

Our Friends Keep Us Together: The Stability of Adolescents' Cross-Race Friendships

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Abstract

Substantive racial integration depends on both access to cross-race friendship opportunities (*demographic integration*) and the development of stable and rewarding social relations (*social integration*). Yet, we know little about the relative stability of cross-race friendship nominations over time. Cross-race friendships are also experienced within social contexts, where other individual, dyadic, and contextual factors may simultaneously affect whether such ties persist. Based on longitudinal network data on over 2,000 students in multiple communities, we test whether cross-race friendships are more or less stable than same-race friendships. We find that cross-race friendships at first glance appear less likely to persist than same-race friendships, but cross-race ties become no less stable than same-race ties after accounting for other social factors, including reciprocity and shared friends. This pattern suggests a threshold process where strong, socially recognized ties embedded among peers face less threat to maintaining friendship stability.

Introduction

There is a growing consensus that true racial integration requires more than merely putting people of different categories together (Moody 2001; Smith, Maas, and van Tubergen 2014): true integration requires interacting as equals. For youth, this means forming and maintaining social relations. Social scientists, school administrators, and the public are interested in understanding the features that shape friendship formation across race, since research shows that substantive social contact reduces prejudice, increases cohesion, and fosters acceptance of differences (Allport 1954; Pettigrew and Tropp 2008; Tropp and Pettigrew 2005). In turn, peer acceptance gives students a sense of participation in school, belonging, and greater access to social resources (Lubbers 2003). Peers provide companionship and behavioral examples that increase motivation

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and school success (Wigfield, Eccles, and Rodriguez 1998) and lower risks of dropout (Hymel et al. 1996; Rumberger and Lim 2008).

To reap these positive benefits of social integration, however, students must develop stable friendships (Poulin and Chan 2010). The benefits of relational integration are likely less effective if cross-race relations are particularly unstable. High levels of churn specific to cross-race relations may induce a sense of distance from those in other racial groups, reinforcing negative perceptions. While prior work has examined factors shaping cross-sectional cross-race friendship prevalence, with the exception of either short-duration studies based on the Add Health data (Rude and Herda 2010) or small local samples (Aboud, Mendelson, and Purdy 2003; Hallinan and Williams 1987; Lee, Howes, and Chamberlain 2007; McDonald et al. 2013), data constraints have made it difficult to assess relational stability over longer spans of adolescence.

Moreover, in addition to whether a friendship spans racial categories, socially salient factors at multiple levels, from individual demographics to school composition, likely affect tie stability. Examining cross-race relations without considering social factors at the individual, dyadic, relational, and contextual levels of the school peer environment may overattribute any observed differences in stability to being a cross-race friendship. Situating the examination of cross-race ties within the broader social ecology of peers and schools can better specify the role of race in shaping relational stability.

Using unique long-term longitudinal network data, we examine the stability of cross-race friendships in detail. We control for factors that may shape the stability of interracial friendship, such as socioeconomic status (SES), peer relational embeddedness, and school context, as well as dynamic features related to duration, development, and changes in school settings. Despite some narrowness in scope (e.g., mostly majority white school communities in two US states), the data here provide a rare opportunity to observe structural networks of cross-race and same-race friendships over an extended period of time, as needed for this research question. These data also provide an important examination of the social networks of rural, racial minority youth in predominantly white settings. Our results suggest that while adolescent friendship turnover is particularly high for cross-race nominations, relational embeddedness matters: continued tie duration is self-reinforcing, and relational stability is amplified by a rich social context with shared friends and reciprocity. In using longitudinal structural network data, this study can look beyond cross-sectional prevalence or distributions of cross-race ties to advance research on adolescent peer dynamics, race, and social relationships.

Empirical and Theoretical Background

Previous Work on Race and Friendship

Most existing work on the stability of cross-race friendship comes primarily from small-scale studies with short time scales, mostly finding greater instability for cross-race compared to same-race friendships. Hallinan and Williams' (1987) classic study of 455 students from ten communities in North Carolina within one year found that students' best cross-race friendships are almost as stable as same-race friendships, moderated by characteristics such as SES. Aboud et al. (2003) find that among 240 elementary school students' mutual friendships over six months, cross-race ties are less stable than same-race ties. Lee and co-authors (2007) also find that cross-race friendships are less stable among fifth-grade children in a multiage grouping setting at a university lab school, despite having the same socioemotional qualities as same-race ties. Similarly, Schneider and co-authors (2007) find that cross-race ties are less stable among seventh-grade students in Toronto and Montreal.

