:395-418.

Asteline, Robert. 1995. "A Reconsideration of Parental and Peer Influences on Adolescent Deviance." *Journal of Health and Social Behavior* 3:103-121.

Baum, C. F., M. E. Schaffer, and S. Stillman. 2003. "Instrumental Variables and GMM: Estimation and Testing." *Stata Journal* 3:1-31.

—. 2007. "Enhanced Routines for Instrumental Variables/Generalized Method of Moments Estimation and Testing." *Stata Journal* 7:465-506.

Bearman, Peter, Jo Jones, and J. Richard Udry. 1997. "The National Longitudinal Study of Adolescent Health: Research Design."

Billy, J. O. G., and J. R. Udry. 1985. "Patterns of Adolescent Friendship and Effects on Sexual-Behavior." *Social Psychology Quarterly* 48:27-41.

Blinder, A. S. 1973. "Wage Discrimination - Reduced Form and Structural Estimates." *Journal of Human Resources* 8:436-455.

Borjas, G. J. 1992. "Ethnic Capital and Intergenerational Mobility." *Quarterly Journal of Economics* 107:123-150.

Cabrera, A. F., and S. M. La Nasa. 2001. "On the Path to College: Three Critical Tasks Facing America's Disadvantaged." *Research in Higher Education* 42:199-150.

Cacioppo, J. T., J. H. Fowler, and N. A. Christakis. 2009. "Alone in the Crowd: The Structure and Spread of Loneliness in a Large Social Network." *Journal of Personality and Social Psychology* 97:977-991.

Calvo-Armengol, A., E. Patacchini, and Y. Zenou. 2009. "Peer Effects and Social Networks in Education." *Review of Economic Studies* 76:1239-1267.

Card, D., and J. Rothstein. 2007. "Racial segregation and the black-white test score gap." *Journal of Public Economics* 91:2158-2184.

Chantala, Kim. 2006. "Guidelines for Analyzing Add Health Data." Carolina Population Center, University of North Carolina at Chapel Hill.

Christakis, N. A., and J. H. Fowler. 2007. "The spread of obesity in a large social network over 32 years." *New England Journal of Medicine* 357:370-379.

—. 2008. "The collective dynamics of smoking in a large social network." *New England Journal of Medicine* 358:2249-2258.

Cohen-Cole, E., and J. M. Fletcher. 2008a. "Detecting implausible social network effects in acne, height, and headaches: longitudinal analysis." *British Medical Journal* 337.

—. 2008b. "Is obesity contagious? Social networks vs. environmental factors in the obesity epidemic." *Journal of Health Economics* 27:1382-1387.

Coleman, James. 1961. *The Adolescent Society*. New York: Free Press.

—. 1988. "Social Capital in the Creation of Human Capital." *American Journal of Sociology* 94:95-120.

Crosnoe, R., S. Cavanagh, and G. H. Elder. 2003. "Adolescent friendships as academic resources: The intersection of friendship, race, and school disadvantage." *Sociological Perspectives* 46:331-352.

Duncan, O.D., A. Haller, and A. Portes. 1968. "Peer Influences on Aspirations: A Reinterpretation." *American Journal of Sociology* 74:119-137.

Elliot, D., D. Huizinga, and S. Ageton. 1985. *Explaining Delinquency and Drug use*. Beverly Hills: Sage.

Entwisle, D. R., and K. L. Alexander. 1993. "Entry into School - the Beginning School Transition and Educational Stratification in the United-States." *Annual Review of Sociology* 19:401-423.

Evans, W, W Oates, and R Schwab. 1992. "Measuring Peer Effects: A Study of Teenage Behavior." *Journal of Political Economy* 100:966-991.

Flashman, Jennifer. forthcoming. "Different Preferences or Different Opportunities?: Explaining Race Differentials in the Academic Achievement of Friends." *Social Science Research*.

Fordham, Signithia, and John Ogbu. 1986. "Black Students' School Success: Coping with the "Burden of 'Acting White'"." *The Urban Reivew* 18:176-206.

