



# Tied Together: Adolescent Friendship Networks, Immigrant Status, and Health Outcomes

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## Abstract

This study examines the social integration of adolescent immigrants by directly analyzing the composition of their friendship networks. Using statistical network analysis, I first consider whether adolescents are more likely to befriend peers who share their immigrant generation status in a large, diverse sample of 7th through 12th graders from the National Longitudinal Study of Adolescent to Adult Health ( $n = 67,586$ ). Next, I test whether having a higher proportion of same-generation friends can protect immigrant youth from experiencing negative health outcomes and adopting risky behaviors. Results indicate that adolescents are more likely to form friendships with peers who share their immigrant generation status and that this tendency is particularly strong for first-generation immigrants. Furthermore, immigrant youth with greater proportions of same-generation friends are less likely to report several negative health behaviors and outcomes. My findings suggest that same-generation friendships can serve as a protective mechanism for immigrant youth, which may help explain the existence of an immigrant health paradox.

**Keywords** Adolescent immigrants · Social networks · Immigrant paradox · Health outcomes

## Introduction

During the latter half of the twentieth century, the United States began to receive growing numbers of immigrants who not only were from a greater selection of origin countries, but who also settled in increasingly diverse destination communities (Bohn

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and Pugatch 2015; Hirschman and Massey 2008; Singer 2004). In response to these demographic trends, scholars, policy makers, and educators have developed a revitalized interest in understanding how migrants are incorporated into their destination societies, as well as the implications of this integration for their general health and well-being. Yet as a result of growing diversity, both in terms of immigrants' individual-level characteristics and the communities where they settle, this task has become increasingly complex (Zhou 1997).

Scholars have long relied on theories of assimilation to better understand the lived experiences of immigrants, and this theoretical discourse has evolved to explain recent migration trends. Gordon's classic assimilation theory (1964) argues that one of the key components of this process is structural incorporation, which occurs when immigrants and their children are integrated into the destination society's social networks, institutions, and organizations. Previous work has considered whether immigrants are incorporated into the economic markets and education systems of their destination countries (Alba and Nee 2009; Bean et al. 2003). However, it remains unclear whether first-generation migrants, or those born outside the country where they currently reside, are socially integrated into their receiving country's friendship networks (Brown 2006; Kao and Joyner 2006). Also unknown is whether this integration is associated with positive or negative consequences for individual health and well-being.

I reconsider this debate by first directly measuring the relational patterns of immigrant youth in a large, diverse sample of more than 100 friendship networks from the National Longitudinal Study of Adolescent to Adult Health (Add Health). Friendships are often characterized by homophily on race, gender, and age, meaning that individuals tend to form ties with those with whom they share similar characteristics and attributes (Goodreau et al. 2009; McPherson et al. 2001; Moody 2001). However, to the best of my knowledge, no previous work has rigorously investigated whether these relationships also tend to be homogenous by immigrant generation. Through the implementation of exponential random graph models (ERGMs), I test whether peers from the same immigrant generation are significantly more likely to form friendships with one another while controlling for other properties that guide friendship formation. High levels of such homophily would suggest that as the result of exclusion, avoidance, or other barriers, immigrant youth are unlikely to be socially integrated into the networks of their native-born peers.

To better understand the implications of homophily on immigrant generation status, I further consider whether immigrants who report greater proportions of same-generation friends are less likely to report negative health-related outcomes and behaviors. On average, an immigrant health advantage exists for adolescent migrants, and first-generation youth tend to report less participation in risky health behaviors than their native-born peers (Bersani 2014; Cervantes et al. 2013; Gordon-Larsen et al. 2003; Lee and Martinez 2009). Previous work has argued that this paradoxical advantage exists in part because of the communities where immigrants settle (Eschbach et al. 2004; Lee and Liechty 2015), but which aspects of these destinations provide migrants with such protections remains unclear. Accordingly, I consider a specific mechanism that may help account for the exceptionally positive health of immigrants—the composition of their friendship networks—and test whether having more same-generation friends is positively associated with multiple indicators of health and well-being. By further understanding which resources help immigrant youth best navigate American

society, policy makers and school personnel will be better equipped to prepare these young people for successful, healthy futures.

## Background

### Homophily and Immigrant Generation Status

According to the principle of homophily, social contact is more likely to be observed among those who are similar than those who are different (McPherson et al. 2001). Homophily characterizes all types of social relationships, including adolescent friendships. Adolescents tend to befriend peers who share their race and gender (Goodreau et al. 2009; Shrum et al. 1988), take similar academic classes (Frank et al. 2013), and are involved in the same extracurricular activities (Schaefer et al. 2011b).

Homophily defines adolescent friendships for several reasons. First, individuals often have inherent preferences to form ties with similar peers. For instance, people tend to be more effective at communicating with those with whom they share the same attitudes and cultural understandings (Rogers and Bhowmik 1970). At the same time, social ties are more likely to connect those who are physically close and have frequent contact, yet geographic space and social structures segregate individuals based on a variety of characteristics (Mouw and Entwisle 2006). Adolescent tie formation frequently occurs within schools that are structured by grade levels and systems of academic tracking, leading adolescents to spend more time with those of similar ages and levels of ability (Felmlee and Faris 2016; Kubitschek and Hallinan 1998). Taken together, individual preferences and structural factors both explain why we should expect to observe homophily in adolescent friendships.

However, despite overwhelming evidence for adolescent friendship homophily on a variety of attributes, research has yet to consider whether these friendships are also characterized by immigrant generation homophily. In other words, it is unclear whether first-generation immigrants are more likely to befriend first-generation peers and whether second- and later-generation adolescents tend to select friends who share their immigrant generation status.<sup>1</sup> Some previous work has suggested that adolescent friendships tend to be homogenous by immigrant generation. Rosenbloom and Way (2004) collected a sample of interviews from minority students attending a public high school in New York City. The authors point to evidence for intraethnic boundaries, particularly between first-generation and later-generation Chinese students. In their interviews, Chinese students drew a clear distinction between foreign- and native-born coethnics by pointing to differences in attitude and acculturation. When asked about their friendships, Chinese students reported that they not only tended to befriend other Chinese students but also held a preference for friends who shared their immigrant generation status. Additionally, American marriages tend to be characterized by homophily on immigrant generation status. Although marriages between foreign- and native-born coethnics are more common than those that cross ethnic or racial lines, a strong tendency still exists for American marriages to be endogamous with respect to

<sup>1</sup> Here, I define *second-generation immigrants* as children of at least one foreign-born parent and *later-generation immigrants* as the children of two native-born parents (following Bersani 2014).

immigrant generation (Qian and Lichter 2007). Overall, previous research has suggested that in addition to race and ethnicity, immigrant generation status should also serve as a social boundary that governs the formation of adolescent friendships (Hypothesis 1).

### Implications of Friendship Homophily for Social Integration

In Milton Gordon's *Assimilation in American Life* (1964), Gordon outlined his classic assimilation theory, which argues that assimilation is a multistage process. The first stage, known as acculturation, occurs when immigrants adopt the cultural patterns of a destination society. This is followed by structural assimilation, which emerges when an immigrant group gains acceptance into the host society's institutions, organizations, and social networks. According to Gordon's argument, structural assimilation is "the keystone of the arch of assimilation" (Gordon 1964:81). In other words, Gordon posited that after an immigrant group structurally assimilates, the other stages of assimilation, such as intermarriage and the decline of prejudice, will inevitably follow.

Despite the importance of structural assimilation, limited previous work has studied whether immigrants are socially integrated into the networks of their native-born peers (Brown 2006). Some research has considered spatial assimilation as a proxy for social integration, finding that first-generation immigrants are more likely to live in racially segregated neighborhoods than their native-born peers (Iceland and Scopilliti 2008; South et al. 2008). Although living in racially diverse neighborhoods could imply increased interaction between immigrants and the native-born, measures of spatial integration often fail to fully capture patterns of social integration, and data on social ties can more directly test for these processes (Brown 2006).