Yet, research increasingly notes the importance of considering how other social factors, including individual characteristics, other dimensions of dyadic similarity, and features of the broader social setting, shape the impact of racial similarity on tie stability (Jugert et al. 2013). For example, Rude and Herda (2010) analyzed a small subsample of same-sex ties limited to one nomination per person from the AddHealth data, finding that interracial friendships are less stable after

controlling for contextual and dyadic characteristics, arguing that dyadic similarity (aside from race) weakly predicts stability, whereas measures of relational closeness and reciprocity strongly dampen the effect of racial difference on stability. Jugert et al. (2013) found that cross-ethnic ties among German and Turkish fifth graders are less stable, while McDonald et al. (2007) found that the racial similarity of best friends did not significantly predict stability after accounting for behavioral similarity, such as aggression homophily. Hartl et al. (2015) similarly found that racial homophily did not predict friendship dissolution, although dissimilarity on gender, peer acceptance, aggression, and school competence did.

Overall, existing research on cross-race tie stability suggests that cross-race ties may be less stable than same-race ties, but that this pattern is more of an open question after accounting for additional contextual factors and dimensions of similarity (Graham and Echols 2018). We know of no study that has examined network nomination stability in settings where students have extended and repeated opportunities to interact. The data used here, while not nationally representative, enable looking beyond the prevalence, distributions, and correlates of cross-race friendships over several years to provide one of the most comprehensive examinations to date of the social ecology of cross-race friendship nomination stability.

Dyadic Factors

In general, the driving features shaping friendship stability are likely similar to those that drive friendship prevalence, including homophily, which governs the initial attractiveness of potential friends. Homophily, or the propensity of similar people to be friends, is a well-known factor driving friendships (Hallinan and Tuma 1978; Hallinan and Williams 1987; McPherson et al. 2001), and race is among the strongest homophily dimensions measured in social relations in general (Louch 2000; McPherson et al. 2001). As such, research on friendships has found that interracial friendships are unlikely even in a desegregated school environment (DuBois and Hirsch 1990; Hallinan and Teixeira 1987; Quillian and Campbell 2003). Moody (2001) finds that adolescents' odds of forming a same-race friendship are about 1.8 times those of forming a cross-race friendship, though contextual and organizational factors strongly moderate this relationship. In general, cross-race friendships are less likely even when measures of interracial contact opportunity are taken into account (Joyner and Kao 2000; Smith, Maas, and van Tubergen 2014; Mouw and Entwistle 2006).

In addition to this attractiveness of a potential friend, friendship maintenance takes time and effort, with lower associated costs and greater benefits when friendships are among similar individuals (Block and Grund 2014; Leszczensky and Pink 2015). Same-race friends often spend more time together and have more intimate and close relationships (Aboud, Mendelson, and Purdy 2003), which is imperative for relationship maintenance.

Moreover, homophily applies to more than just race and likely includes similarity in other salient characteristics. Same-gender friendships are much more prevalent than cross-gender friendships (Aboud, Mendelson, and Purdy 2003; Lee et al. 2007). Although cross-gender friendships increase as youth age (Connolly, Furman, and Konarski 2000; Feiring 1999; Pellegrini 1994; Poulin and Pedersen 2007; Hallinan and Tuma 1978), limited dynamic information suggests that cross-gender ties are unstable (Tuma and Hallinan 1979). Differences in academic performance also affect friendship stability. Friendship with successful students can serve as a status signal, but differences in academic performance may strain maintaining such relations. Indeed, students with similar academic performance are more likely to form friendships with each other (DeLay et al. 2016; Dokuka, Valeeva, and Yudkevich 2015; Flashman 2012; Lomi et al. 2011), while dissimilarity on school competence predicts friendship dissolution (Hartl, Laursen, and Cillessen 2015). Similarly, high SES signals high status, making friendships spanning SES differences unstable. Earlier research found that the bigger the difference in students' SES, the less likely they are to become friends (Rude and Herda 2010). Understanding how race shapes tie stability thus requires considering other relevant characteristics that structure adolescent friendships or can spuriously lead to racial homophily, such as SES homophily (Moody 2001).