Fowler, J. H., and N. A. Christakis. 2008a. "Dynamic spread of happiness in a large social network: longitudinal analysis over 20 years in the Framingham Heart Study." *British Medical Journal* 337.

—. 2008b. "Estimating peer effects on health in social networks: A response to Cohen-Cole and Fletcher; and Trogdon, Nonnemaker, and Pais." *Journal of Health Economics* 27:1400-1405.

Frank, K. A., C. Muller, K. S. Schiller, C. Riegle-Crumb, A. S. Mueller, R. Crosnoe, and J. Pearson. 2008. "The social dynamics of mathematics coursetaking in high school." *American Journal of Sociology* 113:1645-1696.

Fryer, Roland, and Paul Torelli. 2010. "An Empirical Analysis of 'Acting White'." *Journal of Public Economics* 94:380-396.

Furman, Wyndol, and Duane Burhmaster. 1992. "Age and Sex Differences in Perceptions of Networks of Personal Relationships." *Child Development* 63:103-115.

Gamoran, A. 2001. "American schooling and educational inequality: A forecast for the 21st century." *Sociology of Education*:135-153.

Gamoran, A., and R. D. Mare. 1989. "Secondary-School Tracking and Educational-Inequality - Compensation, Reinforcement, or Neutrality." *American Journal of Sociology* 94:1146-1183.

Giordano, P. C., S. A. Cernkovich, and M. D. Pugh. 1986. "Friendships and Delinquency." *American Journal of Sociology* 91:1170-1202.

Granovetter, M. 1973. "Strength of Weak Ties." *American Journal of Sociology* 78:1360-1380.

Hanushek, E. A., J. F. Kain, J. M. Markman, and S. G. Rivkin. 2003. "Does peer ability affect student achievement?" *Journal of Applied Econometrics* 18:527-544.

Hanushek, E. A., and S. G. Rivkin. 2009. "Harming the Best: How Schools Affect the Black-White Achievement Gap." *Journal of Policy Analysis and Management* 28:366-393.

Hartup, W. W. 1996. "The company they keep: Friendships and their developmental significance." *Child Development* 67:1-13.

Hayashi, F. 2000. *Econometrics*. Princeton, NJ: Princeton University Press.

Jencks, Christopher, and Meredith Phillips. 1998. *The Black-White Test Score Gap*. Washington, DC: The Brookings Institution.
Kandel, D. B. 1978. "Homophily, Selection and Socialization in Adolescent Friendships." *American Journal of Sociology* 84:427-436.
Kao, G., and J. S. Thompson. 2003. "Racial and ethnic stratification in educational achievement and attainment." *Annual Review of Sociology* 29:417-442.
Kao, G., and M. Tienda. 1998. "Educational aspirations of minority youth." *American Journal of Education* 106:349-384.
Kastinitz, P., J. Mollenkopf, M. Waters, and J. Holdaway. 2008. *Inheriting the City: The Children of Immigrants Come of Age*. New York: Russell Sage Foundation.
Lucas, Samuel R. 1999. *Tracking Inequality: Stratification and Mobility in American High Schools*. New York City: Teachers College Press.
Manski, C. F. 2000. "Economic analysis of social interactions." *Journal of Economic Perspectives* 14:115-136.
Massey, D. S., and K. E. Espinosa. 1997. "What's driving Mexico-US migration? A theoretical, empirical, and policy analysis." *American Journal of Sociology* 102:939-999.
Matsueda, Ross, and Kathleen Anderson. 1998. "The Dynamics of Delinquent Peers and Delinquent Behavior." *Criminology* 36:269-308.
McPherson, M., L. Smith-Lovin, and J. M. Cook. 2001. "Birds of a feather: Homophily in social networks." *Annual Review of Sociology* 27:415-444.
Moody, J., and D. R. White. 2003. "Structural cohesion and embeddedness: A hierarchical concept of social groups." *American Sociological Review* 68:103-127.
Nee, V., and J. Sanders. 2001. "Understanding the diversity of immigrant incorporation: a forms-of-capital model." *Ethnic and Racial Studies* 24:386-411.
Oaxaca, R. L. 1973. "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review* 14:693-709.
Ogbu, John. 1978. *Minority Education and Caste: The American System in Cross-Cultural Perspective*. New York: Academic Press Inc.
Palloni, A., D. S. Massey, M. Ceballos, K. Espinosa, and M. Spittel. 2001. "Social capital and international migration: A test using information on family networks." *American Journal of Sociology* 106:1262-1298.
Patterson, Gerald, and Thomas Dishion. 1985. "Contributions of Families and Peers to Delinquency." *Criminology* 23:63-79.
Portes, A. 1998. "Social Capital: Its Origins and Applications in Modern Sociology." *Annual Review of Sociology* 24:1-24.
Portes, A., and R. G. Rumbaut. 2001. *Legacies: The Story of the Immigrant Second Generation*. Berkeley, CA: University of California Press, Ltd.
Riegle-Crumb, C., G. Farkas, and C. Muller. 2006. "The role of gender and friendship in advanced course taking." *Sociology of Education* 79:206-228.
Riegle-Crumb, C., Chandra Muller, Ken Frank, and Kathryn Schiller. 2005. *National Longitudinal Study of Adolescent Health: Wave III Education Data*. Chapel Hill: Carolina Population Center, University of North Carolina at Chapel Hill.

