

# The structure of educational inequity: Adolescents' access to parent education through friendship networks and its impact on academic outcomes

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## Abstract

Parents and friends are important influences on adolescents' academic outcomes. We examine whether and how adolescents' social networks compensate for or enhance the effects of their parents' education on academic outcomes. Among a large ethn racially diverse sample of high school students in the Southwestern ( $N = 2,136$ ) and Midwestern ( $N = 1,055$ ) United States, results from network autocorrelation models showed that higher levels of mother and father education were related to greater academic self-efficacy and engagement and higher aspirations, expectations, and grade point averages at both schools. Friends' parents' education levels were positively associated with adolescents' academic aspirations, expectations, and grade point averages across all of the models; higher levels of friends' parents' education were related to greater academic self-efficacy across all models, except for mothers in the Southwest; and friends' fathers' education levels were positively related to adolescents' academic engagement for students in the Midwestern school only. There were no significant interaction effects between parents' and friends' parents' education levels in predicting academic outcomes. Differences in the distribution of parental education across

ethnic-racial groups shaped the implications of the model for adolescents' academic adjustment. Findings highlight the impact of educational opportunity across generations in shaping academic inequities.

#### KEYWORDS

adolescence, ethnicity-race, friends, parent education, social network

## 1 | INTRODUCTION

Parent education is a consistent predictor of children's academic performance during adolescence (Carnevale & Strohl, 2013; Crosnoe & Muller, 2014; Reardon, 2011). Adolescents with more highly educated parents have higher standardized test scores, are more likely to be enrolled in advanced coursework in high school, attend college at higher rates, and may earn higher incomes as they transition into adulthood (Carnevale & Strohl, 2013; Crosnoe & Muller, 2014; McDermott, 2018; Reardon, 2011). In addition to investing more money in their children's educational experiences (e.g., lessons, childcare; Schneider et al., 2018), highly educated parents use the advantages of their own educational trajectories to promote their children's educational outcomes, with research showing that high parent education and income fosters children's educational attainment both directly and indirectly via their supportive parenting and students' academic engagement (Melby et al., 2008) and by promoting adolescents' educational and academic aspirations during the transition to adulthood (Dubow et al., 2009). In other words, parents' educational trajectories shape how they and their children navigate school contexts, informing their educational outcomes (Kirk et al., 2011; Lareau, 2011). Beyond one's own parents, research has also shown that adolescents' friends' parents may provide them with access to resources outside of their families that promote their academic outcomes. For example, having even one friend whose parent has a college degree is related to better academic achievement in middle school and college, particularly for students whose own parents have lower levels of education (Cherng et al., 2013; Lessard & Juvonen, 2019). It is possible that these friendships provide adolescents with material and cultural resources that serve to support their educational outcomes, over and above the resources they obtain from their own parents.

Despite advances in understanding that having friends with highly educated parents may promote adolescents' academic outcomes, there is limited understanding of how adolescents' *social networks* may compensate for or enhance the effects of their own parents' education. Social network research has shown that adolescents' friendship groups are marked by their similarity in sociodemographic and academic characteristics (e.g., Moody, 2001; Shin & Ryan, 2014) and that similarities between friends can operate to further benefit the most academically advantaged students (Flashman, 2012a). As such, and given the salience of the peer context during adolescence (Brown & Larson, 2009), peer processes may serve to produce and reproduce both class-based and race-based societal inequities. To effectively promote adolescents' academic adjustment, and close disparities in academic outcomes, we first need a deeper understanding of how peer contexts transmit and moderate the effects of parent education on adolescents' academic outcomes.

Therefore, the current investigation examined the joint effects of adolescents' and their friends' parental education on their academic outcomes (i.e., academic self-efficacy, engagement, expectations, aspirations, and grade point average) within a dyadic social network framework. Furthermore, given that access to dominant forms of cultural capital (i.e., embodied dispositions associated with education; Bourdieu, 1986) is unevenly distributed within society and is not equally accessed across socioeconomic and ethnic-racial groups (e.g., Lewis & Diamond, 2015; Manning, 2019), we examined how differences in these network characteristics informed ethnic-racial inequities

in academic outcomes. In doing so, the current investigation provides a more thorough examination of how adolescents' embeddedness within complex social structures shapes their academic outcomes, and how these relations may be differentially consequential to students of color compared to their White counterparts.

### 1.1 | Parent education and adolescents' academic outcomes

Parents' own experiences in and conceptions of school are informed by their socioeconomic and cultural contexts, and inform their behaviors toward their children's schooling and their children's academic socialization (Taylor et al., 2004). Parental education represents a significant source of cultural capital in the lives of adolescents, as parents' educational experiences shape their knowledge and embodied ways of being (Bourdieu, 1986), and are used to foster their children's academic outcomes (e.g., Harding et al., 2015). For example, although parents share high academic expectations for their children, the relation between these expectations and adolescents' academic attainment may be diminished by parents' unfamiliarity with college requirements, concerns about affordability, and limited awareness of financial aid opportunities (Kirk et al., 2011). Furthermore, parents with higher levels of education actively create and sustain rules and policies that serve their children, and they make more requests (or demands) of teachers and schools that benefit their children academically (Lareau, 2011; Lewis, 2014; Lewis & Diamond, 2015). In other words, parents with higher levels of education can draw on their own educational trajectories and experiences in school to create and accumulate advantages for their children (Kirk et al., 2011; Lareau, 2011). In doing so, these parents contribute to a dominant system of cultural capital, work to maintain its dominance, and reap the rewards of this dominant position for their children (Lewis, 2014). Indeed, parents' higher education attainment is related to better educational outcomes in adolescence and throughout their children's life course (Dubow et al., 2009; Melby et al., 2008).

### 1.2 | Variability by ethnic-racial background

In the United States, where historic and contemporary discriminatory policies and practices have resulted in a racially stratified educational system, the relation between parent education and adolescents' academic outcomes may vary according to ethnic-racial background. For example, prior research has demonstrated racialized differences in parents' educational attainment, such that Black and Latinx parents are underrepresented in college degree attainment and overrepresented among those with less than a high school diploma compared to their White and Asian American counterparts (McFarland et al., 2019). These systemic racialized differences in parent education suggest that a greater proportion of Asian American and White adolescents may have parents with higher education levels compared to their Black and Latinx counterparts. Moreover, research has shown that even when parents of different ethnic-racial backgrounds share similar levels of education, race informs whether and how schools respond to parents' involvement in schooling. Specifically, dominant forms of cultural capital are unevenly accessed by Black and Latinx families, resulting in the impact of parents' cultural capital on children's academic outcomes being racialized, and consequently, a weaker association between parental education and academic outcomes for Black and Latinx youth (e.g., Lewis & Diamond, 2015; Manning, 2019). Prior research has also shown that White parents with more education use these advantages to secure better opportunities for their children and are granted more educational advantages by school staff and teachers than their Black and Latinx counterparts, reinforcing ethno-racial and socioeconomic inequities (Lewis, 2014; Lewis & Diamond, 2015). Given that race and parent educational attainment are interrelated markers of social class that inform parenting strategies, academic socialization practices, and youths' academic outcomes (Manning, 2019), the current investigation examined whether and how the relations between parent education and adolescents' academic adjustment varied by ethnic-racial background.

### 1.3 | Variability by parent gender

Although research has shown that mothers and fathers may be equally involved in their children's education, gendered parenting roles may inform *how* mothers and fathers are involved in their children's schooling, relating to differences in their children's academic outcomes (Kim, 2018; Kim & Hill, 2015). For example, Kim and Hill's (2015) meta-analysis found that although mothers and fathers reported similar levels of school-based involvement (e.g., volunteering at school, attending parent-teacher meetings), the relation between school-based involvement and children's academic achievement was stronger for mothers than for fathers. However, the authors reported no differences in the relations between mothers' and fathers' home-based involvement (e.g., homework assistance) or academic socialization (i.e., parents' educational goals and expectations) and their children's academic achievement (Kim & Hill, 2015). Given that mothers and fathers draw on their own educational trajectories to guide their involvement in their children's education (Lareau, 2011), and that there may be potential differences in the strength of the relation between their involvement and their children's academic outcomes (Kim & Hill, 2015), the current investigation explored how mothers' and fathers' education levels, respectively, were related to adolescents' academic outcomes.