Contextual Factors

Beyond dyadic homophily, social settings have profound effects on interaction opportunity and climate, which shape the milieu in which friendships are embedded. From simple arithmetic, increases in intergroup contact should be greater for numerically smaller groups within a setting; as the relative size of groups equalizes, opportunities for cross-race interaction increase. Accordingly, students belonging to numerical racial minority groups always have more cross-race tie opportunities than students in the numerical majority group (Blau 1977; Rytina and Morgan 1982).

While the gross distribution of such categories is likely exogenous, the social salience of groups is determined by their distribution in the peer network. The more universally an attribute is shared within a setting, the less likely it will become an important basis of sorting (Feld 1981; Frank et al. 2008; McFarland et al. 2014). Moody (2001) demonstrates the combined effect of these processes, finding a curvilinear association between racial heterogeneity and cross-race tie preference. Friendship segregation is highest when racial-ethnic groups are generally balanced, with interracial friendship more likely at either much lower or higher levels of racial heterogeneity (Moody 2001). In this way, the overall racial heterogeneity of the setting may shape the stability of cross-race tie.

Moreover, relations may become less stable as attractive alternatives become more easily available (Levinger 1976). External factors may modify the level of given racial heterogeneity when friends change social contexts together, such as potentially attractive new friends becoming more available after merging from middle school to high school. Homophilous selection then becomes easier and the original friendship dyad becomes less stable, with the transition to high school creating a particularly vulnerable time for cross-race friendships (Poulin and Chan 2010).

Relational Embeddedness

Beyond dyadic and contextual factors, friendship stability depends on how social relations unfold within a wider friendship network. Structural network processes drive social relations: people want to be friends with those who like them and who like their other friends, so the general relational embeddedness of a friendship dyad likely affects stability. For this reason, it is important to separate the preference for making or maintaining same-race friends from endogenous structural processes.

Reciprocity may be the most well-known basic relational trait, and actors generally expect and seek out close reciprocal relations (Blau 1964; Emerson 1976; Rusbult and Buunk 1993). Prior dynamic work suggests that people are unlikely to maintain long-standing non-reciprocated relations (Gould 2002; Hallinan and Teixeira 1987). In the exchange tradition, friendship is an investment, and people seek returns for the time and emotional energy invested in a relationship.

While reciprocity captures specific interpersonal exchange features, relations are also embedded in a larger circle of common friends and acquaintances. Patterns of triadic closure (Davis 1963; Heider 1946) and structural balance (Cartwright and Harary 1956; Heider 1958)—that friends of friends should be friends—have been well supported in prior work (Block and Grund 2014; Leszczensky and Pink 2015; Moody 2001; Smith, Maas, and van Tubergen 2014). In general, these relational embeddedness features provide social reinforcement and public acknowledgment, and thus a public identity, for the relation. As such, we expect that greater reciprocity and sharing more friends will promote friendship stability.

Such processes can also lead to outcomes similar to those of homophily (over-representation of same-race friendship dyads), though empirical studies that consider factors of embeddedness still show friendship segregation between different racial groups (Block and Grund 2014; Smith, Maas, and van Tubergen 2014; Leszczensky and Pink 2015; Jugert, Leszczensky, and Pink 2018). In this way, failing to account for relational embeddedness through processes like reciprocity or shared friends can lead to overestimating the extent to which race contributes to any differences in friendship stability.

Current Study

Based on these considerations, we hypothesize that *students are less likely to maintain cross-race friendship ties than same-race friendship ties* when controlling for other relevant dyadic, contextual, and relational factors that shape friendship stability. Despite extensive theoretical work justifying these expectations, opportunities to test these relations have been limited empirically. To do so requires a long sequence of dynamic relations where students experience opportunities for friendships across varying contexts, with measurement of sociometric (whole) networks to enable examining relational embeddedness. As there is no national sample of adolescent relations with sufficient dynamics to test this hypothesis¹, we turn to a unique sample that, while not without limitations (i.e., from rural, predominantly white communities in two US states), provides unprecedented longitudinal detail and structural network measurement to enable analyzing our core hypothesis.