However, when studies of social incorporation have taken advantage of data on relational ties, they have tended to consider only how immigrant generation relates to racial homophily. Previous work has found overwhelming evidence that racial homophily characterizes all types of social relationships (Goodreau et al. 2009; McPherson et al. 2001), and this tendency is even greater for first-generation immigrants (Brown 2006; Kao and Joyner 2006). However, we should not assume that same-race friendships are an adequate substitute for measuring same-generation friendships. It is entirely plausible, for instance, that a Mexican immigrant would report friendships with only other Hispanics—friendships that would be considered racially homogenous. Yet this information alone does not indicate whether the immigrant's friends are native-born. Some, if not all, of these friends are likely to have been born in the United States, a finding that would suggest that the migrant is socially integrating into the friendship networks of their native-born peers.

Motivated by Gordon's notion of structural assimilation, I specifically consider whether the friendship choices of first-generation adolescents are characterized by homophily on immigrant generation. As a result of exclusion, personal preferences, and structural factors (Jiménez 2008; Tsai 2006), I expect that when compared with native-born youth, first-generation immigrants are more likely to report same-generation friendships (Hypothesis 2). Such a finding would suggest that first-generation adolescents are unlikely to be socially integrated into the networks of their native-born peers given that most of their friends are fellow migrants. I also expect that because of boundary blurring (Alba and Nee 2009), the salience of immigrant

generation in defining friendship patterns will wane with each passing generation. Boundary blurring occurs when the social distinctions between groups become less distinct as a result of frequent, equal-status interactions. For second-, third-, and later-generation youth, immigrant generation is likely to be a less discernible social boundary, and thus homophily on immigrant generation should play a decreased role in governing their formation of friendships.

### **Immigrant Generation Homophily and the Immigrant Paradox**

Despite being newcomers and having, on average, lower socioeconomic statuses than their native-born peers (Park and Myers 2010), immigrants tend to report higher measures of health, well-being, and prosocial behavior. Although much research on this immigrant paradox has utilized samples of adult migrants (e.g., Eschbach et al. 2004; Palloni and Arias 2004; Riosmena et al. 2013, 2017), a growing body of work has found that the paradox similarly characterizes the behaviors and outcomes of adolescents. For instance, when compared with their later-generation peers, first-generation youth tend to report lower levels of depression (Cervantes et al. 2013) and are less likely to experiment with alcohol (Bacio et al. 2013) or tobacco (Gordon-Larsen et al. 2003).

Two primary processes account for the immigrant paradox. First, individuals who self-select into migration tend to report exceptionally positive measures of health and low predispositions to delinquency (Beiser et al. 2002; Landale et al. 2000; Martinez et al. 2015; Sampson 2008). Then, after arriving in their destinations, migrants often benefit from sociocultural protections that are provided by the solidarity and social capital of their communities (Eschbach et al. 2004; Lee and Liechty 2015). Although scholars have extensively theorized about factors that can help explain the immigrant paradox, they have yet to consider whether migrants' social networks can further elucidate the phenomenon's existence.

Previous empirical work has found that the protective sociocultural factors that adolescent migrants experience in their new communities and schools can help account for their paradoxical outcomes (Bersani et al. 2014; Lee and Liechty 2015). If newcomers settle in migrant communities that promote healthy, prosocial behaviors, this can buffer "negative acculturation," or the adoption of harmful behaviors, such as poor diets, excessive alcohol consumption, and cigarette smoking (Lara et al. 2005; Van Hook et al. 2012). For instance, first-generation Latino adolescents tend to report lower odds of depression when they live in areas with high migrant densities (Lee and Liechty 2015). Immigrant enclaves also buffer the risk of drinking and smoking for some migrant youth (Kulis et al. 2007), and foreign-born adolescents who attend schools with many fellow migrants report lower rates of delinquency (Gieling et al. 2010). Yet other empirical studies have found no evidence that migrant communities afford first-generation youth these protective benefits (e.g., Frank et al. 2007).

Part of the reason that previous work has yielded mixed findings on the role of sociocultural protection in defining the immigrant paradox is that we have a limited understanding of the mechanisms through which this protection can boost immigrant health and well-being (Abraído-Lanza et al. 2005; Lee and Liechty 2015). Although migrant and coethnic communities promote positive

modes of incorporation for immigrant youth (Portes and Rumbaut 1996, 2001), it remains unclear how these communities encourage foreign-born adolescents to abstain from unhealthy, delinquent behaviors. Indeed, spatial research has found evidence for a positive “barrio advantage” for both adolescent and adult migrants alike (e.g., Cagney et al. 2007; Eschbach et al. 2004; Kimbro 2009; Lee and Liechty 2015). However, these studies were unable to conclude *why* having high proportions of foreign-born neighbors is positively associated with indicators of well-being. For instance, they could not determine whether these neighborhoods provide migrant youth with greater social support, offer unique community resources, or simply isolate these adolescents from the negative influences of native-born peers.

The current study seeks to extend our understanding of how sociocultural protection is associated with immigrants’ health-related outcomes by focusing on one potential mechanism: friendships with same-generation peers. For adolescent immigrants, friendships with fellow migrants likely reinforce positive, healthy behaviors. Lee and Zhou (2015) found in their interviews with first- and second-generation Asian American adolescents that individual well-being and success were directly influenced by the cultural frame respondents adopted. The interviewees’ parents immigrated to the United States with what Lee and Zhou termed “success frames,” or cultural frames that are characterized by strict definitions of success, including high academic achievement and abstinence from delinquency. Similarly, Portes and Zhou (1993) argue that when first-generation Mexican immigrants maintain strong ties to the language and values of their home country, they are often protected from the negative influences of their native-born peers. Overall, contact with fellow immigrant peers is likely to reinforce the cultural frames of first-generation adolescents and should encourage their participation in prosocial, healthy behaviors.

To better understand the mechanisms through which sociocultural protection can help account for the immigrant paradox, I examine whether immigrant youth with greater proportions of same-generation friends are more likely to report positive health behaviors and outcomes (Hypothesis 3). Furthermore, I test whether same-generation friendships are associated with health benefits for adolescent immigrants while controlling for the generational composition of their schools. Attending a school with more immigrant peers not only offers more opportunities for first-generation adolescents to make same-generation friends but also situates them in an environment that has been shown to provide sociocultural protection (Eschbach et al. 2004; Gieling et al. 2010; Kimbro 2009; Lee and Liechty 2015). As a result, controlling for the proportion of the student body who identify as first and second generation enables me to tease apart whether direct friendships are a mechanism that can help account for the existence of a barrio advantage.

For my primary analysis, I focus on three health-related behaviors that are shaped by the immigrant paradox: smoking cigarettes, getting drunk, and expressing symptoms of depression. As opposed to other health-related outcomes (e.g., chronic disease or mortality), these three outcomes are relatively common difficulties that adolescents experience in their daily lives (Avenevoli et al. 2008; Cooper et al. 1994; U.S. Department of Health and Human Services 2012). In sensitivity analyses, I consider five additional health behaviors to increase the

generalizability of my findings and include models that test whether Time 1 friendship patterns can predict Time 2 health outcomes.

## Methods

### Data and Sample

This research is based on the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative, multiwave study including more than 90,000 respondents. The first wave was collected in 1994–1995 during students' 7th through 12th grade years, and four follow-up waves have since been conducted. One hundred thirty-two schools were selected for the initial wave of data collection, and all students who attended these schools were asked to complete in-school surveys (Bearman et al. 1997).

To construct my measures of friendship, I limit my sample to data collected from the in-school surveys at Wave I of the study. At this wave, all students in each of the 132 schools were asked to nominate their closest friends, allowing for the creation of global friendship networks. *Global networks* refer to social networks wherein all actors in the population of interest have the opportunity to participate and can theoretically report friendship ties to any other actor in their network. I exclude certain schools from my final analyses because of their unique structures, including a single-gender school, school with no grade levels, and special-education school ( $n = 3$ ). Because I utilize analytical methods that rely on relatively high within-network response rates, schools with a response rate lower than 75 % are also excluded ( $n = 20$ ) (following Moody 2001 and Schaefer et al. 2011b). Finally, I omit schools where the entire student body comprises youth of the third or later (third-plus) generation ( $n = 2$ ). Because of the extreme homogeneity in these schools, I cannot observe any meaningful homophily on immigrant generation status. My final primary sample includes 107 of the Add Health schools and 67,586 students.<sup>2</sup>

I also include two sets of sensitivity analyses that rely on additional waves of data from Add Health. In the first set, I use a subsample of 12,869 students who were also selected to participate in the Wave I in-home survey. Although the Wave I in-home survey limits my sample size, it asked participants to report on a broader range of behaviors, allowing me to test whether I am capturing a consistent relationship across a variety of health-related outcomes. For the second set of sensitivity analyses, I analyze a further subsample of 9,054 adolescents who participated in the Wave II in-home survey. The second wave of Add Health was collected one year following the first wave of data collection, enabling me to construct measures of Time 2 health outcomes.