### 1.4 | Friendship networks and academic outcomes

Peer relationships are an important developmental context during adolescence, as adolescents' friendships are associated with their socio-emotional well-being, cognitive development, and academic outcomes (e.g., Brown & Larson, 2009; Wentzel et al., 2018). Given the critical role that friends play during this developmental period, the resources adolescents access through these friendships could be especially influential to their academic values and aspirations. In line with theories of social capital (Coleman, 1988), adolescents' friendships may facilitate their academic outcomes by connecting them with additional information through direct contact with their friends' parents or through their friends' embodiment of their parents' educational backgrounds, exposing them to social norms that differ from those of their own families (Cherng et al., 2013). A small body of research has demonstrated that adolescents' friendships provide them with access to additional sources of cultural capital through their friends' parents' education, which may promote their academic outcomes (Cherng et al., 2013; Lessard & Juvonen, 2019). For example, Cherng and colleagues (2013) found that having a best friend with a college-educated mother increases the likelihood that adolescents completed college. This research suggests that adolescents' friendships connect them with cultural resources that promote their educational outcomes through their interactions not only with their friends (i.e., through their friends' embodiment of cultural and material resources), but through their direct and indirect interactions with their friends' parents. For example, Cherng and colleagues (2013) noted that adolescents may share important knowledge about schooling with their friends, thus becoming a critical mechanism by which cultural resources are transferred. Adolescents may also share information with their friends about their parents' college-going experiences, even if they do not plan to attend college themselves. Moreover, these friends may carry on, adopt, modify, and/or reject these cultural ways of being, and in doing so transmit information and behaviors that may foster adolescents' academic success, creating indirect exposure to these ways of being as a function of their friendships.

Beyond their interactions with each other, adolescents' direct interactions with their friends' parents may represent additional mechanisms by which cultural resources are shared, including conversations about expectations around college-going, sharing information about attending college, and taking adolescents and their friends on college visits together (Cherng et al., 2013). Through their direct interactions with their friends' parents, adolescents may learn of new and valuable resources, may be directed toward and away from specific opportunities, may experience reinforced social norms, and may strengthen their identities—representing several mechanisms by which adolescents' academic outcomes are influenced by their friends' parents (Carolan & Lardier, 2018). This

small body of research also suggests that diversity in terms of parent education within adolescents' friendship groups operates to benefit those from less advantaged backgrounds while maintaining the social position of the advantaged. For example, among middle school students, Lessard and Juvonen (2019) showed that students whose parents had lower levels of education benefitted academically when their friends' parents had higher levels of education—but that those who had parents with a college education performed similarly regardless of their friendship networks. In other words, these studies suggest that adolescents' exposure to more advantaged peers is a mechanism for closing disparities in academic achievement.

However, adolescent friendship groups are marked by their shared characteristics (Brown & Larson, 2009). Theory suggests that homophily (i.e., the tendency for people to affiliate with those who are similar to themselves) in friendships during adolescence is driven by similarity in physical appearance, behaviors, and attitudes, with prior empirical research demonstrating homophily in adolescent friendships based on sociodemographic characteristics (e.g., race-ethnicity; McCormick et al., 2015; Moody, 2001) and academic outcomes (e.g., Flashman, 2012a; Kiuru et al., 2007; Shin & Ryan, 2014). Flashman (2012a) showed that friends become more similar to each other in terms of academic achievement in middle and high school. In addition, Kiuru et al. (2007) found that 9th grade students shared educational expectations with their peer groups. Further research has shown that early adolescents both selected friends with similar grades and became more like their friends in terms of grades over time (Shin & Ryan, 2014). However, the researchers did not find support for this influence on students' academic self-efficacy (Shin & Ryan, 2014). Taken together, these findings suggest that adolescents are likely to become friends with individuals who are similar to themselves academically throughout adolescence, but that this relation varies across educational outcomes. Importantly, research suggests that this network homophily can result in the most academically advantaged students being more likely to be friends (Flashman, 2012a), which may widen gaps in students' educational outcomes along socioeconomic and ethnic-racial lines. For example, the racialized structure of opportunity in U.S. schools may shape adolescents' peer networks in school, with Black and Latinx students less likely than White students to have access to high-achieving peers, and this isolation from high-achieving peers may inhibit adolescents' academic outcomes (Flashman, 2012b). However, when adolescents do have ethnoracially and socioeconomically diverse friendship networks, they benefit from these friendships, with diverse networks being particularly influential in boosting the academic outcomes of those from less advantaged backgrounds (e.g., Cherng et al., 2013; Lessard & Juvonen, 2019).

## 1.5 | Current study

The current investigation examined whether and how adolescents' parent education levels related to their academic outcomes and whether this relation was moderated by their friends' parents' educational attainment. Drawing on analysis of two dyadic networks, we examined whether and how adolescents' friends' mothers' and fathers' educational background compensated for or enhanced the effects of their own mothers' and fathers' education on their academic outcomes. Given strong theoretical and empirical support for the presence of homophily in adolescent friendships (e.g., McCormick et al., 2015), and specifically on academic achievement outcomes (e.g., Shin & Ryan, 2014), our analysis controls for the contributions of peer homophily on the developmental outcomes of interest. In doing so, we expand the body of research on parent education and adolescent outcomes by extending the focus beyond homophily, examining differences in these relations for mothers and fathers, and situating this understanding within the broader context of race and class in the United States. Understanding these relations during adolescence is important because the salience of peer relationships during this developmental period may bolster the impact friendships have on adolescents' academic outcomes. Moreover, these social relationships may reflect and reproduce ethnic-racial and class-based inequities, impacting individuals' outcomes across the life course. To our knowledge, no research has examined how the cumulative effects of adolescents' social networks drive inequities in academic outcomes.

For Hypothesis 1, we expected that higher parent education levels would be related to greater academic self-efficacy and academic engagement and to higher aspirations, expectations, and achievement, in line with prior research (Dubow et al., 2009; Melby et al., 2008). Prior research has shown that the most academically advantaged students are more likely to be friends (Flashman, 2012a) and that access to social capital at school may work in concert with family resources to influence academic outcomes (e.g., Parcel & Dufur, 2001). In line with this research, for Hypothesis 2, we anticipated that higher levels of friends' parents' education would be related to adolescents' higher academic outcomes above and beyond the effects of one's own parents, bolstering these students' advantages. Furthermore, although we expected homophily to exist, we did not expect it to be absolute. For Hypothesis 3, we anticipated that in instances where adolescents and their friends had different levels of parental education, having friends with higher parental education would compensate for one's own lower parental education, relating to higher academic outcomes.

In addition, we examined whether there were ethno-racial differences in parent education. In line with prior research showing uneven distribution of parent education across ethnic-racial groups (McFarland et al., 2019), we anticipated that Black and Latinx adolescents would have parents with lower education levels than their White and Asian American counterparts. Furthermore, given homophily in friendship networks based on race and ethnicity and that parent education is unevenly distributed across ethnic-racial groups, in Hypothesis 4, we expected that friends of Black and Latinx students would have parents with lower education than the friends of their White and Asian American counterparts. Last, to put the effects of this differential distribution into context, we explored the implications of our findings for adolescents from different ethnic-racial groups.

## 2 | METHOD

Our interest is in understanding the influence of adolescents' school-based friends on academic outcomes. As such, we focus on specific school contexts and aim to measure all students and the network of friendships linking them within the school. This approach allows us to estimate how individual adolescents were affected by their friends at school by drawing on their dyadic connections to other students. Our social network approach was predicated on the assumption that there would be homophily among students based on their parents' levels of education (i.e., adolescents would be more likely to be friends with individuals whose parents had similar levels of education). As such, we first examine this assumption of homophily. Next, we examined whether and how parent education was related to adolescents' own academic outcomes and whether these relations were moderated by their friends' parent education levels. Given that friends influence one another on academic outcomes (e.g., Shin & Ryan, 2014), to provide an unbiased account of friends' parent education contributions to the focal adolescent academic outcomes, we used network autocorrelation models that controlled for friends' levels of academic outcomes.