Data and Measurements

Data

Our data come from the PROSPER (**P**romoting **S**chool-Community-University **P**artnerships to **E**nhance **R**esilience) Peers project. The wider PROSPER project was a randomized controlled trial focused on testing interventions connecting community, school, and university resources toward strengthening adolescent resistance to drug use. The intervention conditions and outcomes are beyond the purview of this study, which uses survey data with friendship networks through PROSPER Peers, a subset of the wider PROSPER project. Analyses (available upon request) that examine school treatment/control assignment indicate that treatment condition did not predict friendship retention or affect patterns described in the final models here, as is the case for most prior studies using the PROSPER friendship network data (e.g., Copeland et al. 2019). Further details about the intervention and survey design are available in prior work (Spath et al. 2004, 2011, 2013).

The study was fielded in twenty-eight rural/semi-rural school districts in Pennsylvania and Iowa. To be eligible to be randomly selected into the study, school districts had to have total enrollments ranging from 1,300 to 5,200 students and at least 15% free or reduced-price lunch eligibility. We follow students from two cohorts for five waves starting in the fall of sixth grade. Among the 12,245 first-wave respondents, 90% completed three waves, 85% completed four waves, and 71% completed all five waves. As the project samples all current students, new students enter the sample at each wave. On average in the five-wave sample, 50% of the students were female, 35% were eligible for free/reduced-price school lunch, and 80% were White (Spath et al. 2013).

Prior work indicates that while the PROSPER data are not nationally representative, the friendship network processes observed in PROSPER are consistent with those observed in other datasets (Gallupe et al. 2019). The PROSPER school districts are also typical of rural school districts in the United States, with the exception that the PROSPER sample tends to have slightly more students per school and is slightly under-representative of Black youth (Jacobsen et al., 2022). We correct for the latter by setting a minimum threshold for school district racial diversity in our analytic sample, as discussed below.

We make several sample restrictions to enable reliable estimates. First, of the 17,305 total respondents in the five waves, 13,866 have at least two consecutive waves of data collection, which is further reduced to 10,126 individuals with valid race/ethnicity data who self-identified as White, Hispanic, or Black² (the proportion of students who identified differently was very small (6.4%) and not evenly distributed across settings, making estimation unstable). Of this subsample, we further restrict to those with valid network and survey data, yielding 8,552 students. To allow for cross-race tie opportunity, we selected only school districts where the proportion of the non-white population was at least 15% in every wave and where the proportion of missing data on race

was less than 20%, yielding 2,539 students. Finally, we further restrict our sample for observations with valid data on being eligible for free/reduced-price lunch in school because it serves as the key control variable for SES (and the only measure of SES in this survey). The resultant analytic sample is 2,190 students in ten school communities (four of which were in the treatment condition of the larger PROSPER intervention). Among them, 48% were male, 37% were free lunch eligible, 72% were White, 19% were Hispanic, and 9% were Black.

We follow other work using the PROSPER peer network data (e.g., Osgood et al. 2015; Ragan et al. 2022) in using the in-grade friendship networks of these students measured with an open name generator, here examining the two cohorts across five waves. Students were asked to name friends by answering the question “Who are your best and closest friends in your grade?” where two names were allowed for best friends and five names for other close friends, combined here for up to seven friendship nominations, following prior work in this dataset (Copeland et al. 2019; Osgood et al. 2015; Ragan et al. 2022). In cases where measurement of friendship retention was impossible because one member of the dyad left the sample at time t , the dyad was removed from the analysis at time $t-1$. This restriction means that any observed differences are not due to differential rates in moving or leaving a school setting. Consequently, a friendship dyad is included in the analysis once if it was not retained between two consecutive waves, twice if it was retained between two consecutive waves, and up to maximum four times if it was retained between each wave.

Measurements

The dependent variable of the analysis is a binary measure of *friendship retention* between two consecutive waves (1 = friendship dyad existing at t already existed at $t-1$, 0 otherwise) to compare retained versus dissolved ties, meaning that new friendships are not included in the reference category or analyses.

The primary independent variable assesses the racial composition of the dyad, measured in two ways. First, we classified *different race* friendship dyads as a binary variable that takes the value 1 when both ego and alter belong to different racial groups. Second, to determine if there is heterogeneity in the effects across racial groups, we decomposed the same-race and different-race friendship dyads into all possible dyadic combinations, modeled as binary predictors.

We used wave indicators to control for the *time period* in which the friendship retention was measured (Ref: wave 1–2 transition). We measured *duration* as the number of time periods the friendship existed before the given observation to control for the likelihood of long-lasting friendships to continue to persist. Since our age range spans the transition from elementary school to high school, we construct a *merge* measure that takes the value of 1 if the pair merged with other schools to account for the contextual change in the educational environment.