<sup>2</sup> Students in the retained sample differ in minor ways from those who were omitted. For instance, the proportion of first-generation (8.77 %) and second-generation youth (9.84 %) is slightly lower in the analyzed sample than among the omitted cases (11.28 % and 13.01 %, respectively). Yet even in lieu of such differences, omitting these 25 schools is unlikely to substantively bias my findings. If anything, these omissions should produce more conservative estimates because schools with higher percentages of first- and second-generation students and lower percentages of white students are *more* likely to exhibit patterns discussed in the Results section.



## Measures

### Immigrant Generation Status

I measure immigrant generation status by using respondents' answers to two survey questions. All students were asked whether they were born in the United States. Those who indicated that they were born outside the United States are coded as first-generation immigrants.<sup>3</sup> Respondents were also asked whether their resident mothers and fathers were born in the United States. Students who were born in the United States but reported at least one foreign-born parent are coded as being second generation (following Bersani 2014).<sup>4</sup> I code native-born respondents with no foreign-born parents as being third-plus generation.

### Friendship

Respondents were also asked to nominate their 5 closest male and female friends, allowing each respondent to make up to 10 friendship nominations. Because the methods of analysis require global network data, I consider only within-school friendship nominations. Following work by Goodreau et al. (2009) and Schaefer et al. (2011b), my analyses include only reciprocated friendships, or those friendships in which each member of the pair nominated one another. Mutual friendships represent stronger and more intimate relationships than unreciprocated social ties (Vaquera and Kao 2008).

To test my third hypothesis regarding the association between immigrant generation homophily and health outcomes, I also construct an individual-level variable that accounts for the proportion of mutual same-generation friendships reported by each respondent. Here, the denominator is a count of the mutual friendships in which the respondent is involved, and the numerator is the number of these friendships that are with same-generation peers. To account for the fact that respondents have different numbers of friends, I include two controls: (1) a count variable that measures the number of mutual friends reported by each respondent, and (2) a dummy variable that indicates whether the respondent is a friendship isolate (i.e., he or she has no in-school, mutual friendships).

### Health Outcomes

To better understand the relationship between the generational composition of adolescents' friendship groups and their individual well-being, I use three dependent variables in my primary analyses: smoking, drunkenness, and depression. Students were asked how often they smoked cigarettes and got drunk in the past 12 months. Because the majority of respondents in my sample abstained from smoking and getting drunk, I

<sup>3</sup> A small proportion (0.6 %) of my sample was born outside the United States to two U.S.-born parents. In supplemental analysis, I drop these respondents from my sample and observe the same substantive trends reported in the results (analyses available upon request).

<sup>4</sup> In supplemental analysis, I test whether conclusions vary for second-generation with two foreign-born parents and second-generation respondents with one foreign-born parent and one native-born parent. Because I find no significant differences between the two groups (analyses available upon request), I aggregate them to increase my sample size (following Rumbaut 2004).



code those respondents who report any past-year participation as 1 and those with no past-year participation as 0 (following Adams and Schaefer 2016; Fang et al. 2003; Osgood et al. 2014).<sup>5</sup> I calculate depression scores by averaging students' responses to four survey questions regarding measures of past-month depression.<sup>6</sup> Students' response options for each of the four questions are 0 = never, 1 = rarely, 2 = occasionally, 3 = often, or 4 = every day. In sensitivity analyses, I include five additional outcomes—marijuana use, other illicit drug use, self-rated health, obesity, and exercise—as well as dependent variables that capture health behaviors during the second wave of the study. I provide details about the construction of these measures in the online appendix.

### Individual-Level Control Variables

All analyses include several controls that are associated with both friendship formation and adolescent health behaviors. Because substance use and depression vary by race and ethnicity (Osgood et al. 2015; Riolo et al. 2005), I construct a measure for race/ethnicity by considering students' responses to two questions: one about Hispanic ethnicity, and the other as to how respondents racially identify. Responses are recoded into five categories: Hispanic (any race), white (non-Hispanic), black (non-Hispanic), Asian/Pacific Islander (non-Hispanic), and other (non-Hispanic). I include controls for gender (1 = girl), student's grade level, and parents' highest level of education. Parents' highest level of education is scored as 0 = less than high school, 1 = high school graduate, 2 = some college, and 3 = bachelor's degree or higher. If a respondent's parents had differing levels of education, I code the variable as the higher education level. Additionally, I include a binary variable to account for family structure, where 1 = respondent currently lives in a two-parent household. Because low academic performance tends to be associated with substance use and depression, I also create a measure of respondents' GPA by averaging their self-reported past-year grades in English, math, science, and social studies (ranging from 1 = D through 4 = A). Finally, I construct a variety score to control for respondents' delinquency by summing the number of delinquent activity types that each respondent admitted to participating in during the past year (following Sweeten 2012). To create this score, I use students' responses to three questions about delinquent behaviors that do not involve substance use, resulting in a measure that varies from 0 to 3.<sup>7</sup> To account for missing data across all schools, I use multiple imputation (using chained equations) to estimate 10 data sets. I use all

<sup>5</sup> In supplemental analyses, I consider different measures of respondents' tobacco and alcohol use. These alternative metrics include definitions that are either more problematic (e.g., smokes every day vs. smokes less than everyday) or less risky (e.g., had at least one drink in the past year vs. had zero drinks). Overall, results are substantively similar (analyses available upon request).

<sup>6</sup> Depression-related survey items were collected by asking respondents, "In the last month, how often did you feel depressed or blue?" "Did you cry a lot?" "Did you have trouble eating, or a poor appetite?" "Did you have trouble falling asleep or staying asleep?" Previous research has noted that many commonly used survey instruments do not capture equivalent mental health concepts across all racial/ethnic groups and immigrant generations (Perreira et al. 2005). Because my sample is diverse, I consider an alternative version of my depression measure that contains only those survey items in the five-item version of the CES-D (following Perreira et al. 2005). These analyses show the same trends as those presented in the Results section (available upon request).

<sup>7</sup> The delinquency variety score considers three items in which respondents were asked how many times in the past year they lied to their parents, skipped school without an excuse, and got into physical fights.

independent and dependent variables to inform the missing data model and impute for all missing measures. In my final analyses, I include cases for which I impute on the dependent variable (following Johnson and Young 2011).<sup>8</sup>

### School-Level Variables

I include two school-level variables to account for the generational composition of each school's student body. One measure indicates the proportion of the student body defined as first-generation, and the other measures the proportion defined as second-generation. I also include an indicator for the proportion of the student body that identifies as being a racial minority (i.e., the proportion of students who do not identify as non-Hispanic whites) as well as a count for the number of students that attended each school. Finally, I include two binary controls: one indicates whether a school was public (1 = public, 0 = private or Catholic), and the other notes where each school is located (1 = urban, 0 = suburban or rural) (following Moody 2001).

### Plan of Analysis: Exponential Random Graph Models

To test my first and second hypotheses, I estimate exponential random graph models (ERGMs), which provide an ideal means to test for various forms of friendship homophily in social networks (Hunter et al. 2008; Robins et al. 2007). ERGMs employ a statistical analysis that compares the dyadic (i.e., pairwise), patterns observed in an actual network to what would be expected by chance. Using Markov chain Monte Carlo (MCMC), ERGMs are fit by a random algorithm that takes a sample of all possible networks drawn from a probability distribution and uses this sample to approximate the true likelihood function (Hunter 2007). In other words, ERGMs can determine whether the network processes observed in an actual network are statistically significantly different from what would be expected to occur randomly. Another benefit of ERGMs is that they allow one to control for endogenous structural processes, including phenomena such as the tendency for respondents to nominate their friends' friends (i.e., transitivity). Failing to control for these endogenous processes can bias estimators of friendship homophily by making them artificially high. Finally, unlike traditional statistical models, ERGMs enable one to analyze data at the level of the dyad without violating dependence assumptions (Robins et al. 2007).