Rosenquist, J. N., J. Murabito, J. H. Fowler, and N. A. Christakis. 2010. "The Spread of Alcohol Consumption Behavior in a Large Social Network." *Annals of Internal Medicine* 152:426-W141.

Sewell, W., A. Haller, and A. Portes. 1969. "The Educational and Early Occupational Attainment Process." *American Sociological Review* 34:82-92.

Sewell, W., and R. Hauser. 1975. *Education, Occupation, and Earnings: Achievement in the Early Career*. New York: Academic Press.

Thornberry, T. P., A. J. Lizotte, M. D. Krohn, M. Farnworth, and S. J. Jang. 1994. "Delinquent Peers, Beliefs, and Delinquent-Behavior - a Longitudinal Test of Interactional Theory." *Criminology* 32:47-83.

Vaquera, E., and G. Kao. 2008. "Do you like me as much as I like you? Friendship reciprocity and its effects on school outcomes among adolescents." *Social Science Research* 37:55-72.

Table 1 Description of Analysis Variables

Variable	Description
Transcript GPA	Transcript GPA from 1994-1995 school year. 0-4
Friends' Average Academic Achievement	Average of friend-reported average grade in English, math, science, and social studies, in the most recent grading period. Friends report letter grades A, B, C, or D or lower. Letter grades are assigned 4, 3, 2, and 1 points respectively and averaged across subjects. Reported at the time of the Wave I In-school survey.
Indirect Friends' Average Academic Achievement	Average of friends' friends' self-reported average grades in English, math, science, and social studies, in the most recent grading period. Reported at the time of the Wave I In-school survey.
Proportion of Black Indirect Friends	Proportion of friends' friends who report African American racial category.
Proportion of Latino Indirect Friends	Proportion of friends' friends who report belonging to Hispanic ethnic group, regardless of racial category reported.
Self-Reported GPA	Average of student-reported average grade in English, math, science, and social studies, in the most recent grading period. Respondent reports letter grades A, B, C, or D or lower. Letter grades are assigned 4, 3, 2, and 1 points respectively and averaged across subjects. Reported at the time of the Wave I In-school survey.
Race/ethnicity Black Latino Asian/Pacific Islander	Student-reported categories include African American, Latino, Asian, Native American, and Other. White is the reference group. Students who mark multiple race categories are classified under the racial group which *best* describes their racial background.
Gender	Dichotomous variable indicating the respondent's gender. Reference category is female.
Grade	Grade in school during the 1994-1995 school year. 9-12
Mother's education	Mother's highest level of education including the following categories: (1) less than a high school diploma (2) high school graduate or GED (3) some college attendance (including attending an applied, vocational, or technical college) (4) college degree (5) advanced degree
Father's education	Father's highest level of education including the following categories: (1) less than a high school diploma (2) high school graduate or GED (3) some college attendance (including attending an applied, vocational, or technical college) (4) college degree (5) advanced degree
Mother's Occupational Status	Occupational socioeconomic index score from respondent report of mother's occupation. 7-70 Mothers without an occupation are flagged.
Father's Occupational Status	Occupational socioeconomic index score from respondent report of mother's occupation. 7-70 Fathers without an occupation are flagged.
Family Composition	Dichotomous variable indicating whether the respondent lives with 2 biological/adoptive parents at the time of the in-school survey.
Migration History Foreign born 2nd generation	Respondent's/family's migration history. Reference category is 3+ generation migrant.
School music	Dichotomous variable indicating whether the respondent participated in any of the following school music programs: (1) Band, (2) Chorus or choir, (3) Orchestra.