### 2.1 | Participants

The study sample comprised 9th through 12th grade students in two high schools located in a large metropolitan area of the southwestern United States and a mid-sized metropolitan area of the midwestern United States, respectively. The Southwest sample included 2,136 adolescents (52.4% female). In terms of grade level, 29.0% were in the 9th grade, 25.9% were in the 10th grade, 23.5% were in the 11th grade, and 21.6% were in the 12th grade ( $M_{\text{grade}} = 10.38$ ,  $SD = 1.11$ ). A majority of participants were born in the United States ( $n = 2011$ ; 94.1%). Participants' self-identified as American Indian or Native American (3.7%;  $n = 80$ ), Arab, Middle Eastern, North

African (AMENA; 0.5%;  $n = 11$ ), Asian American or Pacific Islander (4.0%;  $n = 85$ ; hereafter referred to as Asian American American), Black or African American (26.6%;  $n = 569$ ), Latinx or Hispanic (25.6%;  $n = 547$ ), White (36.3%;  $n = 775$ ), Multiracial (2.1%;  $n = 45$ ), or Other (0.3%;  $n = 7$ ). The Midwest sample included 1,055 adolescents (47.4% female). In terms of grade level, 23.3% were in the 9th grade, 35.8% were in the 10th grade, 24.5% were in the 11th grade, and 16.4% were in the 12th grade ( $M_{\text{grade}} = 10.34$ ,  $SD = 1.01$ ). A majority of participants were born in the United States ( $n = 872$ ; 82.7%). Participants self-identified as White (43.9%;  $n = 463$ ), Asian American American (26.7%;  $n = 282$ ), Black or African American (18.8%;  $n = 198$ ), Latinx or Hispanic (5.4%;  $n = 57$ ), Multiracial (2.6%;  $n = 27$ ), AMENA (1.4%;  $n = 15$ ), American Indian or Native American (0.8%;  $n = 8$ ), or Other (0.3%;  $n = 3$ ).

## 2.2 | Procedure

The research team at each site distributed paper-and-pencil surveys to teachers, and students completed the 45-min survey during the school day. This whole-school approach, the measures, and method of administration were identical at both sites. The university and school district institutional review boards at each site approved the study. Consent and assent for students' school record information were obtained from parents and students, respectively. Classrooms with a 90% return rate for parental consent forms (regardless of the parents' response) were given a pizza party, and teachers received a \$20 gift card for their assistance with data collection.

A passive consent process with an "opt-out" option was used for the survey. Two weeks prior to survey administration, opt-out consent forms were delivered to the school and distributed by teachers. This letter explained that their child's participation in the study was voluntary and that they could refuse to have their child participate at any time. All communications with parents were provided in English and Spanish. Teachers were instructed to retain any completed opt-out forms that were returned by students, which were collected by the research team on the day of survey administration. The survey response rate was 73.66% in the Midwestern school and 87.71% in the Southwestern school. Active parental consent was obtained for access to students' school records. The response rate for students' school records was 33.49% ( $N = 505$ ) in the Midwest and 39.09% ( $N = 951$ ) in the Southwest.

## 2.3 | Measures

### 2.3.1 | Friend nominations

Adolescents were asked, "Name your 10 closest friends in your school (your closest friends can be of any gender and from any grade). Who are the friends you hang around with and talk to the most in your school? You can list as many or as few names as you need but remember, only name your closest friends." Prior research suggests that this approach can accommodate typical adolescent peer group sizes without artificially limiting or compelling adolescents' friendship nominations (Ryan, 2001). Youth were asked to write the first and last name and grade level of their friends. Given that we were interested in obtaining whole school networks in two high schools serving thousands of students, a roster approach, in which students select their friends from the school roster, was not feasible. On average, adolescents in the Southwestern school nominated 3.53 friends ( $SD = 2.97$ ) and adolescents in the Midwestern school nominated 3.63 friends ( $SD = 2.83$ ). At each school, approximately 10% of students nominated 10 friends ( $n = 93$  Midwestern;  $n = 183$  Southwestern).

### 2.3.2 | Mother and father education levels

Mother and father education levels were self-reported by students (1 item each; e.g., "What is the highest level of education that your mother has completed? If unsure, please take a guess."). Responses were coded on an 8-point scale ranging from *8th Grade or Lower* (1) to *Professional Degree: Medical Doctor, Ph.D., Lawyer, Dentist, etc.* (8). Higher scores indicated higher parental levels of education (Southwest mother education  $M = 4.77$ ,  $SD = 1.75$ , father education  $M = 4.47$ ,  $SD = 1.79$ ; Midwest mother education  $M = 6.03$ ,  $SD = 1.69$ , father education  $M = 6.15$ ,  $SD = 1.78$ ). For reference, a 4 on this measure is equivalent to some college, vocational, or technical school, a 5 is equivalent to an Associate's degree, and a 6 is equivalent to a Bachelor's degree. At each school, the average mother and father education for the friends nominated by each respondent was also calculated to represent their friend's mother or father education, respectively.

### 2.3.3 | Academic self-efficacy

Students' academic self-efficacy was measured using the Patterns of Adaptive Learning Scale (Midgley et al., 2000). This scale measured adolescents' perceptions of their competence to do their classwork using five items (e.g., "I'm certain I can master the skills taught in this class this year") rated on a 5-point Likert scale with endpoints of *not at all true* (1) to *very true* (5). Higher scores indicated greater academic self-efficacy. Cronbach's alpha was .91 in the Southwest and .92 in the Midwest.

### 2.3.4 | Academic engagement

Academic engagement was assessed with the Engagement versus Disaffection with Learning: Student Report scale (Skinner et al., 2008). The scale includes two subscales, including behavioral engagement (6 items; e.g., "When I am in class, I listen carefully") and emotional engagement (4 items; e.g., "I enjoy learning new things"). In the current study, an overall scale score was used, indicating a holistic measure of adolescents' academic engagement. The ten items were rated on a 5-point Likert scale ranging from *never* (0) to *all the time* (4), where higher scores indicate greater engagement. In the Midwest, Cronbach's alpha was .91. In the Southwest, Cronbach's alpha was .89.

### 2.3.5 | Educational aspirations and expectations

Adolescent educational aspirations were assessed with a single item (i.e., "How far would you like to go in school?"). Likewise, educational expectations were assessed with a single item (i.e., "How far do you really think you will go in school?"). Both items were rated on a 7-point scale ranging from *some high school* (1) to *a professional degree* (7), where higher scores indicate more advanced levels of education (Southwest aspirations  $M = 5.56$ ,  $SD = 1.32$ , expectations  $M = 5.15$ ,  $SD = 1.38$ ; Midwest aspirations  $M = 5.99$ ,  $SD = 1.14$ , expectations  $M = 5.62$ ,  $SD = 1.32$ ).

### 2.3.6 | Academic achievement

Academic achievement was measured using students' grade point average. School-reported data were collected at the end of the academic year (Southwest  $M = 2.94$ ,  $SD = .78$ ; Midwest  $M = 3.46$ ,  $SD = .71$ ).



### 2.3.7 | Covariates

Covariates included gender (0 = female, 1 = male), ethnic-racial group membership, grade, friend emotional support, and whether they lived with their mother and/or father, given prior work noting variability in academic outcomes as a function of these characteristics (e.g., Kim, 2018; Lewis & Diamond, 2015). Friend emotional support was measured using the Network of Relationships Inventory emotional support subscale (Furman & Buhrmester, 1985). The scale (3 items; e.g., "How often do you turn to this person for support with personal problems?") was rated on a 5-point Likert scale ranging from *never or hardly at all* (1) to *always or extremely much* (5). A score for each friend nomination was generated by averaging the three items. Cronbach's alphas for the emotional support subscale for each friendship nomination ranged from .89 to .95 in the Southwest and .87 to .92 in the Midwest. In the current investigation, a mean score for emotional support was calculated for each participant by averaging the mean scores (i.e., summing the subscales and dividing this number by the participant's number of friendship nominations). Emotional support may foster positive developmental outcomes, including academic achievement (e.g., Stanton-Salazar & Spina, 2005). In the current investigation, we include this covariate as a proxy for emotionally close adolescent friendships, as close, supportive friendships may impact adolescents' developmental and academic outcomes and may provide adolescents with greater exposure to indirect and direct messages from friends' parents. Last, given that parent involvement in education may be related to adolescents' academic outcomes, and may involve home-based strategies (e.g., helping with homework) that are dependent on having regular access to that parent (e.g., Kim, 2018), we included whether adolescents lived with their mother or father as a covariate in each respective model. Participants were asked to describe the parents they lived with. Options included biological mothers, biological fathers, stepmother, stepfather, parents' partners, adoptive or foster parents, and an option to write in another response. These responses were used to create two variables representing whether the adolescent lived with their mother (0 = no, 1 = yes) and whether they lived with their father (0 = no, 1 = yes).