Although the underlying estimation procedures are fundamentally different, ERGM parameters can be conceptualized as being similar to the parameters in a logistic regression (Robins et al. 2007). ERGM coefficients can be exponentiated and interpreted like log odds. Given that the unit of analysis is the relationship, not the individual, an exponentiated ERGM coefficient estimates how a one-unit change for a given indicator relates to the odds that a friendship tie exists between two individuals. More details on the estimation procedures that underlie ERGMs are available in the online appendix.

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<sup>8</sup> In analyses not shown here, I estimate my models using the unimputed sample as well as an imputed sample that omits those cases with missing data on the dependent variable. Overall, I uncover the same trends as those presented in the Results section.

## Parameters

I include two types of parameters in my ERGMs: the first relates to structural processes endogenous to the network, and the second relates to homophily on specified individual-level attributes. Four of the included parameters account for structural processes. First, the *base log odds of friendship* parameter accounts for the likelihood that a friendship exists between any two actors in the network and can be understood to serve a role similar to that of an intercept. I include a parameter to measure *friendship skew* to account for the fact that although most people in my sample report relatively few friends, a small minority have many friends. Finally, the *open triads* and *closed triads* parameters work concurrently to model the tendency for friendships to be transitive. The open triad parameter controls for the necessary preconditions for a transitive friendship to form (e.g., *a* is friends with *b*, and *b* is friends with *c*, but *a* and *c* are not friends). The closed triad parameter measures the tendency for triadic closure in open triads (e.g., for a friendship to form between *a* and *c*). Only the closed triad parameter is interpreted when estimating the tendency for triadic closure, but it is necessary to include the open triad parameter to decrease bias (Hunter 2007).<sup>9</sup>

The second type of parameters that I include in my ERGMs tests for homophily on several individual-level attributes. These ERGM parameters assume that homophily is either uniform or differential. Uniform homophily assumes that the tendency for friendships to form between same-attribute peers is equal across all distinct groups, and differential homophily allows for these tendencies to vary. In the following ERGMs, I test for homophily with regard to immigrant generation status, race/ethnicity, gender, parental education, and grade level. I use both uniform and differential parameters to test for homophily on immigrant generation status, but only uniform parameters to test for homophily on the control variables.

## Meta-Analysis

ERGMs can analyze only a single network at a time, so it was necessary to run these analyses on each of the 107 networks separately. Of the 107 networks, 6 were unable to reach convergence or produce adequate goodness-of-fit statistics and are therefore excluded from the meta-analysis. These six networks have substantially lower levels of heterogeneity on immigrant generation status and race/ethnicity but are otherwise similar to the 101 networks that reached convergence (see further discussion in the Results section).

For the 101 networks that reached convergence and produced satisfactory fit statistics, I aggregate the findings from each ERGM by employing a two-level random-effects meta-analysis. Following previous work (e.g., Snijders and Baerveldt 2003), I calculate the sample-wide mean for each ERGM coefficient by estimating a random intercept model where I fix the level-one variance to equal the coefficient's squared standard error, and the school serves as the second level. This averaging

<sup>9</sup> *Base log odds of friendship* refers to the edges parameter, *friendship skew* is the geometrically weighted degree parameter, *open triads* is the geometrically weighted dyad-wise parameter, and *closed triads* is the geometrically weighted edgewise parameter (see Snijders et al. 2006). For all terms that require a decay parameter, I use a weight of 0.25 (following Goodreau et al. 2009 and Schaefer et al. 2011b).

process takes into account the different levels of precision across all models by giving greater weight to those with more precise estimates (Lubbers and Snijders 2007).

### Plan of Analysis: Multilevel Models

To test whether immigrant generation homophily is negatively associated with adolescent health behavior (Hypothesis 3), I estimate multilevel models (MLMs) to account for the nested structure of the data. I construct two-level MLMs wherein the first level represents the student and the second represents the school. For each of my dependent variables, I estimate separate MLMs using multilevel logistic regression models for each binary outcome and multilevel regression models for continuous measures. Additional details about my modeling strategy are included in the online appendix.

## Results

### Descriptive Results

Although the majority of students in my sample are third or later-generation, there is still a substantial minority of first-generation (8.77 %) and second-generation youth (9.84 %) (see Table 1). Additionally, my sample contains a fair amount of racial/ethnic diversity, with 44.09 % of all students identifying with minority racial or ethnic groups. Unsurprisingly, first- and second-generation youth are significantly more likely to report Hispanic and Asian ethnicities than the third- and later-generation students in my sample.

Compared with third- and later-generation youth, first- and second-generation adolescents are about twice as likely to have parents who did not complete high school. Additionally, first-generation immigrants are significantly more likely to be in advanced grade levels and live outside two-parent homes. Yet even though these characteristics are associated with increased participation in risky health behaviors (Barret and Turner 2005; King et al. 2018), first- and second-generation youth are significantly less likely to report past-year smoking and drunkenness, and first-generation immigrants report significantly lower average depression scores. Taken together, these findings complement prior work that has documented an immigrant paradox for the health behaviors of adolescents.

On average, 76.03 % of each student's friendships are with peers who share their generation status. To illustrate this tendency, a friendship network from school number 77 (i.e., Sunshine High School) is plotted in Fig. 1. On the left of the friendship network is a cluster of first-generation immigrants. Several small clusters of second-generation adolescents surround the upper-right of the graph, and many third- and later-generation students are situated in the lower-right of the network. Although immigrant generation homophily characterizes many of the adolescent friendships at Sunshine High School, Fig. 1 suggests that cross-generation friendships are also numerous. For example, note the cluster of adolescents near the center of the network who also report cross-generation friendships.

**Table 1** Descriptive statistics (full sample:  $n = 67,586$ )

Variables	All	First Generation	Second Generation	Third-Plus Generation
<b>Individual-Level Variables</b>				
Smoke in past year (%)	33.26	24.26*†	31.33*	35.03
Drunk in past year (%)	28.08	19.82*†	26.04*	29.70
Depression score	0.94 (0.84)	0.88*† (0.84)	0.96 (0.84)	0.95 (0.83)
Gender (girl)	50.39	48.47*†	51.47	51.81
<b>Race/Ethnicity (%)</b>				
White (non-Hispanic)	53.73	12.37*†	24.34*	65.10
Black (non-Hispanic)	15.89	4.40*	5.04*	17.61
Hispanic	15.11	49.16*†	41.66*	6.83
Asian (non-Hispanic)	4.87	25.80*†	18.21*	0.75
Other race (non-Hispanic)	8.22	6.95*†	9.41*	8.06
Missing	2.18	1.32	1.35	1.64
<b>Grade (%)</b>				
7th	14.83	9.80*†	14.12	14.55
8th	14.28	9.35*†	13.08*	14.57
9th	20.32	17.88*†	19.42*	20.92
10th	18.80	20.85*	20.05*	18.81
11th	16.42	20.82*†	17.32	16.40
12th	14.51	19.50*†	15.36*	14.27
Missing	0.85	1.79*†	0.65	0.48
<b>Parents' education (%)</b>				
Less than high school	7.45	14.88*	14.85*	6.02
High school graduate	26.26	15.02*†	21.44*	30.56
Some college	15.35	8.89*†	12.61*	17.92
At least a bachelor's degree	35.11	32.56*†	37.49	38.29
Missing	15.73	28.65*†	13.60*	7.22
<b>Mutual friends</b>				
	1.57 (1.72)	1.10*† (1.46)	1.46* (1.63)	1.72 (1.76)
<b>Isolates (%)</b>				
	37.45	49.65*†	39.33*	33.39
<b>GPA</b>				
	2.80 (0.81)	2.76*† (0.83)	2.83 (0.81)	2.83 (0.80)
<b>Delinquency</b>				
	1.52 (1.13)	1.42*† (1.16)	1.57* (1.12)	1.52 (1.12)
<b>Two-parent household (%)</b>				
	70.03	67.18*†	83.85*	74.66
<b>Immigrant generation (%)</b>				
First	8.77			
Second	9.84			
Third and higher	72.02			
Missing	9.37			

**Table 1** (continued)

Variables	All	First Generation	Second Generation	Third-Plus Generation
	Mean	SD	Min.	
School-Level Variables				
Number of students	631.64	(480.26)	25	
Proportion minority students	.43	(.30)	.07	
Public school (%)	81.31			
Urban (%)	18.69			
Proportion first generation	.06	(.09)	0	
Proportion second generation	.08	(.08)	0	
Proportion third-plus generation	.76	(.17)	.07	

*Note:* Standard deviations are presented in parentheses.