Variable	Description
School sports team/activity	Dichotomous variable indicating whether the respondent participated in any of the following school sports teams/activities at the time of the in-school survey: (1) Cheerleading/dance team, (2) Baseball/softball, (3) Basketball, (4) Field hockey, (5) Football, (6) Ice hockey, (7) Soccer, (8) Swimming, (9) Tennis, (10) Track, (11) Volleyball, (12) Wrestling, (13) Other sport.
School club	Dichotomous variable indicating whether the respondent participated in any of the following school clubs at the time of the in-school survey: (1) French club, (2) German club, (3) Latin club, (4) Spanish club, (5) Book club, (6) Computer club, (7) Debate team, (8) Drama club, (9) Future Farmers of America, (10) History club, (11) Math club, (12) Science club, (13) Other club or organization.
Student government, newspaper, yearbook	Dichotomous variable indicating whether the respondent participated in student government, newspaper, or yearbook.
School engagement	The average of students' responses to the following three questions: how many times have you skipped school for the full day without an excuse, how often have you had trouble paying attention in school, and how often have you had trouble getting homework done. Skipping school is coded into the following categories: 0=0, 1=1-2, 2=3-5, 3=6-9, 4=10 or more. The other two items range from 0-4. All items were reverse coded before averaging so that a high score means greater school engagement than a low score.
School attachment	The average of students' responses to three questions asking how much they agree with the following statements: you feel close to people at your school, you feel like you are a part of your school, you feel happy to be at your school. Each question ranges from 1-strongly agree to 5-strongly disagree. All items were reverse coded so that a high score means greater school attachment than a low score.
Honors or AP English Course	A dichotomous variable indicating whether the respondent took an honors or AP level English course in the 1994-1995 school year from the AHAA transcript study.
Math Course Level	A series of dummy variables indicating the math course taken in the 1994-1995 school year from the AHAA transcript study including the following categories: (0) No math (1) Basic/Remedial Math (2) General/Applied Math (3) Pre-Algebra (4) Algebra 1 (5) Geometry (6) Algebra 2 (7) Advanced Math (including Algebra 3, Finite Math, Statistics) (8) Precalculus (including Trigonometry) (9) Calculus