Same gender is a binary variable (1 = ego and alter are both male or both female), and grade point average (GPA) *difference* measures the difference between ego’s and alter’s average GPA score, indicating academic grades in school. Our indicator of socioeconomic status (SES) is eligibility for free or reduced-price school lunch. About 71% of the dyads are *same SES* (1 = ego and alter are both either eligible or ineligible for free lunch).

We account for social embeddedness with measures capturing friendship network structure. *Outdegree* controls for ego’s tendency to be active in making friends. *Mutual friendship* indicates whether ego is also nominated by alter to differentiate a one-sided effort to make friends with alter (51.5% of the dyads), from a stronger mutual friendship (48.49%). Finally, the *number of shared friends* that ego and alter have in common (either sent or received friendship ties) accounts for the added effect of having more socially embedded relationships.

We calculated the *racial heterogeneity* with the Blau index in the setting in every wave to control for the racial composition of the peer environment. The index captures the probability that two randomly chosen students are of different race/ethnicities.

We also examined the effects of two-parent family structure and age, but these measures had little differential effect on friendship stability and no effect on primary association with race, so

Table 1. Dyad- and Ego-Level Summary Statistics for PROSPER Analytic Sample

	Mean or proportion	SD	Min.	Max.
Dyad level				
Different race	.21	—	0	1
Duration	.27	.66	0	3
Merge	.63	—	0	1
Same gender	.90	—	0	1
GPA difference	.62	.69	0	4
Same SES	.71	—	0	1
Racial heterogeneity	.37	.09	.21	.50
Outdegree	4.75	1.83	0	7
Mutual friendship	.48	—	0	1
N of shared friends	2.64	2.23	0	17
Observations	18,868			
Individual (Ego) level				
Male	.48			
SES	.36			
Race				
White	.73			
Hispanic	.19			
Black	.09			
Individuals	2,190			

Note: SES = socioeconomic status.

we have excluded those considerations from these tables (models with these controls available upon request). Summary statistics are presented in [table 1](#).

Methods and Models

As the dependent variable is binary and observations are clustered within communities, we estimated a series of hierarchical logistic regression models that adjust for clustering within school districts. We created two sets of models. The first set of basic models ([table 4](#)) compares cross-race to same-race friendship nominations, pooling across race. Second, we disaggregated the model by specific ego/alter race categories ([table 5](#)), allowing us to examine differences in friendship stability associated with a particular dyadic combination of racial categories. In both sets, we distinguish the race of the sender to disentangle sender-specific effects from dyadic effects. We present average marginal effects that indicate the average change in the probability of friendship retention for a unit change in a given predictor, providing interpretable estimates that avoid common pitfalls of interpreting logistic regressions ([Breen et al. 2018](#); tables showing log odds and standard errors are available upon request).

The hierarchical logistic model used here more directly approaches the research question than dedicated dynamic network models (Temporal Exponential Random Graph Models, panel ERGMs, or Stochastic Actor-Oriented Models (SAOMs)). Moreover, the core analysis question in our models turns on the racial homophily coefficients, which, in the ERGM language, are dyad-independent parameters estimated with the pseudolikelihood (i.e., logit ML) method, suggesting no advantage to using this more complicated and less robust modeling strategy, although results using a pseudolikelihood TERGM are shown in the Supplemental Material. Other factors of interest, such as the impact of transitivity on cross-race versus same-race tie stability, are also not currently supported by ERGM methods. In cases where competing dynamics are at issue (“selection vs. influence”) we agree that SAOMs are advantageous (and have used these models