\*Statistically significant differences from third-plus-generation immigrant respondents according to a two-sample *t* test ( $p < .05$ )

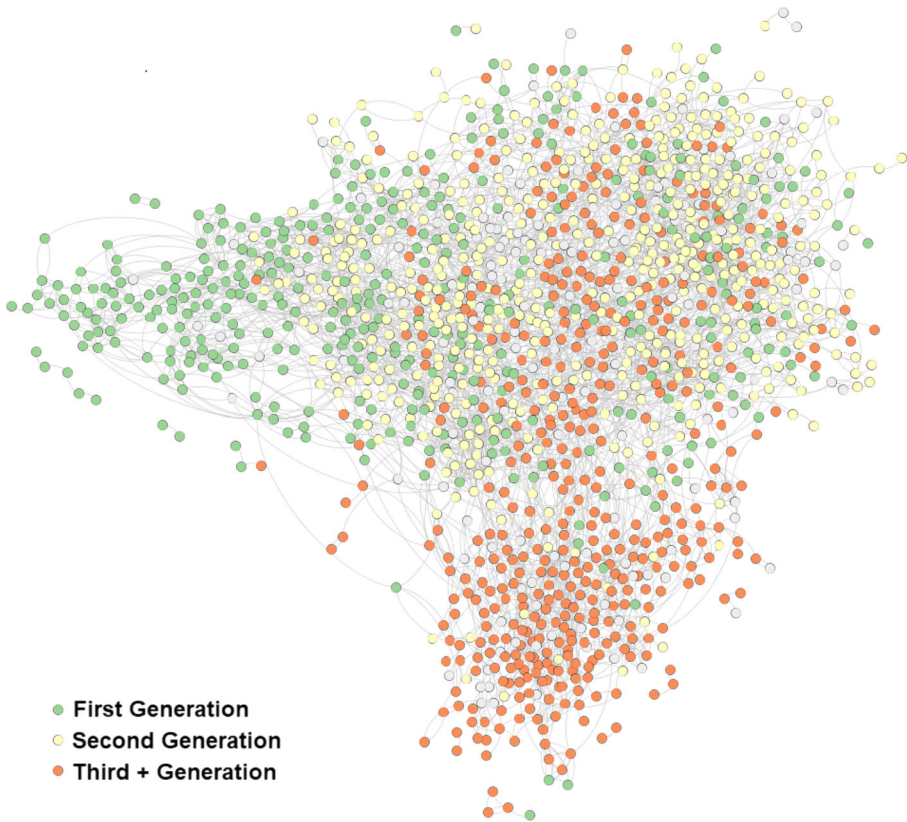
†Statistically significant differences from second-generation immigrant respondents according to a two-sample *t* test ( $p < .05$ )

## ERGMs

To investigate my descriptive findings further, I use ERGMs to statistically test for homophily on generation status. The first ERGM presented in Table 2 provides statistical evidence for my first hypothesis: immigrant generation homophily characterizes adolescent friendships even after other, well-established forms of homophily and structural factors are controlled for. The positive and significant parameter for immigrant generation homophily ( $b = 0.189, p < .001$ ) suggests that after all controls are accounted for, respondents are 1.21 times more likely to befriend peers who share their same immigrant generation status than those who do not. The controls I include in the model are also in the expected directions. The parameter for base log odds of friendship is negative and significant ( $b = -6.398, p < .001$ ), reflecting the fact that students tend to be friends with only a small proportion of their peers. Friendship skew is also negative ( $b = -1.544, p < .001$ ), highlighting the tendency for respondents to make fewer additional friendship ties as they report greater numbers of friends. Both transitivity controls are significant, with the positive closed triad parameter giving evidence for a tendency toward transitive friendships ( $b = 1.544, p < .001$ ). Finally, I find support for several other types of homophily, including homophily on race/ethnicity, gender, grade, and parents' education status, complementing patterns found in prior literature.<sup>10</sup>

To test whether first-generation immigrants have the strongest tendency to form friendships that are homophilous on immigrant generation (Hypothesis 2), I include a second model that tests for differential homophily on immigrant generation status. As expected, first-generation immigrants have a particularly strong tendency to report friends

<sup>10</sup> As mentioned previously, six schools in my sample were unable to produce adequate fit statistics and were thus excluded from the meta-analyses presented in Table 2. However, supplemental analyses suggest that homophily on immigrant generation status is also likely to characterize the excluded networks (analyses available upon request).



**Fig. 1** Friendship network at Sunshine High School by immigrant generation status. Circles represent students, and curved lines represent friendships. For the purpose of this illustration, both reciprocated and nonreciprocated friendships have been graphed.

who share the same immigrant generation status ( $b = 0.915, p < .001$ ). After all included controls are accounted for, a first-generation immigrant is 2.49 times more likely to form a friendship with another first-generation immigrant than they are to befriend a native-born peer. The tendency to report friends of the same immigrant generation is weaker for second-generation adolescents, but second-generation youth are still significantly more likely to report friends who also have immigrant parents ( $b = 0.652, p < .001$ ). Finally, I find evidence for immigrant generation homophily among third-plus-generation students, but this tendency is minimal ( $b = 0.198, p < .001$ ). Although homophily on immigrant generation status is most pronounced among first-generation students, it remains a significant predictor of friendship formation for all immigrant generations in my sample.

### MLMs

I next test whether friendship homophily on immigrant generation status is associated with smoking, drunkenness, and depression in the full in-school sample (Hypothesis 3). When respondents of all immigrant generations are considered, there are no significant associations between a respondent's proportion of same-generation friends and their



**Table 2** Meta-analysis of exponential random graph models ( $n = 101$  networks)

	Model 1		Model 2	
	Estimate	SE	Estimate	SE
Base Log Odds of Friendship	-6.398***	0.120	-6.428***	0.117
Same Immigrant Generation	0.189***	0.021		
Both first generation <sup>a</sup>			0.915***	0.088
Both second generation <sup>a</sup>			0.652***	0.053
Both third-plus generation			0.198***	0.021
Network Structure				
Friendship skew	-1.544***	0.042	-1.545***	0.041
Open triads	-0.315***	0.010	-0.313***	0.010
Closed triads	1.544***	0.042	1.545***	0.041
Homophily				
Same race/ethnicity	0.549***	0.044	0.555***	0.041
Same gender	0.767***	0.024	0.767***	0.023
Same grade	2.107***	0.061	2.105***	0.060
Same parent education	0.233***	0.015	0.239***	0.016

<sup>a</sup> For Model 2, ERGMs were unable to estimate coefficients for differential homophily for first- and second-generation immigrant youth in networks with low rates of students who ascribed to these categories. As a result, the meta-analysis averages the ERGM coefficients of these parameters for 43 and 59 networks, respectively. In separate meta-analyses, I average only networks with the same coefficients (e.g., networks where homophily coefficients could only be estimated for second and third-plus generation), and identical patterns are observed (analyses available upon request).

\*\*\* $p < .001$

odds of reporting negative health outcomes (see Model 1 in Tables 3, 4, and 5). The coefficient for the proportion of first-generation students, however, is negative and significant for all three behaviors. This finding suggests that students who attend schools with high proportions of foreign-born youth tend to report lower rates of smoking, drinking, and depression.