Table 2 Means and Standard Deviations of Analysis Variables, N=4,884

Variable	Full Sample		White		Black		Latino	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Transcript Reported GPA	2.75	0.82	2.83	0.80	2.34	0.84	2.57	0.75
Friends' Average GPA	2.88	0.53	2.93	0.51	2.66	0.47	2.70	0.59
Indirect Friends' Average GPA	2.90	0.39	2.95	0.38	2.70	0.34	2.74	0.41
Proportion of Black Indirect Friends	0.14	0.30	0.03	0.07	0.79	0.26	0.08	0.17
Proportion of Latino Indirect Friends	0.09	0.18	0.04	0.08	0.06	0.08	0.53	0.34
Self-Reported GPA	2.89	0.76	2.94	0.75	2.61	0.73	2.73	0.68
Black	0.14	0.35						
Latino	0.08	0.27						
Asian/Pacific Islander	0.04	0.20						
Gender	0.47	0.50	0.47	0.50	0.39	0.49	0.50	0.50
Grade	10.45	1.13	10.44	1.13	10.48	1.12	10.54	1.13
Mother's education								
(1) less than a high school diploma	0.12	0.33	0.09	0.29	0.12	0.32	0.35	0.48
(2) high school graduate or GED	0.35	0.48	0.37	0.48	0.34	0.47	0.27	0.44
(3) some college attendance	0.21	0.41	0.22	0.41	0.23	0.42	0.17	0.37
(4) college degree	0.20	0.40	0.19	0.40	0.20	0.40	0.13	0.34
(5) advanced degree	0.08	0.28	0.09	0.28	0.08	0.28	0.03	0.18
Father's education								
(1) less than a high school diploma	0.09	0.29	0.08	0.27	0.07	0.26	0.28	0.45
(2) high school graduate or GED	0.28	0.45	0.30	0.46	0.23	0.42	0.21	0.41
(3) some college attendance	0.17	0.38	0.18	0.39	0.12	0.32	0.14	0.35
(4) college degree	0.18	0.38	0.20	0.40	0.11	0.31	0.10	0.31
(5) advanced degree	0.10	0.30	0.10	0.30	0.05	0.21	0.06	0.25
Mother's Occupational Status	37.15	30.39	39.0	30.0	33.61	30.94	27.6	30.4
Father's Occupational Status	27.28	28.29	30.5	28.6	14.76	23.68	19.3	24.2
Family Composition	0.77	0.42	0.77	0.42	0.54	0.50	0.73	0.44
Foreign born	0.05	0.22	0.01	0.09	0.02	0.13	0.22	0.42
2nd generation immigrant	0.07	0.26	0.04	0.18	0.03	0.16	0.35	0.48
School music	0.23	0.42	0.24	0.43	0.25	0.43	0.15	0.35
School sports team/activity	0.61	0.49	0.62	0.49	0.56	0.50	0.54	0.50
School club	0.44	0.50	0.45	0.50	0.42	0.49	0.38	0.49
Stu. government, newspaper, yearbook	0.17	0.38	0.17	0.38	0.20	0.40	0.13	0.34
School engagement	2.65	0.93	2.70	0.89	2.53	1.04	2.49	0.99
School attachment	3.50	1.12	3.56	1.10	3.28	1.17	3.37	1.27
Honors or AP English Course	0.17	0.38	0.09	0.28	0.11	0.31	0.17	0.37
Math Course Level								
(0) No math	0.11	0.31	0.11	0.31	0.10	0.29	0.16	0.37
(1) Basic/Remedial Math	0.02	0.14	0.02	0.13	0.03	0.17	0.03	0.18
(2) General/Applied Math	0.06	0.24	0.06	0.23	0.11	0.31	0.04	0.20
(3) Pre-Algebra	0.03	0.18	0.03	0.17	0.07	0.25	0.02	0.15
(4) Algebra 1	0.23	0.42	0.23	0.42	0.23	0.42	0.21	0.41
(5) Geometry	0.20	0.40	0.20	0.40	0.20	0.40	0.29	0.45
(6) Algebra 2	0.17	0.38	0.17	0.38	0.16	0.37	0.11	0.32
(7) Advanced Math	0.03	0.17	0.03	0.17	0.04	0.19	0.02	0.14
(8) Precalculus	0.09	0.29	0.10	0.29	0.06	0.24	0.08	0.27
(9) Calculus	0.05	0.21	0.05	0.22	0.02	0.13	0.02	0.13