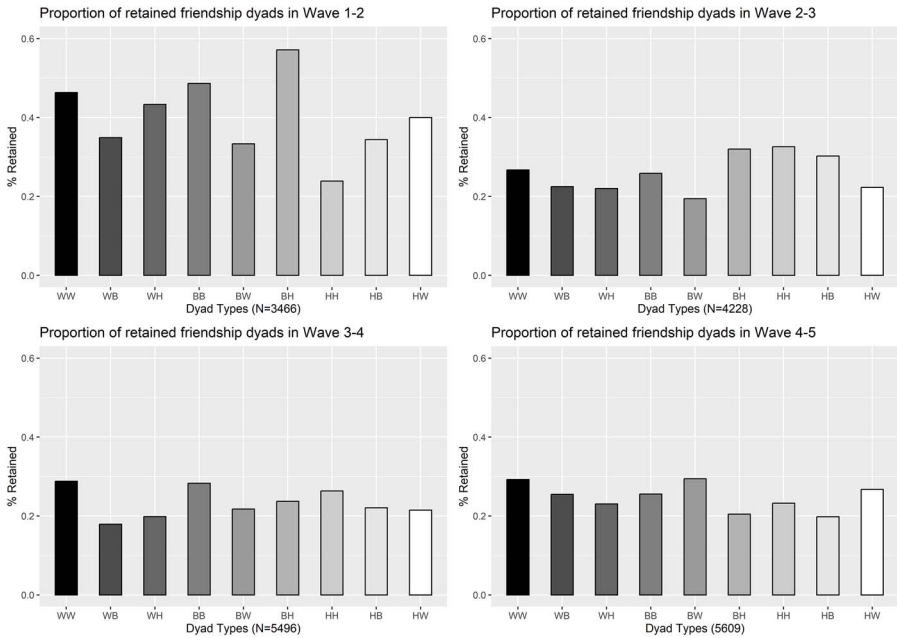


Figure 1. Proportion of retained friendship dyads between each consecutive wave by dyad racial composition.

when appropriate), but doing so here would substantially change the modeling, interpretation, and presentation of the research question at hand. The current approach is also empirically grounded, as recent evidence suggests that such models provide comparable performance to a well-specific regression model (Ragan et al. 2022), indicating that an SAOM or ERGM is not always more accurate than a theoretically-grounded regression model.

For each set of models, after establishing a baseline in Model 1, Model 2 includes duration and merging, both variables unique to the dynamic nature of the data. Model 3 captures dyadic similarity on gender, GPA, and SES, and Model 4 adjusts for school racial heterogeneity. Model 5 introduces outdegree, reciprocity, and number of shared friends to adjust for friendship quality and social embeddedness.

Results

Descriptive Analysis

Given the rarity of longitudinal sociometric network data across multiple settings, we first describe patterns of dropped and retained ties over time. Figure 1 illustrates the proportion of retained friendship dyads between each consecutive wave stratified by dyadic racial composition and the total number of friendship ties in each time period. While the number of friendship nominations increased over time (3,466, 4,228, 5,496, and 5,609 in each time period), friendship retention seems to be increasingly unlikely over time both among same- and cross-race dyads. Nonetheless, there are differences in friendship retention based on the racial composition of the dyad. These differences are less obvious in the first time period and became more prominent as friendship gets more racially homophilous over time. An example is the decrease in the retention of White-Hispanic and Hispanic-White dyads between the first and second time period (both from slightly over 40% to slightly over 20%), which comes with an increase in the retention of Hispanic-Hispanic dyads (roughly 20–30%).

Table 2. Descriptive Cross-tables of Two Friendship Types (Dropped/Retained, Same-race/Cross-race) and the Categorical Explanatory Variables, by Column and Row Percentage

	Friendship types (column %)				Friendship types (row %)			
	Dropped	Retained	Same-race	Cross-race	Dropped	Retained	Same-race	Cross-race
Race: different	22.7%	18.7%	-	-	74.0%	26.0%	-	-
Ego race: White	77.1%	80.8%	87.6%	43.8%	69.1%	30.9%	88.0%	12.0%
Ego race: Hispanic	16.8%	13.9%	10.1%	37.1%	73.9%	26.1%	50.0%	50.0%
Ego race: Black	6.1%	5.4%	2.2%	19.2%	72.7%	27.3%	29.8%	70.2%
Wave 1–2	15.0%	26.5%	18.1%	19.5%	56.9%	43.1%	77.3%	22.8%
Wave 2–3	23.7%	19.6%	22.1%	23.8%	73.9%	26.1%	77.2%	22.8%
Wave 3–4	30.5%	26.2%	29.3%	29.1%	73.2%	26.8%	78.6%	21.4%
Wave 4–5	30.8%	27.7%	30.5%	27.5%	72.3%	27.7%	80.2%	19.8%
Merge	62.5%	62.1%	65.4%	51.4%	70.2%	29.8%	82.3%	17.7%
Same gender	88.4%	94.1%	90.4%	89.1%	68.7%	31.3%	79.2%	20.8%
Same SES	68.7%	75.0%	74.8%	55.1%	68.2%	31.8%	83.2%	16.8%
Reciprocated friendship	38.7%	71.5%	50.1%	42.7%	55.9%	44.1%	81.1%	18.9%

Note: The reference categories of binary variables are not shown. SES = socioeconomic status.