However, as shown in the second set of models, same-generation friendships are associated with unique benefits for foreign-born adolescents across all three health outcomes. After I control for all included variables, immigrant youth who report only friendships with other first-generation adolescents have 18.45 % lower odds of reporting past-year smoking ( $b = -0.204$ ,  $p < .05$ ) (Table 3, Model 2). Even though all first-generation immigrants have lower odds of smoking than their later-generation peers ( $b = -0.102$ ,  $p < .05$ ), reporting friendships with other first-generation adolescents is associated with even less risk of using cigarettes. First-generation immigrants who nominate only other immigrants as friends also have a 36.56 % lower odds of reporting past-year drunkenness ( $b = -0.455$ ,  $p < .001$ ) (Table 4, Model 2). Finally, same-generation friendships are significantly associated with lower depression scores for first-generation youth ( $b = -0.095$ ,  $p < .01$ ) (Table 5, Model 2). For example, a first-generation immigrant who befriends only fellow migrants is expected to report a depression score that is roughly 0.1 points lower than a first-generation migrant with

**Table 3** Logistic multilevel model predicting students' smoking ( $n = 67,586$ )

	Model 1		Model 2	
	Coef.	SE	Coef.	SE
Proportion of Same-Generation Friends	0.002	0.040	0.025	0.042
First Generation	-0.137**	0.043	-0.102*	0.046
First generation $\times$ Proportion same-generation friends			-0.204*	0.094
Second Generation	0.006	0.039	0.023	0.043
Second-generation $\times$ Proportion same-generation friends			-0.102	0.095
Number of Mutual Friends	0.040***	0.008	0.039***	0.008
Friendship Isolate	0.132**	0.038	0.134**	0.038
Grade	0.109***	0.008	0.109***	0.008
Girl	0.279***	0.019	0.279***	0.019
Parent's Education	-0.014	0.011	-0.014	0.011
Black	-0.924***	0.039	-0.924***	0.039
Hispanic	-0.169***	0.036	-0.165**	0.036
Asian	-0.411***	0.059	-0.398***	0.058
Other Race	-0.023	0.034	-0.023	0.034
GPA	-0.487***	0.014	-0.487***	0.015
Delinquency	0.870***	0.012	0.870***	0.012
Lives in Two-Parent Household	-0.154***	0.022	-0.154***	0.022
Number of Students <sup>a</sup>	0.007	0.008	0.007	0.008
Proportion of Minority Students	-0.014	0.135	-0.014	0.135
Public School	0.253**	0.101	0.253*	0.101
Urban	-0.074	0.092	-0.075	0.092
Proportion of First-Generation Immigrant Students	-1.256*	0.609	-1.223*	0.609
Proportion of Second-Generation Immigrant Students	-0.186	0.636	-0.174	0.637
Intercept	-1.795***	0.143	-1.808***	0.143
Variance, Level 1	0.108***		0.108***	

Notes: White is the omitted category for race/ethnicity. Third-plus generation is the omitted category for immigrant generation.

<sup>a</sup> Coefficients and standard errors have been multiplied by 100 to ease interpretation.

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

no foreign-born friends. The association between same-generation friendship and the three health behaviors is not statistically significant for second- and third-plus-generation respondents (see Fig. 2).<sup>11</sup>

<sup>11</sup> I estimate additional MLMs for each outcome variable that test for differences by race and ethnicity (analyses available by request) and find some evidence that immigrants of certain ethnicities benefit from immigrant generation homophily. Compared with white first-generation immigrants, Cuban and Filipino immigrants have even lower odds of smoking when they report larger proportions of same-generation friendships. No other interactions were statistically significant, which suggests that same-generation friendships are associated with healthy behaviors for first-generation youth from all racial/ethnic backgrounds in my sample.

**Table 4** Logistic multilevel model predicting students' drunkenness ( $n = 67,586$ )

	Model 1		Model 2	
	Coef.	SE	Coef.	SE
Proportion of Same-Generation Friends	-0.050	0.039	-0.009	0.040
First Generation	-0.250***	0.050	-0.173**	0.052
First generation $\times$ Proportion same-generation friends			-0.455***	0.105
Second Generation	-0.073	0.042	-0.051	0.044
Second generation $\times$ Proportion same-generation friends			-0.128	0.105
Number of Mutual Friends	0.080***	0.008	0.078***	0.008
Friendship Isolate	0.125**	0.039	0.128**	0.039
Grade	0.368***	0.009	0.368***	0.009
Girl	0.023	0.021	0.023	0.021
Parent's Education	-0.040***	0.012	-0.041**	0.012
Black	-0.632***	0.041	-0.631***	0.041
Hispanic	-0.023	0.038	-0.016	0.038
Asian	-0.775***	0.067	-0.748***	0.068
Other Race	0.037	0.038	0.037	0.038
GPA	-0.355***	0.015	-0.355***	0.015
Delinquency	0.989***	0.014	0.989***	0.014
Lives in a Two-Parent Household	-0.255***	0.024	-0.255***	0.024
Number of Students <sup>a</sup>	0.013	0.010	0.013	0.010
Proportion of Minority Students	-0.034	0.158	-0.034	0.158
Public School	0.187	0.119	0.185	0.119
Urban	-0.193	0.109	-0.194	0.109
Proportion of First-Generation Immigrant Students	-1.759*	0.720	-1.697*	0.720
Proportion of Second-Generation Immigrant Students	0.876	0.750	0.888	0.750
Intercept	-5.058***	0.166	-5.081***	0.166
Variance, Level 1	0.151		0.151***	

Notes: White is the omitted category for race/ethnicity. Third-plus generation is the omitted category for immigrant generation.

<sup>a</sup> Coefficients and standard errors have been multiplied by 100 to ease interpretation.

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

Even though same-generation friendships are significantly associated with better health outcomes for foreign-born youth, there remains a protective association of school contexts characterized by high proportions of peers who are first-generation immigrants. Students who attend schools with high proportions of first-generation students tend to report lower odds of smoking ( $b = -1.223$ ,  $p < .05$ ), reduced risks of getting drunk ( $b = -1.697$ ,  $p < .05$ ), and decreased depression scores ( $b = -0.338$ ,  $p < .001$ ). For instance, students who attend the school with the highest proportion of first-generation immigrants in my sample (58.6 % of the

**Table 5** Multilevel regression model predicting students' depression ( $n = 67,586$ )

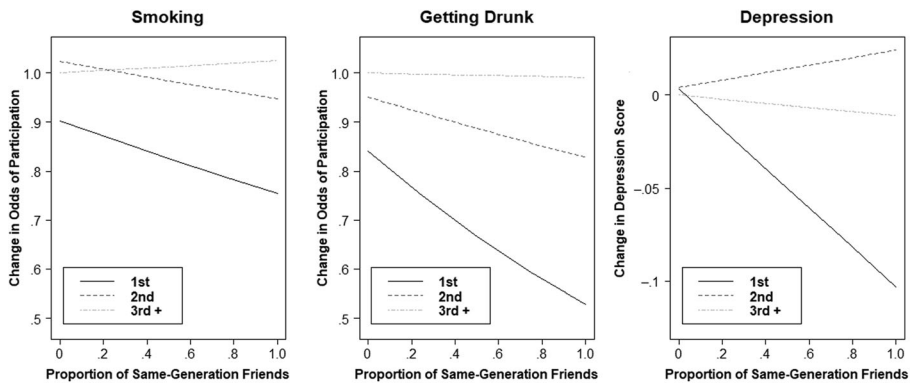
	Model 1		Model 2	
	Coef.	SE	Coef.	SE
Proportion of Same-Generation Friends	-0.017	0.012	-0.011	0.012
First Generation	-0.016	0.015	0.003	0.016
First generation $\times$ Proportion same-generation friends			-0.095**	0.027
Second Generation	0.008	0.018	0.004	0.015
Second generation $\times$ Proportion same-generation friends			0.031	0.032
Number of Mutual Friends	0.010***	0.003	0.009**	0.003
Friendship Isolate	0.022	0.012	0.021	0.012
Grade	0.042***	0.003	0.042***	0.003
Girl	0.595***	0.006	0.595***	0.006
Parent's Education	-0.006	0.004	-0.006	0.004
Black	-0.171***	0.011	-0.171***	0.011
Hispanic	-0.003	0.012	-0.003	0.013
Asian	0.008	0.018	0.013	0.018
Other Race	0.091***	0.012	0.091***	0.012
GPA	-0.057***	0.005	-0.057***	0.005
Delinquency	0.207***	0.004	0.206***	0.004
Lives in a Two-Parent Household	-0.059***	0.007	-0.059***	0.007
Number of Students <sup>a</sup>	0.002	0.002	0.002	0.002
Proportion of Minority Students	-0.084**	0.026	-0.085**	0.026
Public School	-0.002	0.019	-0.002	0.019
Urban	0.009	0.017	0.009	0.017
Proportion of First-Generation Immigrant Students	-0.357**	0.107	-0.338**	0.107
Proportion of Second-Generation Immigrant Students	0.236*	0.116	0.229	0.116
Intercept	0.166***	0.036	0.164***	0.036
Variance Components				
Intercept	0.003***		0.003***	
Level 1	0.571***		0.571***	

Notes: White is the omitted category for race/ethnicity. Third-plus generation is the omitted category for immigrant generation.