Table 3 Two-Stage Least Squares Regression Coefficients, Add Health 1994-1995

		Friends' Average GPA		Transcript GPA	
		Coef.	S.E.	Coef.	S.E.
1	Friends' mean self-reported GPA	-	-	0.123*	0.062
	Indirect friends' characteristics				
2	Proportion Black	0.022	0.058	-	-
3	Proportion Latino	-0.065	0.067	-	-
4	Mean self-reported GPA	0.720**	0.027	-	-
	"Exogenous" independent variables				
5	Self-reported GPA (Fall 1994)	0.038*	0.017	0.574**	0.025
6	Male	-0.005	0.016	-0.158**	0.021
	Race/ethnicity [reference=white]				
7	Black	-0.059	0.049	-0.178**	0.048
8	Latino	0.001	0.050	-0.047	0.056
9	Asian/Pacific Islander	0.122**	0.046	0.006	0.067
10	American Indian	0.076	0.078	-0.144	0.154
11	Other	-0.019	0.077	-0.114	0.107
12	Foreign born	0.020	0.043	0.087	0.050
13	Second generation immigrant	-0.064	0.038	0.048	0.046
	Mother's education [reference=less than high school]				
14	High school graduate	-0.084*	0.035	0.121**	0.039
15	Some college	-0.061	0.035	0.127**	0.046
16	BA	-0.043	0.038	0.180**	0.048
17	Advanced degree	-0.043	0.042	0.207**	0.055
	Father's education [reference=less than high school]				
18	High school graduate	0.051	0.031	-0.009	0.050
19	Some college	0.062*	0.031	0.027	0.049
20	BA	0.062	0.038	0.051	0.047
21	Advanced degree	0.049	0.044	0.057	0.052
22	Mother's occupational status	0.000	0.001	0.001	0.001
23	Father's occupational status	0.000	0.000	0.000	0.001
24	2-parent family	-0.055	0.036	0.082	0.048
25	Number of siblings	-0.005	0.007	0.000	0.010
	Grade in school [reference=12th grade]				
26	'9	0.040	0.047	0.051	0.044
27	'10	0.020	0.025	-0.002	0.042
28	'11	-0.002	0.025	-0.078*	0.042
29	Club	0.052**	0.017	0.044*	0.022
30	Sports	-0.005	0.016	0.071**	0.026
31	Music	0.010	0.020	0.068**	0.025
32	Yearbook/newspaper	-0.001	0.016	-0.019	0.033
33	School attachment	0.015	0.008	0.015	0.013
34	School engagement	0.024*	0.010	0.108**	0.014
	Mathematics course [reference=no math]				
35	Remedial	-0.093	0.061	-0.351**	0.142
36	General	0.050	0.045	-0.223**	0.071
37	Pre-algebra	-0.023	0.086	-0.303**	0.089
38	Algebra	-0.033	0.046	-0.200**	0.047
39	Geometry	0.020	0.042	-0.041	0.051
40	Algebra 2	0.023	0.039	-0.021	0.053
41	Advanced math	0.091	0.053	0.172**	0.065
42	Pre-calculus	0.109**	0.036	0.066	0.051

		Friends' Average GPA		Transcript GPA	
		Coef.	S.E.	Coef.	S.E.
43	Calculus	0.136**	0.050	0.005	0.059
44	Honors/AP English	0.068**	0.020	0.085**	0.028
45	Constant	0.570**	0.093	0.222	0.177
	F-Statistic	-		230.6 **	
	Hansen J Overidentification Test	-		1.527	
	N	4,884		4,884	

**p<.01, *p<.05

Table 4 Percent of Achievement Differences Explained by Differences in Friend Achievement Characteristics

	White-Black	White-Latino	Latino-Black
Difference in transcript GPA	0.49	0.26	0.23
Effect of friends' average GPA given:			
White friends' GPA	0.360	0.360	
African American's friends' GPA	0.327		0.327
Latino friends' GPA		0.333	0.333
Difference in effects	0.033	0.028	0.006
% of GPA difference explained	7%	11%	2%
Estimate of friend effects	0.123		
Average friendship group GPA			
White	2.93		
African American	2.66		
Latino	2.70		

Table 5 Two-Stage Least Squares Regression Coefficients by Race/Ethnicity, Add Health 1994-1995

	White				Black				Latino			
	Friends' GPA		Transcript GPA		Friends' GPA		Transcript GPA		Friends' GPA		Transcript GPA	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Friends' mean self-reported GPA	–	–	0.131*	0.064	–	–	0.058	0.162	–	–	0.435**	0.111
Indirect friends' characteristics												
Proportion Black	-0.095	0.147	–	–	0.057	0.094	–	–	-0.078	0.219	–	–
Proportion Latino	0.056	0.116	–	–	-0.020	0.249	–	–	-0.246*	0.120	–	–
Mean self-reported GPA	0.762**	0.031	–	–	0.588**	0.066	–	–	0.657**	0.113	–	–
F-Statistic	–		211	**	–		29.5	**	–		17.8	**
Hansen J Overidentification Test	–		0.11		–		1.109		–		2.481	
N	2801		2801		852		852		721		721	