This tendency for racial homophily is not unanimous however, as it is paired with preference towards majority students: dyads including white alters became increasingly more likely to be retained over time. According to our descriptive findings, in the fourth time period, White-White (29%), Hispanic-White (27%), and Black-White (29%) dyads seemed to be the most stable. This pattern could be interpreted as greater preference or numerical availability of majority racial group peers, as white students receive nearly equal rates of nominations from white, Hispanic, and Black peers. Furthermore, it follows that the tendency for homophily seems to be stronger in the earlier stages among those in minority racial groups (Hispanic and Black students), and it decreases in time as these youth start cultivating cross-race friendships (predominantly with white students).

Tables 2 and 3 present the categorical and continuous explanatory variables of the basic model, cross-tabulated by dropped and retained friendship types, as well as cross-race and same-race friendship types. Table 2 shows that cross-race friendship dyads were more common (22.7%) in dropped friendship nominations than retained (18.7%) and that 74% of cross-race ties were dropped. A large majority of both dropped and retained friendships involved a white ego (77.1 and 80.8%) due to the racial composition of the sample. Consequently, it is not surprising that the majority of same- and cross-race friendships were initiated by a white ego (87.6% and 43.8%). The vast majority of white egos, however, nominated white alters (88%), whereas Hispanic egos chose friends in a more heterogenous way (50%), and the majority of Black egos nominated cross-race alters (70.2%).

The time period measure tells us that friendship ties become increasingly more fragile (15% dissolve between waves 1 and 2, then 23.7% between 2 and 3, 30.5% between 3 and 4, and, finally, 30.8% between waves 4 and 5). At the same time, ties also become more homogenous over time, as the proportion of same-race dyads increased from 18.1% to 30.5%. The merge variable indicates that roughly 62% of dropped and retained friendships experienced a change in the organization of the educational environment, with 70.2% of the friendships that went through a merge dropped and only 29.8% retained. This evidence suggests that friendships become more fragile as adolescents access new pools of potential friends.

With regard to the demographic variables, we observed strong homophily on gender in both retained and dropped friendship dyads (table 2), though gender homophily was stronger in

Table 3. Descriptive Cross-tables of Two Friendship Types (Dropped/Retained, Same-Race/Cross-Race) and the Mean Value of the Continuous Explanatory Variables

Mean values	Friendship types			
	Dropped	Retained	Same-race	Cross-race
Duration	0.06	0.77	0.29	0.22
GPA difference	0.65	0.54	0.61	0.66
Racial heterogeneity	0.37	0.38	0.37	0.38
Outdegree	4.5	5.34	4.77	4.67
N of shared friends	2.28	3.49	2.76	2.2

SES = socioeconomic status.

retained friendship dyads (94.1%) than in dropped ones (88.4%). Finally, in [table 2](#), similarity in SES supports friendship retention, as 75% of retained friendship dyads matched on SES, while only 68.7% matched for dropped ties. Regarding the racial composition of friendships, gender homophily was found to be similarly strong in same- and cross-race dyads. More interestingly, while 74.8% of same-race friendships were same-SES ties, only 55.1% of cross-race friendships were same-SES ties. The average difference in GPA between ego and alter ([table 3](#)) is about 0.65 for dropped friendships and 0.54 for retained, suggesting that peers with more similar GPAs are more likely to remain friends. Furthermore, the GPA difference was 0.61 among same-race friends and 0.66 among cross-race friends, suggesting that cross-race friendships may bridge a wider gap in socioeconomic background and school performance.

For the relational embeddedness variables, unexpectedly, 55.9% of the reciprocated friendships were dropped and only 44.1% were retained ([table 2](#)). Retained ties averaged about 3.49 shared friends compared to 2.28 for dropped ties ([table 3](#)). [Table 3](#) also indicates that students with stable friendship relations had more outgoing ties in general, with an average outdegree of 5.34 compared to 4.5 for students in dropped friendship relations. Finally, looking at differences in relational embeddedness by race ([table 3](#)), same-race friendships had somewhat more outgoing ties (4.77 versus 4.67) and more shared friends (2.76 versus 2.2) than cross-race friendships. Same-race friendships were also more likely to be reciprocated than cross-race ones (50.1% and 42.7% reciprocation, respectively), and 81.1% of the reciprocated friendships were same-race friendship ties ([table 2](#)).