## 2.4 | Analytic plan

To examine the association between adolescents' academic adjustment and their parents' education, friends' parents' education, and the interaction of these factors, we employed a network autocorrelation model (Doreian, 1989). This model controls for the possibility that friends' parental education affects one's own academic adjustment indirectly via peer influence on adjustment. To do so, network autocorrelation models introduce a model parameter to represent friends' values for the outcome as predictors of the respondents' value (Doreian, 1989). Our model is represented as:

$$y = \rho W y + X \beta + \epsilon$$

Network autocorrelation models are similar to linear regression, with  $y$  representing the outcome of interest,  $X$  representing covariates, their corresponding parameters  $\beta$ , and an error term ( $\epsilon$ ). What sets the autocorrelation model apart is the  $\rho W y$  expression, where  $W$  is a matrix corresponding to friendships in the school, which, when multiplied by the outcome vector  $y$ , becomes a weighted version of friends' scores on that outcome. The autocorrelation parameter ( $\rho$  or  $\rho$ ) then captures the strength of the relation between the respondent's outcome ( $y$ ) and their friends' scores on that outcome (Wang et al., 2014).

An essential step in network autocorrelation models is to weight the data with a spatial adjacency matrix ( $W$ ) that represents the network (Leenders, 2002; Wang et al., 2014).  $W$  is an  $N \times N$  matrix where each cell represents whether the respondent in row  $i$  named the person in row  $j$  as a friend (0 = no, 1 = yes). The  $W$  matrix may be included in the model as either an autocorrelation of the dependent variable (as shown above) or as autocorrelation

**TABLE 1** Means, standard deviations, correlations, and network autocorrelations for both schools

	Mother Ed	Father Ed	Self-efficacy	Engagement	Aspirations	Expectations	GPA
Mother Ed		0.63**	0.23**	0.17**	0.37**	0.39**	0.37**
Father Ed	0.57**		0.27**	0.22**	0.40**	0.45**	0.58**
Self-efficacy	0.11**	0.15**		0.56**	0.27**	0.36**	0.37**
Engagement	0.06*	0.08**	0.52**		0.27**	0.34**	0.33**
Aspirations	0.15**	0.15**	0.24**	0.25**		0.76**	0.44**
Expectations	0.23**	0.25**	0.38**	0.31**	0.70**		0.53**
GPA	0.24**	0.23**	0.32**	0.20**	0.30**	0.33**	
SW M (SD)	4.77 (1.75)	4.47 (1.79)	3.69 (0.89)	2.36 (0.70)	5.56 (1.32)	5.15 (1.38)	2.94 (0.78)
SW Moran's I	0.12***	0.19***	0.06**	0.08***	0.14***	0.15***	0.40***
MW M (SD)	6.03 (1.67)	6.15 (1.78)	3.73 (0.89)	2.48 (0.70)	5.99 (1.14)	5.62 (1.32)	3.46 (0.71)
MW Moran's I	0.26***	0.32***	0.12***	0.12***	0.17***	0.21***	0.41***

Note: Descriptive information for the Southwestern school is presented below the diagonal. Descriptive information for the Midwestern school is presented above the diagonal. In the Southwestern school  $n$  ranged from 755 to 1,781. In the Midwestern school  $n$  ranged from 434 to 982.

Abbreviations: Ed, education; GPA, grade point average; MW, Midwestern; SW, Southwestern.

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

of the disturbance term (not shown; Leenders, 2002). Whereas the former, also known as a *W1* model, indicates that a respondent's score on the dependent variable ( $y$ ) is the product of their friend's  $y$ , the latter (*W2*) model indicates that the error in predicting the respondent's  $y$  is correlated with their friend's error in  $y$  (i.e., the autocorrelation of each disturbance in  $y$  on its neighbors; Leenders, 2002). The difference in these modeling choices reflects theoretical differences in how social influence occurs. In the current investigation, we assume influence occurs directly between friends via communication that allows, for instance, for ideas and information to spread (i.e., social influence through direct contact between friends) and, as such, we use a *W1* model.

In the current study, network autocorrelation models were run separately for the Southwest and Midwest schools. A significant autocorrelation parameter indicates that adolescents and their friends are more similar than expected by chance on the outcome of interest. Controlling for peer similarity is critical to our examination as it eliminates peer influence on adjustment as an alternative explanation for our hypothesized effects. Participants were only included in the analyses if they were part of at least one friendship (i.e., if they nominated a friend or were nominated by a friend). In other words, participants who were completely isolated from the network (i.e., that had an indegree and outdegree of 0) were excluded. This resulted in a final network size of  $n = 999$  in the Midwest and  $n = 2,005$  in the Southwest. Missing data on all measures were imputed using the multivariate imputation by chained equations (*mice*) package in R (Van Buuren & Groothuis-Oudshoorn, 2010). Estimates were combined from five imputed data sets, which allowed us to balance the precision of the estimates against the computational expense of large models (Nassiri et al., 2019). Analyses were conducted using the *Inam* function within version 2019.6 of the *statnet* package in R (Butts, 2008).

## 3 | RESULTS

### 3.1 | Descriptive statistics

Descriptive statistics including means, standard deviations, bivariate correlations, and network autocorrelations for each school are presented in Table 1. The Moran's  $I$  (Paradis, 2009) measure of network autocorrelation was used as a descriptive summary of adolescents' similarity to their friends on our variables of interest using the *ape* package. Like the Pearson correlation, Moran's  $I$  ranges from  $-1$  to  $+1$  with larger positive values indicating greater similarity between adolescents who are connected in a friendship network. Results indicated that in both the Midwestern and Southwestern schools, adolescents' scores were positively and significantly correlated with their friends' scores in terms of mother education, father education, and all measures of academic adjustment. In other words, adolescents tended to be friends with peers whose parents had similar levels of education as their own and who had similar scores on academic characteristics to themselves.

### 3.2 | Parent education, friends' parents' education, and academic adjustment

We drew on network autocorrelation models to test whether adolescents' social networks would compensate for, or enhance, the effects of their own parents' education, above and beyond the effects of the covariates and adolescents' similarities to their peers on these outcomes. Separate models were estimated for mothers and fathers in the Midwestern and Southwestern schools, respectively. Estimates for these models are presented in Table 2 for Midwestern mothers, Table 3 for Midwestern fathers, Table 4 for Southwestern mothers, and Table 5 for Southwestern fathers.

Across all models, our controls for network autocorrelation indicated homophily on the indicators of academic adjustment (see the  $\rho$  estimates in Tables 2 through 5). At both sites, the positive significant network autocorrelations in grade point average and academic expectations showed significant homophily for these outcomes in

**TABLE 2** Network autocorrelation models for the Midwestern school examining mother education ( $n = 999$ )

	Self-efficacy	Engagement	Aspirations	Expectations	GPA
Intercept	2.910 (0.365)***	2.217 (0.265)***	5.746 (0.422)***	4.525 (0.474)***	2.951 (0.262)***
Grade	-0.032 (0.028)	-0.063 (0.022)**	0.004 (0.034)	0.043 (0.038)	0.011 (0.021)
Gender	0.242 (0.062)***	0.105 (0.047)*	-0.256 (0.072)***	-0.193 (0.086)*	-0.076 (0.061)
AMENA	0.047 (0.236)	0.322 (0.183)	0.825 (0.294)**	0.569 (0.353)	0.077 (0.195)
American Indian	-0.043 (0.318)	-0.033 (0.248)	-0.095 (0.379)	0.006 (0.444)	0.064 (0.345)
Asian American	0.095 (0.068)	0.137 (0.052)**	0.340 (0.081)***	0.366 (0.093)***	0.208 (0.054)***
Black	-0.051 (0.080)	0.033 (0.060)	0.128 (0.104)	0.109 (0.132)	-0.470 (0.105)***
Latinx	-0.209 (0.135)	-0.166 (0.102)	0.107 (0.163)	-0.238 (0.188)	-0.495 (0.172)**
Other	0.103 (0.483)	-0.443 (0.376)	-0.576 (0.653)	-0.737 (0.717)	-0.666 (0.694)
Multiracial	-0.024 (0.188)	0.094 (0.138)	0.070 (0.227)	0.141 (0.256)	-0.251 (0.182)
Emotional	0.087 (0.041)*	0.154 (0.027)***	0.064 (0.045)	0.067 (0.054)	0.002 (0.031)
Live with Mom	0.427 (0.093)***	0.159 (0.071)*	0.133 (0.108)	0.396 (0.133)**	0.383 (0.080)***
Mother Ed	0.090 (0.018)***	0.038 (0.015)*	0.192 (0.023)***	0.226 (0.027)***	0.091 (0.020)***
Friend Mother Ed	0.055 (0.023)*	0.029 (0.018)	0.120 (0.030)***	0.150 (0.036)***	0.113 (0.024)***
MED × Friend MED	-0.002 (0.012)	0.007 (0.009)	0.003 (0.014)	0.001 (0.019)	0.008 (0.009)
$\rho$	0.042 (0.025)	0.044 (0.023)	0.032 (0.018)	0.054 (0.020)**	0.046 (0.021)*

Abbreviations: AMENA, Arab, Middle Eastern, North African; Emotional, friends' emotional support; Ed, education; GPA, grade point average; MED, mother education.