<sup>a</sup> Coefficients and standard errors have been multiplied by 100 to ease interpretation.

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

student body) have 51.16 % lower odds of smoking and 63.01 % lower odds of getting drunk, and are expected to report average depression scores that are 0.23 points lower. These associations hold irrespective of the immigrant generation status of an individual or the individual's friends. Overall, these findings suggest that same-generation friendships are likely to explain some, but not all, of the protection migrant youth receive from living and attending school in areas with high densities of first-generation immigrants.



**Fig. 2** Change in individual odds of reporting smoking, change in odds of getting drunk, and change in depression score by proportion of same-generation friends and immigrant generation. The experiences of second-generation immigrants are not statistically significantly different from the experiences of third-plus generation respondents (see Tables 3, 4, and 5).

## Sensitivity Analyses

In sensitivity analyses, I first test whether same-generation friendships are positively associated with a broader range of health behaviors for foreign-born adolescents. I use a subsample of respondents who participated in the in-home survey during Wave I of Add Health, which decreases my sample size by roughly 80 % but allows me to consider a wider variety of health-related outcomes and behaviors. Overall, I find that for first-generation adolescents, same-generation friendships are significantly associated with some additional indicators of health and well-being but not others (see Table 6). After I control for all included variables, a first-generation respondent who reports only same-generation friends has 57.22 % lower odds of reporting previous marijuana usage ( $b = -0.849, p < .01$ ); 65.90 % lower odds of using other illegal substances ( $b = -1.076, p < .05$ ); and 242.47 % greater odds of reporting excellent, very good, or good self-rated health ( $b = 1.231, p < .05$ ). The protective association of same-generation friendships is not significant but is in the expected direction for immigrant respondents' rates of obesity ( $b = -0.081, p = .754$ ) and participation in at least five bouts of moderate to vigorous physical activity per week ( $b = 0.090, p = .587$ ).

Similar to the primary analysis, all my sensitivity analyses include school-level controls for the proportion of the student body that is foreign-born. As a result, the positive associations between same-generation friendships, abstinence from substance use, and high measures of self-rated health exist beyond this contextual attribute. The school-level indicator for the proportion of the student body that is foreign-born is significant only in the marijuana model ( $b = -2.144, p < .01$ ). Regardless of their immigrant generation and friendship patterns, students who attend schools with large proportions of peers who are first-generation immigrants are less likely to report having ever used marijuana.

Additionally, I use a subsample of students who participated in the second wave of Add Health to test whether there are effects of adolescents' Time 1 friendship composition on their Time 2 health outcomes (see the online appendix, Table A3). Overall, I find limited support that adolescent immigrants who report same-generation friendships

**Table 6** Logistic multilevel regression models for Wave I in-home subsample ( $n = 12,869$ )

	Marijuana	Other Illicit Drugs	Self-rated Health	Obesity	Exercise
Proportion of Same-Generation Friends	-0.038 (0.071)	-0.098 (0.093)	-0.057 (0.127)	0.044 (0.083)	-0.069 (0.062)
First Generation	-0.672*** (0.117)	-0.567** (0.043)	-0.207 (0.203)	-0.431** (0.140)	-0.168 (0.093)
First generation $\times$ Proportion same-generation friends	-0.849** (0.272)	-1.076* (0.508)	1.231* (0.530)	-0.081 (0.260)	0.090 (0.165)
Second Generation	-0.312** (0.102)	-0.302* (0.150)	-0.030 (0.175)	-0.046 (0.140)	-0.053 (0.089)
Second generation $\times$ Proportion same-generation friends	0.043 (0.182)	-0.089 (0.282)	-0.543 (0.290)	-0.058 (0.212)	0.014 (0.161)
Proportion of First-Generation Immigrant Students	-2.144* (0.946)	-0.835 (1.072)	-0.281 (0.701)	-0.156 (0.658)	0.443 (0.557)
Proportion of Second-Generation Immigrant Students	3.547** (1.077)	3.261* (1.327)	1.550 (1.070)	0.250 (0.781)	1.259 (0.675)
Variance, Level 1	0.204***	0.214***	0.119*	0.068***	0.056***

*Notes:* Coefficients are presented, and standard errors are given in parentheses. All models include individual-level controls for grade level, gender, parents' education, race/ethnicity, GPA, delinquency, family structure, and measures of mutual friendship nominations. All models also include school-level controls for number of students, proportion of racial minorities, public schools, and urban environments. To account for missing data across all schools at the individual level, I use multiple imputation (using chained equations) to estimate 10 imputed data sets.

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

at Time 1 have better health outcomes in the following year. For the first-generation immigrants in my sample, reporting same-generation friends at Time 1 is significantly associated only with lower odds of reporting having ever smoked at Time 2 ( $b = -0.881, p < .01$ ). Additionally, the proportion of first-generation students in the Time 1 student body is significantly related to greater odds of reporting five or more bouts of exercise at Time 2 ( $b = 1.165, p < .05$ ). However, it is important to note that, because of data limitations, these models are unable to consider whether friendships remained intact and school compositions remained constant between the two waves of data.

## Discussion

From analyzing more than 100 schools included in the Add Health data set, this study aims to further our understanding of the social integration of adolescent immigrants by rigorously testing for homophily on immigrant generation. Adolescents do not randomly form friendships. Instead, a variety of different preferences, opportunities, and barriers guide the development of these relationships, which often results in the creation of homophilous friendships (Goodreau et al. 2009; McPherson et al. 2001; Schaefer

et al. 2011b). The current study highlights a surprisingly understudied form of homophily—homophily on immigrant generation status—and relates this process to the social integration of immigrant youth.

In addition to selecting friendships that are homophilous on a variety of demographic factors, adolescents are more likely to befriend peers of the same immigrant generation. Although the current study finds evidence for this homophily among first-, second-, and third-plus-generation adolescents, immigrant generation homophily is particularly strong among foreign-born youth. This pattern suggests that immigrant generation status is a stark social boundary for adolescent immigrants that plays an important role in structuring their friendship choices. Foreign-born adolescents are significantly more likely to befriend fellow immigrants, and this tendency exists even after I control for a variety of structural and dyadic-level factors. Most notably, immigrant generation homophily exists above and beyond racial and ethnic homophily, and for first-generation adolescents, the tendency to form friendships with other immigrants is even greater than that toward racial/ethnic homogamy. Such a finding is particularly noteworthy given that prior research has often highlighted the strength of racial homophily compared with homophily on other demographic characteristics (McPherson et al. 2001; Moody 2001).

Individual preferences and structural constraints likely explain why I observe particularly high amounts of same-generation friendships among first-generation immigrants. For instance, adolescents who are immigrants may be excluded from friendships with later-generation peers because of language barriers or discrimination (Gordon 1964; Tsai 2006). Immigrant generation status often operates as a social boundary wherein first-generation immigrants are more likely to be perceived as different by their later-generation peers (Alba and Nee 2009). Accordingly, native-born adolescents may have an inherent interest to avoid forming friendships that cross nativity boundaries. First-generation immigrant youth would then be left with few friendship options outside those with fellow immigrants, resulting in particularly homophilous groups of foreign-born friends.