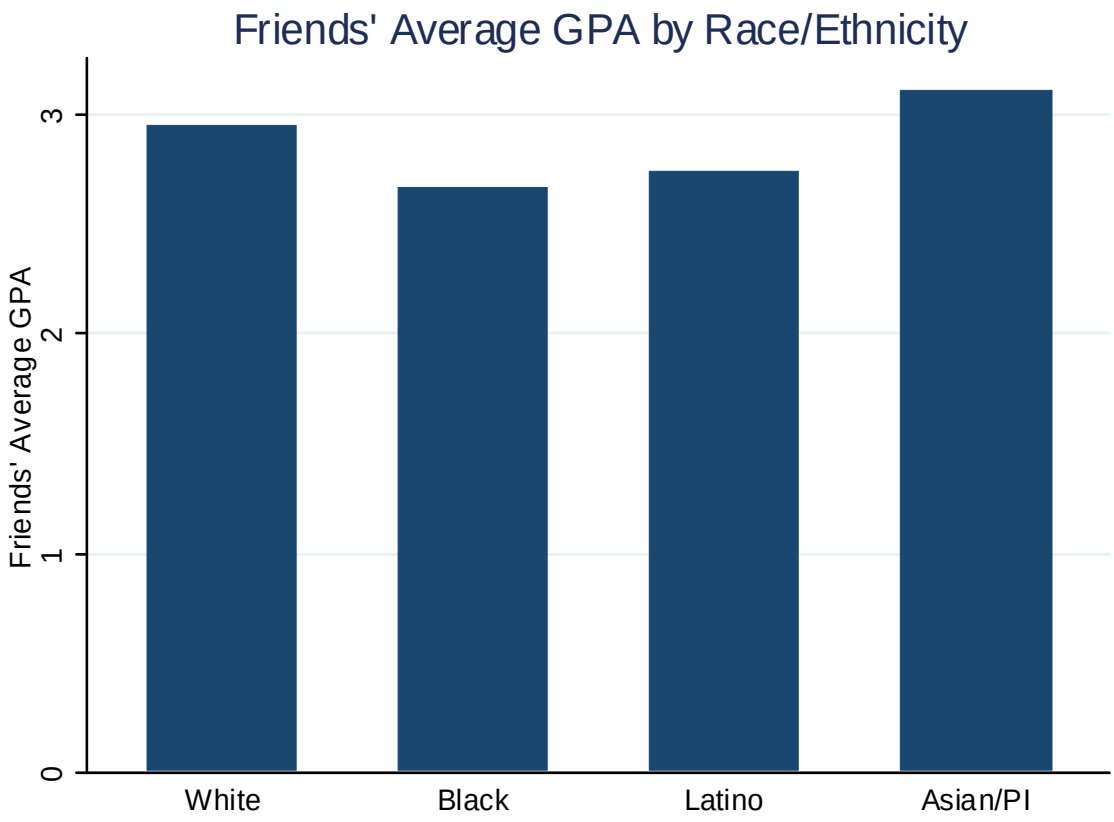
Robust standard errors clustered by school are reported in parentheses, **p<.01, *p<.05

All models include controls for fall self-reported achievement, gender, immigration history, parents' education, parents' occupational status, grade in school, family composition, number of siblings, participating in a club, participating in music, participating in sports, participating in newspaper/student government/yearbook, school engagement, school attachment, mathematics course, and honors English.

Table 6 Decomposition of Race/Ethnic Differences in Transcript GPA from Estimates in Table 5, Add Health 1994-1995

	Black-White	Latino-White
Difference in Transcript GPAs	0.489	0.256
Contribution of:		
Different Effects	0.193	-0.822
Different Means	0.016	0.098
Interaction Between Means and Effects	0.020	-0.069
Percent of Difference Explained by:		
Different Effects	40%	-321%
Different Means	3%	38%
Interaction Between Means and Effects	4%	-27%

Figure 1


Friends' Average GPA by Race/Ethnicity
Friends' Average GPA
0
1
2
3
White
Black
Latino
Asian/PI