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

models for both mothers and fathers. In addition, there were positive significant network autocorrelations for academic aspirations in all models, with the exception of the models for mother education in the Midwestern school, which were not statistically significant (Table 2). Network autocorrelations for academic self-efficacy and engagement were significant in the Southwestern school (Tables 4 and 5), indicating that adolescents were similar to their friends on these indicators of adjustment but were not statistically significant in the Midwestern school (Tables 2 and 3).

Turning to our hypothesized effects of parental education (Hypothesis 1), results indicated that mother and father education levels were positively and significantly related to adolescents' academic self-efficacy, engagement, aspirations, expectations, and grade point average at both sites, above and beyond the effects of adolescents' similarity to their friends on these outcomes. In other words, higher mother and father education levels were consistently related to better academic adjustment at both schools. With respect to friends' parental education (Hypothesis 2), we found some support for effects on academic outcomes. At both sites, there were statistically significant positive relations between friends' parental education (mother and father) and three of our five outcomes: adolescents' aspirations, expectations, and grade point average (Tables 2 through 5). Having friends with higher parent education levels was related to greater academic self-efficacy across all models, except in the case of mothers in the Southwest (Table 4), for which the associations were not statistically significant. In addition, friends' fathers' education levels were related to adolescents' academic engagement in the models for fathers in the Midwestern school only (Table 3). Last, we did not find support for Hypothesis 3, that having friends with higher parental education would compensate for one's own low parental education, in any of the models. Specifically, across all of the models, results indicated that there were no statistically significant interaction effects between adolescents' parents' education and their friends' parents' education (Tables 2 through 5).

**TABLE 3** Network autocorrelation models for the Midwestern school examining father education ( $n = 999$ )

	Self-efficacy	Engagement	Aspirations	Expectations	GPA
Intercept	3.121 (0.363)***	2.220 (0.260)***	5.925 (0.436)***	4.833 (0.473)***	3.303 (0.239)***
Grade	-0.041 (0.028)	-0.072 (0.021)**	-0.021 (0.033)	0.015 (0.037)	-0.002 (0.018)
Gender	0.249 (0.062)***	0.118 (0.046)*	-0.253 (0.072)***	-0.185 (0.085)*	-0.102 (0.056)
AMENA	0.047 (0.235)	0.306 (0.179)	0.717 (0.291)*	0.470 (0.343)	0.033 (0.176)
American Indian	-0.020 (0.316)	-0.036 (0.242)	-0.149 (0.374)	-0.038 (0.436)	0.103 (0.331)
Asian American	0.028 (0.066)	0.097 (0.052)	0.216 (0.081)**	0.208 (0.094)*	0.124 (0.051)*
Black	0.076 (0.084)	0.137 (0.061)*	0.277 (0.104)**	0.318 (0.136)*	-0.271 (0.095)**
Latinx	-0.147 (0.138)	-0.093 (0.101)	0.221 (0.166)	-0.116 (0.187)	-0.249 (0.166)
Other	0.340 (0.485)	-0.294 (0.373)	-0.135 (0.642)	-0.165 (0.705)	-0.274 (0.698)
Multiracial	-0.097 (0.184)	0.085 (0.134)	0.014 (0.223)	0.043 (0.247)	-0.289 (0.180)
Emotional	0.089 (0.041)*	0.157 (0.026)***	0.074 (0.045)	0.076 (0.054)	-0.004 (0.028)
Live with Father	0.249 (0.070)***	0.254 (0.052)***	0.170 (0.086)*	0.300 (0.101)**	0.237 (0.058)***
Father Ed	0.092 (0.020)***	0.042 (0.016)*	0.205 (0.022)***	0.246 (0.026)***	0.169 (0.016)***
Friend Father Ed	0.077 (0.025)***	0.049 (0.019)**	0.097 (0.028)***	0.139 (0.033)***	0.085 (0.023)***
FED × Friend FED	0.014 (0.011)	0.016 (0.009)	0.018 (0.013)	0.031 (0.017)	-0.002 (0.009)
$\rho$	0.049 (0.025)	0.041 (0.023)	0.035 (0.016)*	0.059 (0.019)***	0.035 (0.016)*

Abbreviations: AMENA, Arab, Middle Eastern, North African; Emotional, friends' emotional support; Ed, education; FED, father education; GPA, grade point average.

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

### 3.3 | Implications of the model across ethnic-racial groups

To test Hypothesis 4, that parent education would be differentially distributed across ethnic-racial groups, we examined relations between parent education levels and students' ethnic-racial backgrounds. Table 6 presents the education levels for mothers, friends' mothers, fathers, and friends' fathers for all adolescents at both schools. Given the small number of AMENA, American Indian, Other, and Multiracial adolescents, we focus our interpretation of these relations among Asian American, Black, Latinx, and White adolescents. In line with prior research showing inequitable distribution of parent education across ethnic-racial groups (McFarland et al., 2019), the findings show that there was a larger proportion of Latinx students whose parents or friends' parents had less than a high school education compared to their Asian American, Black, and White counterparts, and a greater proportion of Asian American and White adolescents had a parent or had friends whose parents had a Bachelor's degree or more compared to their Black and Latinx counterparts across sites. This pattern is similar when we examine parents' and friends' parents who had between a high school diploma and an Associate's degree, with the exception of friends' parents in the Southwest where there were relatively even distributions of students across ethnic-racial groups. In sum, these findings show that a greater proportion of Asian American and White students had parents with higher levels of education and had access to more highly educated parents through their friendships than their Black and Latinx peers at both schools.

Last, we explored whether there were differential implications for the models across ethnic-racial groups. We used our models to predict the adjustment levels for Asian American, Black, Latinx, and White students based on the means and standard deviations for the variables of interest within each ethnic-racial group. Specifically, we considered how differences in parental education, from one standard deviation below to one standard deviation above the mean, affected each adjustment outcome. Figure 1 presents the predicted adjustment based upon the mean and standard deviation for each ethnic-racial group. The standard deviations for parents' education and for

**TABLE 4** Network autocorrelation models for the Southwestern school examining mother education ( $n = 2,005$ )

	Self-efficacy	Engagement	Aspirations	Expectations	GPA
Intercept	2.613 (0.232)***	2.136 (0.192)***	5.110 (0.316)***	3.340 (0.349)***	2.410 (0.271)***
Grade	0.043 (0.017)*	-0.031 (0.014)*	0.030 (0.028)	0.118 (0.028)***	0.069 (0.024)**
Gender	0.242 (0.042)***	0.074 (0.033)*	-0.468 (0.065)***	-0.244 (0.066)***	-0.290 (0.066)***
AMENA	-0.096 (0.295)	0.222 (0.222)	0.706 (0.427)	0.529 (0.423)	0.176 (0.223)
American Indian	-0.029 (0.110)	0.128 (0.087)	0.023 (0.189)	-0.241 (0.181)	-0.638 (0.102)***
Asian American	0.120 (0.101)	0.217 (0.082)**	0.109 (0.161)	-0.025 (0.178)	0.114 (0.119)
Black	-0.105 (0.055)	0.052 (0.042)	0.074 (0.083)	0.061 (0.089)	-0.546 (0.058)***
Latinx	-0.098 (0.058)	0.013 (0.042)	-0.089 (0.086)	-0.090 (0.089)	-0.269 (0.056)***
Other	0.604 (0.348)	0.092 (0.270)	0.839 (0.505)	1.238 (0.574)*	0.086 (0.422)
Multiracial	-0.326 (0.156)*	-0.169 (0.144)	-0.359 (0.217)	-0.207 (0.238)	-0.405 (0.278)
Emotional	0.098 (0.029)**	0.095 (0.020)***	0.011 (0.044)	0.087 (0.037)*	-0.043 (0.035)
Live with Mom	0.122 (0.071)	0.080 (0.053)	0.090 (0.098)	0.089 (0.110)	0.112 (0.083)
Mother Ed	0.038 (0.013)*	0.019 (0.009)*	0.119 (0.018)***	0.173 (0.020)***	0.073 (0.013)***
Friend Mother Ed	0.013 (0.017)	0.005 (0.013)	0.055 (0.023)*	0.050 (0.025)*	0.108 (0.013)***
MED × Friend MED	0.005 (0.010)	0.006 (0.007)	-0.006 (0.020)	-0.003 (0.017)	-0.005 (0.008)
$\rho$	0.047 (0.015)**	0.055 (0.022)*	0.055 (0.014)***	0.070 (0.017)***	0.061 (0.025)*

Abbreviations: AMENA, Arab, Middle Eastern, North African; Emotional, friends' emotional support; Ed, education; GPA, grade point average; MED, mother education.