The abundance of same-generation friendships may also be the result of personal preferences among first-generation immigrant youth. Compared with later-generation adolescents, first-generation immigrants could hold stronger personal preferences for friendships with same-generation peers. For instance, immigrant youth may particularly value friendships with peers who share similar migration and assimilation experiences or who speak their same native language (Jiménez 2008). This preference would likely attenuate among later-generation adolescents because their immigrant generation status is less salient to their individual identity (Alba and Nee 2009).

Finally, foreign-born youth may report more same-generation friends because of explicit structural boundaries, such as academic tracking and course-taking patterns, which often result in the formation of homophilous friendships (Frank et al. 2013; Lee and Zhou 2015). Adolescents may be encouraged to take different classes based on their immigrant generation status, particularly if they are first-generation immigrants. For instance, first-generation immigrants are more likely to be placed in English for Speakers of Other Languages (ESOL) classes than their native-born peers (Tsai 2006). When classrooms are highly segregated by immigrant generation, it shapes students' opportunities to form friendships because individuals are more likely to befriend peers with whom they frequently interact. The analyses of the current study are unable to



parse out whether patterns of exclusion, personal preferences, or institutionally created boundaries cause the observed homophily (Goodreau et al. 2009). However, I suspect that all three factors play a role in explaining why we observe more same-generation friendships among the first-generation immigrants in my sample.

Additionally, I find evidence that for foreign-born youth, homophily on immigrant generation is positively associated with six of eight indicators of health and well-being. In the full in-school sample, first-generation immigrants are less likely to smoke, have lower odds of getting drunk, and report lower depression scores when they nominate greater proportions of foreign-born friends. In the in-home subsample, these homophilous friendships are associated with lower rates of using marijuana and other illicit drugs, as well as with higher self-rated health. However, friendships with fellow migrants are not significantly associated with lower rates of obesity or inactivity for first-generation immigrants.

Homophily on immigrant generation may be beneficial to first-generation adolescents for certain health outcomes, but not others, because of the unique resources provided by these friendships. Pairs of friends who are both first-generation immigrants may have parents who hold similar cultural values, and the dyad may speak the same native language—factors that would likely reinforce their adherence to cultural success frames (Lee and Zhou 2015; Portes and Zhou 1993). Because success frames primarily focus on academic achievement and socioeconomic mobility (Lee and Zhou 2015), it is unsurprising that the reinforcement provided by same-generation friends to immigrant youth supports some healthy behaviors more than others. For instance, adolescent substance use is associated with greater risks of high school dropout (Townsend et al. 2007) and can jeopardize adolescents' odds of college acceptance, due in part to the risk of developing a criminal record (Custer 2016). However, evidence for an association between physical activity and academic success has been mixed (Coe et al. 2006; Tremblay et al. 2000). In fact, many schools have cut physical education classes as an effort to increase the academic performance of their students (Coe et al. 2006).

It is important to note that when I uncover positive associations between same-generation friendships and healthy behavior, this relationship exists even after I control for measures of school context, including the proportion of the student body that is foreign-born. Previous work has argued that migrant youth who settle in communities or attend schools with high proportions of foreign-born peers tend to report positive indicators of health and well-being (Gieling et al. 2010; Lee and Liechty 2015). For first-generation youth, maintaining friendships with same-generation peers is one mechanism that could provide such support given that these relationships are associated with lower risks of reporting certain risky health behaviors.

Interestingly, for four of the eight health behaviors considered, the control for proportion of first-generation immigrant students remains positive and significant after I include individual-level network measures. On the one hand, this result suggests that direct friendships with first-generation peers only partially explain the protective association of living or attending school in dense migrant enclaves. Additional features of these communities, such as unique services or extracurricular activities, should further elucidate why these environments are associated with certain health benefits. On the other hand, the positive relationship between the proportion of foreign-born students and certain health behaviors characterizes the experiences of all students in my sample, regardless of their immigrant generation status or friendship choices. In other

words, foreign- and native-born students are expected to experience certain health benefits if they attend schools with higher proportions of first-generation peers. Even when friendships are highly segregated by immigrant generation, results of prior research suggest that these environments should have a positive impact on adolescent health outcomes. For instance, previous work has found that adolescent smoking, drinking, and depression are highly susceptible to influence from friends (e.g., McMillan et al. 2018; Osgood et al. 2015; Schaefer et al. 2011a). In school networks with large proportions of foreign-born students, clusters of friends who are first-generation immigrants are likely to help impede the diffusion of these behaviors through the broader network, including to those students with whom they have no direct ties.

In additional sensitivity analyses, I test whether having greater proportions of same-generation friends at Time 1 decreased foreign-born adolescents' participation in risky health behaviors a year later at Time 2. I find that reporting same-generation friendships at Time 1 significantly reduced the Time 2 smoking behaviors of immigrant youth. This trend is noteworthy because previous work has argued that immigrants' lower smoking rates account for a substantial portion of their mortality advantage over native-born peers (Blue and Felon 2011). However, Time 1 same-generation friendships were not significantly related to the other Time 2 health outcomes of interest.

Several factors could explain why I find strong evidence for an association between same-generation friendships and health outcomes at Time 1 but few significant relationships between Time 1 friendships and Time 2 outcomes. First, similar to the contemporaneous Time 1 findings, the proportion of same-generation friends reported by an adolescent immigrant at Time 2 is likely associated with multiple healthy Time 2 outcomes. However, given that global friendship data are available only at the first wave for most of the schools in my sample, I am unable to test this hypothesis. Second, although friend influence may remain long-lasting for immigrants' smoking behaviors, foreign-born youth who initially report positive indicators of other health-related behaviors may be more likely to select same-generation friends, or influence could be more contemporaneous. Detailed longitudinal data on friendship stability are necessary to examine such complex processes. Third, previous work has found that the majority of adolescent friendships last for no longer than one year (Faris and Felmlee 2018). Given that behavior homogeneity and relationship stability are positively correlated (Hafen et al. 2011; McPherson et al. 2001), I highly suspect that adolescent immigrants who took up risky health behaviors between the two time points were more likely to leave behind previous friendships with first-generation immigrants and develop ties to native-born youth. In sum, the current project makes clear that for foreign-born adolescents, having friendships with first-generation immigrants is significantly associated with a variety of better health outcomes, a relationship that likely derives from both peer influence and friend selection.

The current study has additional limitations that should be addressed. First, because of the data collection strategy, I was able to consider only within-school friendships. Although some adolescents in my sample reported out-of-school friends, the Add Health survey did not collect any data on these individuals. However, this limitation is unlikely to have substantively biased my findings. Other settings where adolescents form friendships, such as their home neighborhoods and extracurricular activities, also tend to be segregated by immigrant generation (Kimbrow 2009; Lee and Zhou 2015). Out-of-school friendships should be particularly homogenous for first-generation

youth, given previous work that highlighted the durability of ties between migrants and friends who remain in origin countries (Verdery et al. 2018). Additionally, the primary analysis of the current study relies on the in-school Add Health data, which did not ask immigrant respondents to report their age when they migrated to the United States. Future research should consider whether patterns of homophily on immigrant generation change as adolescent immigrants spend more time in the host country.

Despite these limitations, the current study makes important contributions to research on the structures of adolescents' social networks, as well as the literature on immigrants' health behaviors. I find convincing evidence that homophily on immigrant generation status guides the formation of adolescents' friendships. This tendency is particularly strong for first-generation youth, suggesting that many immigrant adolescents are segregated from the networks of the native-born, which may preclude their social integration. Furthermore, same-generation friendships appear to have certain protective associations for foreign-born youth and, because I find a significant tendency for friendships to be homophilous by immigrant generation, this relationship should help account for the existence of an immigrant health paradox. The current study highlights the importance for schools and coethnic communities to continue offering classes and extracurricular activities that specifically cater to first-generation youth. Because institutional structures often shape the formation of friendships (Felmlee et al. 2018; Frank et al. 2013), such programs may help facilitate the development of same-generation social ties and further promote immigrant health. By considering how first-generation youth are embedded in their friendship networks, as well as the consequences of these positions, we can better understand the mechanisms that shape the behaviors and outcomes of adolescent immigrants.

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