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

**TABLE 5** Network autocorrelation models for the Southwestern school examining father education ( $n = 2,005$ )

	Self-efficacy	Engagement	Aspirations	Expectations	GPA
Intercept	2.746 (0.221)***	2.197 (0.179)***	5.192 (0.318)***	3.289 (0.325)***	2.436 (0.313)***
Grade	0.039 (0.017)	-0.031 (0.014)*	0.026 (0.028)	0.122 (0.028)***	0.070 (0.024)**
Gender	0.228 (0.042)***	0.068 (0.033)*	-0.486 (0.065)***	-0.267 (0.066)***	-0.306 (0.067)***
AMENA	-0.106 (0.296)	0.222 (0.221)	0.650 (0.419)	0.478 (0.423)	0.110 (0.221)
American Indian	0.065 (0.111)	0.161 (0.089)	0.169 (0.186)	-0.007 (0.181)	-0.525 (0.110)**
Asian American	0.105 (0.101)	0.205 (0.081)*	0.041 (0.167)	-0.129 (0.833)	0.059 (0.123)
Black	-0.049 (0.057)	0.065(0.044)	0.139 (0.086)	0.165 (0.093)	-0.502 (0.057)***
Latinx	-0.040 (0.058)	0.026 (0.041)	-0.081 (0.085)	-0.048 (0.086)	-0.298 (0.054)***
Other	0.689 (0.358)	0.121 (0.277)	0.928 (0.525)	1.367 (0.608)*	0.152 (0.381)
Multiracial	-0.281 (0.154)	-0.159 (0.133)	-0.325 (0.219)	-0.178 (0.239)	-0.380 (0.278)
Emotional	0.096 (0.028)**	0.094 (0.020)***	0.006 (0.044)	0.082 (0.038)*	-0.049 (0.037)
Live with Father	0.019 (0.047)	0.019 (0.034)	0.105 (0.065)	0.180 (0.074)*	0.169 (0.037)***
Father Ed	0.052 (0.013)***	0.022 (0.010)*	0.086 (0.018)***	0.168 (0.020)***	0.031 (0.016)*
Friend Father Ed	0.050 (0.016)**	0.009 (0.013)	0.102 (0.025)***	0.074 (0.026)**	0.126 (0.015)***
FED × Friend FED	0.015 (0.009)	0.006 (0.008)	-0.003 (0.015)	0.011 (0.015)	0.003 (0.008)
$\rho$	0.040 (0.015)**	0.053 (0.022)*	0.048 (0.015)**	0.059 (0.018)**	0.052 (0.026)*

Abbreviations: AMENA, Arab, Middle Eastern, North African; Emotional, friends' emotional support; Ed, education; GPA, grade point average; FED, father education.

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

**TABLE 6** Parent and friends' parent education level by race/ethnicity for the Midwest and Southwest schools

	AMENA % (n)	Amer. Indian % (n)	Asian American % (n)	Black % (n)	Latinx % (n)	Other % (n)	White % (n)	Multiracial % (n)
<i>Midwest mothers</i>								
<HS	0.0% (0)	14.29% (1)	4.23% (11)	3.14% (5)	27.08% (13)	0.0% (0)	0.71% (3)	0.0% (0)
HS-AS	30.77% (4)	0.0% (0)	14.62% (38)	37.11% (59)	27.08% (13)	33.33% (1)	15.59% (65)	38.09% (8)
BA+	69.23% (9)	85.71% (6)	81.15% (211)	59.75% (95)	45.83% (22)	66.67% (2)	84.17 (351)	61.91% (13)
<i>Midwest friends' mothers</i>								
<HS	0.0% (0)	0.0% (0)	1.67% (4)	2.68% (4)	13.64% (6)	0.0% (0)	1.28% (5)	0.0% (0)
HS-AS	58.33% (7)	57.14% (4)	30.74% (73)	61.74% (92)	65.91% (29)	0.0% (0)	32.48% (127)	20.00% (4)
BA+	41.67% (5)	42.86% (3)	67.78% (162)	35.57% (53)	20.45% (9)	100% (2)	66.24% (259)	80.00% (16)
<i>Midwest fathers</i>								
<HS	7.69% (1)	14.29% (1)	3.10% (8)	5.19% (8)	34.78% (16)	0.0% (0)	0.24% (1)	0.0% (0)
HS-AS	15.38% (2)	0.0% (0)	7.75% (20)	44.16% (68)	28.26% (13)	66.67% (2)	16.18% (67)	26.32% (5)
BA+	76.92% (10)	85.71% (6)	89.15% (230)	50.65% (78)	36.96% (17)	33.33% (1)	83.57% (346)	73.68% (14)
<i>Midwest friends' fathers</i>								
<HS	8.33% (1)	14.29% (1)	1.26% (3)	3.38% (5)	25.58% (11)	0.0% (0)	2.31% (9)	0.0% (0)
HS-AS	58.33% (7)	42.86% (3)	21.34% (51)	66.89% (99)	55.81% (24)	0.0% (0)	32.82% (128)	26.32% (5)
BA+	33.33% (4)	42.86% (3)	77.41% (185)	29.73% (44)	18.60% (8)	100% (2)	64.87% (253)	73.68% (14)
<i>Southwest mothers</i>								
<HS	0.0% (0)	5.08% (3)	9.72% (7)	4.84% (20)	21.70% (97)	0.0% (0)	3.18% (21)	5.88% (2)
HS-AS	75.00% (6)	52.54% (31)	43.06% (31)	54.48% (225)	53.47% (239)	100% (4)	40.39 (267)	61.76% (21)
BA+	25.00% (2)	42.37 (25)	47.22% (34)	40.68% (168)	24.83% (111)	0.0% (0)	56.43% (373)	32.35% (11)
<i>Southwest friends' mothers</i>								
<HS	0.0% (0)	15.52% (9)	5.88% (4)	17.99% (75)	19.49% (84)	0.0% (0)	7.78% (49)	12.50% (4)
HS-AS	77.78% (7)	75.86% (44)	75.00% (51)	70.50% (294)	71.46% (308)	80.00% (4)	75.08% (473)	81.25% (26)
BA+	22.22% (2)	8.62% (5)	19.12% (13)	11.51% (48)	9.05% (39)	20.00% (1)	17.14% (108)	6.25% (2)

(Continues)



TABLE 6 (Continued)

	AMENA % (n)	Amer. Indian % (n)	Asian American % (n)	Black % (n)	Latinx % (n)	Other % (n)	White % (n)	Multiracial % (n)
<i>Southwest fathers</i>								
<HS	12.50% (1)	15.52% (9)	6.94% (5)	9.43% (38)	27.59% (120)	0.0% (0)	5.35% (35)	10.00% (3)
HS-AS	62.50% (5)	65.52% (38)	40.28% (29)	63.03% (254)	53.56% (233)	100% (3)	45.41% (297)	50.00% (15)
BA+	25.00% (2)	18.97% (11)	52.78% (38)	27.54% (111)	18.85% (82)	0.0% (0)	49.24% (322)	40.00% (12)
<i>Southwest friends' fathers</i>								
<HS	22.22% (2)	29.31% (17)	16.18% (11)	26.27% (109)	24.01% (103)	0.0% (0)	11.62% (73)	29.03 (9)
HS-AS	55.56% (5)	67.24% (39)	67.65% (46)	66.27% (275)	70.40% (302)	100% (5)	72.45% (455)	70.97% (22)
BA+	22.22% (2)	3.45% (2)	16.18% (11)	7.47% (31)	5.59% (24)	0.0% (0)	15.92% (100)	0.0% (0)

Note: Percent reported within ethnic-racial group.

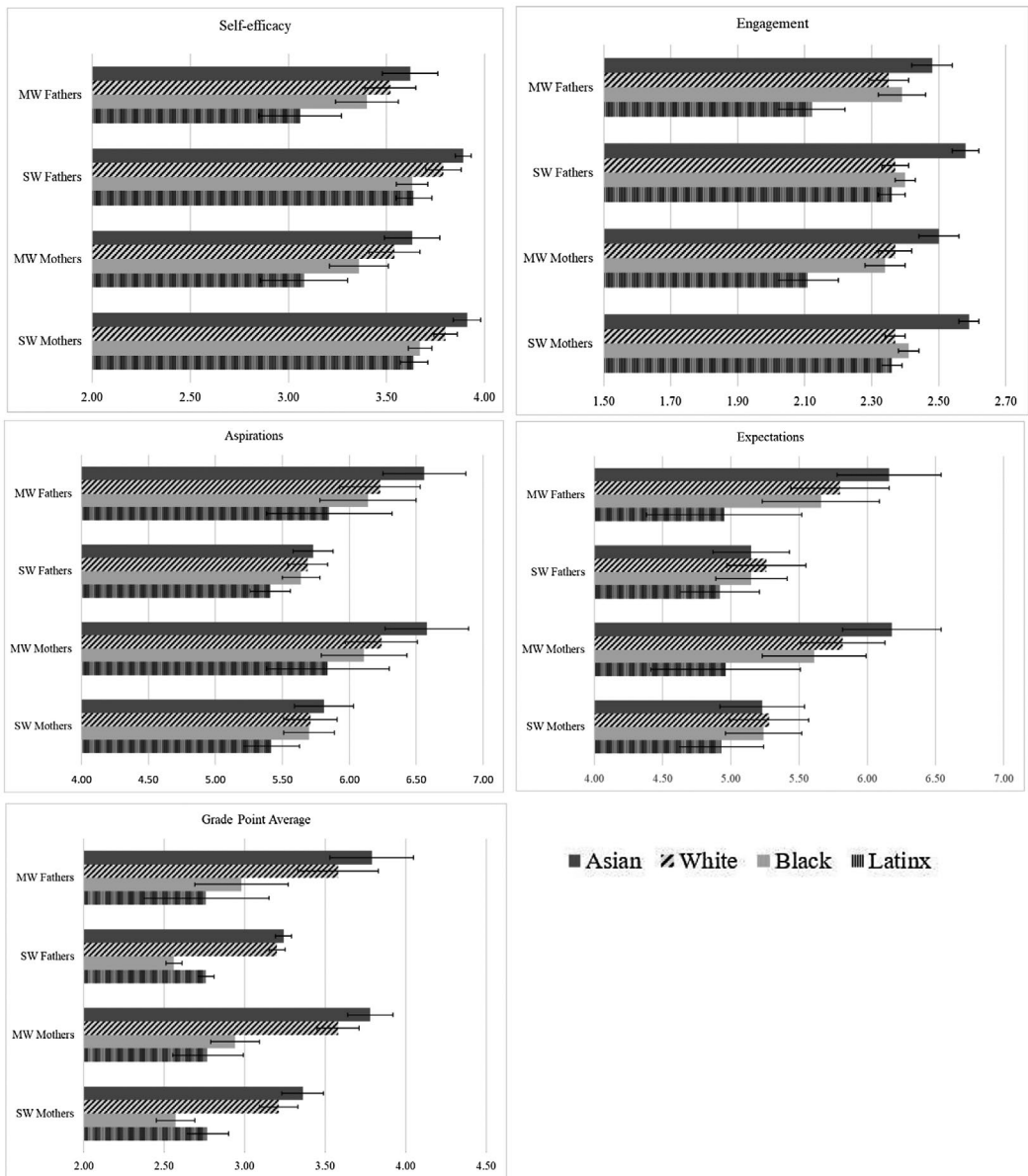
Abbreviations: AMENA, Arab, Middle Eastern, North African; Amer. Indian, American Indian; BA+, Bachelor's degree or more; <HS, less than high school; HS-AS, high school degree through Associate's degree.

friends' parents' education were relatively comparable across ethnic-racial groups, suggesting that adolescents have similar access to benefits from higher, versus lower, parent and friends' parents' education across ethnic-racial groups. However, given the inequitable distribution of parent education across these ethnic-racial groups, the range of predicted adjustment based on these standard deviations varies greatly, with Asian American and White adolescents having a higher predicted range of adjustment across academic outcomes compared to their Black and Latinx counterparts. These differences are most notable for grade point average, where similar standard deviations across parents and sites support the idea that adolescents receive similar benefits from higher parental education. However, given that there are different mean levels of parent education across ethnic-racial groups, the predicted grade point averages of adolescents in these groups are starkly different. This model suggests that Black and Latinx adolescents whose parental education level is one standard deviation *above* their respective group mean have lower predicted grade point averages than do Asian American and White adolescents whose parental education is one standard deviation *below* their group mean. For example, in the Midwestern site, a Black or Latinx adolescent whose father has a Bachelor's or Master's degree has a predicted grade point average that is lower than the predicted grade point average for an Asian American student whose father has some college or vocational school training or a White student whose father has an Associate's degree.

Moreover, although predicted adjustment for academic aspirations, expectations, and grade point average was higher in the Midwestern site than the Southwestern site, there were stark disparities in the implications of the models for academic adjustment across ethnic-racial groups in the Midwest that were not apparent in the models for the Southwest. For example, the predicted academic expectations for Latinx adolescents in the Southwestern site included attending or graduating from two-year college, vocational, or technical school, and this predicted expectation was generally aligned with the predicted academic expectations for their Black, White, and Asian American peers, who were predicted to graduate from two-year college, vocational, or technical school. In comparison, in the Midwestern site, Latinx adolescents were similarly predicted to attend or graduate from two-year college, vocational, or technical school; however, their Black, White, and Asian American counterparts were predicted to have academic expectations that fell between (Black and White students) or exceeded (Asian American students) graduating from two-year college, vocational, or technical school or attaining a Bachelor's degree.

### 3.4 | Tests of robustness

We examined two tests of robustness to better understand potential collinearity among the predictors. First, we examined the possibility that friends' parents' attributes and friends' attributes may be highly collinear, which may create ambiguities in network autocorrelation models (Lyons, 2011). We examined models without the network autocorrelation terms and compared the standard errors for the estimated effect of friends' parents' education. As reported in Tables S1 through S4 in the Supplemental Analyses, the standard error for friends' parents' education was lower in the models without the autocorrelation term than it was in models that included the autocorrelation. For Southwestern mothers, the standard errors for the models without the network autocorrelation were .001 (engagement, aspirations, and grade point average) and .002 (efficacy, expectations) lower. For Southwestern fathers, the standard errors were .002 (efficacy, engagement) and .004 (aspirations, expectations, grade point average) lower. In models examining Midwestern mothers, the standard errors were .001 (efficacy, engagement), .004 (aspirations), .005 (expectations), and .008 (grade point average) lower. For Midwestern fathers, standard errors were .003 (engagement, aspirations), .004 (efficacy), .005 (expectations), and .01 (grade point average) lower. Although the difference between these models was often small, there are notable exceptions including the relatively large increase in standard errors in the association between father education and engagement (Tables S2



**FIGURE 1** Implications of the model to adolescents’ academic outcomes by ethnic-racial group. Standard deviations based on own parent education. For each outcome, the x axis represents students’ predicted adjustment on that indicator based on the network autocorrelation models. MW, Midwestern; SW, Southwestern

and S3). Nonetheless, most of the standard errors are relatively stable and, combined with small changes in the coefficients, suggest that models that include the network autocorrelation may be conservative. Second, we examined models without the parent education by friend parent education interaction term for all models. The results for these analyses are substantively similar to findings from the hypothesized models that included this interaction term (see Tables S5 through S8, Supplemental Analyses for detailed reporting). Given that the interaction and network autocorrelation terms are key variables of interest, and that the substantive findings remained similar across models, we retain the hypothesized models as robust to these tests of collinearity.

## 4 | DISCUSSION

Parent education is strongly related to adolescents' academic performance (Carnevale & Strohl, 2013; Crosnoe & Muller, 2014; Reardon, 2011) and plays a role in the perpetuation of economic and ethno-racial inequality across generations (Manning, 2019; McDermott, 2018). The increased salience of social relationships during adolescence makes it a critical period for understanding whether and how these relationships influence adolescents' academic outcomes. Indeed, prior research has shown that adolescents' friendships are a critical developmental context that may foster their academic outcomes (Crosnoe & Benner, 2015) by connecting them to resources outside of their families (Cherng et al., 2013; Lessard & Juvonen, 2019). The current investigation sought to build on this body of research by examining whether and how parent education within adolescents' social networks compensated for or enhanced the effects of their own parents' education. As a complement to prior research showing that adolescents' friendship groups are marked by their similarity on sociodemographic and academic characteristics (e.g., Moody, 2001; Shin & Ryan, 2014), our findings show that parent education was positively related to adolescents' academic outcomes (Hypothesis 1), and that their friends' parent education was positively related to their academic outcomes (Hypothesis 2), above and beyond the effects of their own parents and their similarity to friends on these outcomes. However, we did not find evidence to suggest that parent and friends' parent education interacted to compensate for or enhance these associations (Hypothesis 3). Rather, these findings suggest the *additive* effects of parent and friends' parent education within social networks (Zimmerman et al., 2013). Furthermore, our findings show that although the implications of the model were similar across ethnic-racial groups, systemic racialized differences in parent education mirrored racialized differences in adolescents' predicted academic adjustment (Hypothesis 4). In other words, these findings suggest that parent education is an important factor in understanding how adolescents' social contexts produce and reproduce both class- and race-based societal inequities.

Findings support a growing body of literature showing that previous generations' access to education shapes later generations' academic outcomes (e.g., Harding et al., 2015) and demonstrate that family advantages operate to reinforce socioeconomic and racialized inequities during adolescence. Specifically, findings supported Hypothesis 1 and Hypothesis 2, showing that higher parent and friends' parent education levels were uniquely, over and above the other, positively associated with adolescents' academic outcomes. In line with prior research showing that higher parent education is associated with better academic performance and attainment (Carnevale & Strohl, 2013; Crosnoe & Muller, 2014; Reardon, 2011), findings showed that higher parent education was associated with adolescents' positive views of their own competence, attitudes, expectations for, and performance in school. Furthermore, these findings show that parent education is a defining feature of the social contexts in which adolescents are embedded, even within ethnoracially and socioeconomically diverse schools. Specifically, adolescents' friendship networks were characterized by their similarity on parent education; and having friends whose parents had higher levels of education was positively related to adolescents' academic aspirations, expectations, and grade point average above and beyond the effects of their own parents' education and their similarity to their friends on these outcomes. These findings suggest that not only do adolescents accrue substantive benefits to their educational outcomes through their friendship networks, but that the positive effects of higher parent and friends' parent education may be concentrated among those with greater advantage, in line with prior research (Cherng et al., 2013; Flashman, 2012a; Lessard & Juvonen, 2019). Taken together, these findings suggest that parent education is a distinguishing feature of adolescents' friendship networks that may further increase disparities in educational outcomes due to inequities in educational opportunity across generations.

Moreover, it is possible that current and historic systemic racialization of the education system informs adolescents' academic outcomes via their friendship networks—representing a structural component of inequalities in educational outcomes. For example, Flashman (2012b) showed that the racialized structure of the U.S. education system situates Black and Latinx students with systematic disadvantages in access to high-achieving peers compared to their White counterparts. Similarly, academic tracking that clusters Black and Latinx students and Asian American and White students, respectively, even within the *same* school building may limit their opportunities to

establish friendships across ethno-racial groups, furthering differences in their academic outcomes. Although research suggests that increased socioeconomic diversity in schools may help to equalize educational opportunities and diminish ethnic-racial disparities in educational outcomes, given the strong relations between ethnic-racial and socioeconomic stratification in the United States (see Crosnoe & Benner, 2015 for a review), the present study suggests that increased diversity alone is limited in its ability to promote adolescents' academic outcomes. For example, in contrast to parent education, friends' parent education was not significantly related to adolescents' academic outcomes consistently—with higher friends' parent education associated with greater academic self-efficacy across most of the models, but with higher academic engagement in only one model. Combined with the homophily in friendship networks based on parent education and the lack of support for the anticipated interaction, this finding suggests that although friends' parent education may be an additive resource for students, there are limits as to whether and how friendship networks are able to compensate or enhance the effects of parent education. Furthermore, despite examining these relations within ethnoracially and socioeconomically diverse schools, we found evidence of racialized disparities in adolescents' predicted academic outcomes. In particular, our findings on the lower returns to higher parent education levels to Black and Latinx students compared to their Asian American and White counterparts provide evidence of ethno-racial discrimination that operates within the broader U.S. school system. Taken together, these findings suggest that creating more diverse educational contexts is only a first step in creating more equitable school systems. Rather, programs, policies, and interventions are needed that directly target inequities in educational access and attainment across generations.

Adolescence may be a critical period for strategically targeting interventions aimed at reducing academic inequities (Crosnoe & Benner, 2015). Given that adolescents access cultural resources associated with better academic outcomes through their friendships (Cherng et al., 2013), programs that create more equitable access to information and conversations about academics across social groups and that leverage the information and conversations adolescents have at home may provide new avenues for promoting academic equity. These approaches could be combined with interventions shown to decrease socioeconomic differences in academic achievement among older adolescents (e.g., including self-affirmation, difference-education, and goal reframing; Stephens et al., 2015). Moreover, parent education represents only one aspect of cultural capital. Interventions aimed at promoting academic equity should incorporate student, family, and community cultural wealth (e.g., linguistic, familial, navigational; Yosso, 2005). Last, given the salience of social relationships during this developmental period (Brown & Larson, 2009), approaches that work to develop relationships among adolescents and that foster their connectedness to teachers, peers, and adults in their communities (Donlan et al., 2017) may be particularly effective. In other words, structural transformation within schools in terms of scaffolded curricula can be used to create intergenerational and inclusive educational networks of support for students (Jack, 2016).

## 5 | LIMITATIONS AND FUTURE DIRECTIONS

The findings from this study should be interpreted with consideration of its limitations. First, our study is cross-sectional. Future research is needed to examine how parent characteristics shape adolescents' friendship selection and influence over time and the potentially cumulative mechanisms through which parent education and friends' parent education shape adolescents' academic outcomes. Given that indicators of academic adjustment during adolescence vary in their longitudinal associations with outcomes in young adulthood (e.g., educational attainment, occupational success; Dubow et al., 2009; Melby et al., 2008), research is needed to understand the potential for friends' parent education to inform adolescents' long-term developmental outcomes. In addition, given lower rates of access to adolescents' academic records, caution in interpreting the findings on students' grade point averages is warranted. Although the findings are similar across sites, findings may change with more complete data. Second, our examination focused on two ethnoracially and socioeconomically diverse high school contexts in the Midwestern and Southwestern United States. Although the U.S. youth population is increasingly

diverse, school contexts remain deeply segregated by both race and class. Relatedly, we were unable to examine the specific implications of the model for some of the ethnic-racial minority groups in the sample due to the small sample size. Additional research is needed to examine these relations in schools with varying ethno-racial and socioeconomic compositions that reflect the nation's schools. Our models also showed substantive differences in the predicted academic adjustment for adolescents in the Midwest compared to the Southwest. Research is needed to disentangle whether and how these differences are related to student composition and/or to state and local educational policy. Our findings did not suggest differences in the relations between mother and father education and adolescents' academic adjustment. Although these findings are in line with prior work showing that mothers' and fathers' involvement in their children's schooling is equitably related to their academic outcomes (Kim & Hill, 2015), future research should focus on the mechanisms by which parent and friends' parent education are differentially associated with adolescents' academic outcomes—and why potential differences in these pathways for mothers and fathers lead to similar outcomes for adolescents. In addition, past research has shown that extended family members (e.g., aunts, cousins, grandparents) impact the educational outcomes of adolescents (Loury, 2006), with interactions between immediate and extended family serving a vital role in the educational success of adolescents (Jaeger, 2012). The current study represents a limited view of adolescents' social contexts and the resources provided through their social networks. Research is needed that examines these networks to better understand the ways in which concentrated advantage or disadvantage, network diversity, and additional sources of familial and community wealth (Yosso, 2005) contribute to adolescents' academic outcomes. A critical area for future research is to examine adolescents' exposure to highly educated adults within these social networks, understand variation in exposure to adults with different levels of education, and examine how these communities may collectively impact adolescents' academic outcomes.

## 6 | CONCLUSIONS

Parent education plays an important role in shaping adolescents' academic outcomes (e.g., Reardon, 2011). Findings from the current investigation expand this body of research to show that parent education is a distinguishing feature of adolescents' friendship networks and that parent and friends' parent education are uniquely associated with adolescents' academic adjustment. These findings suggest that the friendships one has during this period represent a lever that can perpetuate or decrease inequality. By examining these relations in two ethnoracially and socioeconomically diverse high schools, the current study shows that the academic benefits adolescents reap from having friends whose parents have higher levels of education (e.g., Cherg et al., 2013; Lessard & Juvonen, 2019) may be enhanced through targeted interventions that capitalize on the importance of social relationships during this developmental period and that complement familial and community sources of cultural wealth. This combination of strategies may be particularly effective for improving adolescents' educational outcomes and reducing the reproduction of class- and race-based inequities in society.

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## DATA AVAILABILITY STATEMENT

Research data for the current manuscript are not shared.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found online in the Supporting Information section.

Supplementary Material

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