Regression analysis

We assess relational stability by modeling consistency in nomination from wave t-1 to wave t with logistic regression. The unit of analysis in these models is the dyad, and the dependent variable equals 1 if ego nominates alter at both t-1 and t and equals 0 if ego nominates alter at t-1 but not at t. Models include random intercepts for the school district that adjust for clustering within different community contexts.

[Table 4](#) presents average marginal effects in models considering cross-race dyads. The baseline model, Model 1, suggests that compared to a same-race friendship, a cross-race friendship is roughly 5% less likely to be retained over time, and nominations from Hispanic teens are roughly 3% less likely to persist. Adolescent relations are generally unstable, as indicated by the consistently negative effects across each specific wave change and the negative intercept in models showing log odds (available upon request).

While most relations are unstable, the duration of prior relations has a strong positive effect, shown in Model 2. Duration indicates that ties are about 35% more likely to be retained if nominated in a prior year, compared to newly nominated friends. The negative effect of merging settings suggests that school changes have a negative effect on friendship stability³. In Model 2, differences by ego's race are no longer significant, suggesting that friendship nominations by Hispanic teens are just as likely to be retained when the tie duration and changes in

Table 4. Average Marginal Effects on Friendship Retention of Dyad/Ego Characteristics in PROSPER

	Model 1 AME [CI]	Model 2 AME [CI]	Model 3 AME [CI]	Model 4 AME [CI]	Model 5 AME [CI]
Different race	-0.049*** [-0.066, -0.032]	-0.029*** [-0.043, -0.014]	-0.024** [-0.039, -0.008]	-0.022** [-0.038, -0.007]	-0.011 [-0.027, 0.004]
Ego's race: Hispanic	-0.027** [-0.047, -0.008]	-0.009 [-0.026, 0.007]	-0.006 [-0.023, 0.012]	-0.008 [-0.025, 0.009]	-0.006 [-0.023, 0.011]
Ego's race: Black	-0.007 [-0.037, 0.024]	0.001 [-0.024, 0.027]	0.005 [-0.022, 0.032]	0.004 [-0.022, 0.031]	-0.002 [-0.028, 0.024]
Time period					
Wave 2-3	-0.174*** [-0.196, -0.153]	-0.182*** [-0.202, -0.162]	-0.180*** [-0.201, -0.159]	-0.183*** [-0.208, -0.157]	-0.201*** [-0.224, -0.177]
Wave 3-4	-0.165*** [-0.185, -0.144]	-0.185*** [-0.204, -0.165]	-0.184*** [-0.204, -0.164]	-0.192*** [-0.218, -0.167]	-0.214*** [-0.238, -0.190]
Wave 4-5	-0.156*** [-0.176, -0.135]	-0.158*** [-0.178, -0.138]	-0.159*** [-0.179, -0.138]	-0.170*** [-0.195, -0.145]	-0.206*** [-0.230, -0.182]
Duration		0.350*** [0.331, 0.369]	0.344*** [0.325, 0.364]	0.341*** [0.305, 0.378]	0.279*** [0.252, 0.305]
Merge		-0.051** [-0.084, -0.018]	-0.057*** [-0.091, -0.022]	-0.067*** [-0.102, -0.033]	-0.075*** [-0.110, -0.040]
Same gender			0.044*** [0.026, 0.063]	0.045*** [0.026, 0.064]	0.015 [-0.005, 0.035]
GPA difference			-0.016*** [-0.025, -0.008]	-0.015*** [-0.024, -0.007]	-0.006 [-0.014, 0.003]
Same SES			0.027*** [0.014, 0.039]	0.027*** [0.014, 0.040]	0.018** [0.005, 0.030]
Racial heterogeneity				0.505*** [0.326, 0.685]	0.339*** [0.179, 0.499]
Outdegree					0.027*** [0.023, 0.031]
Mutual friendship					0.108*** [0.092, 0.124]
N of shared friends					0.010*** [0.007, 0.013]
Observations	18,868	18,868	17,872	17,872	17,872

Note: SES = socioeconomic status. **, *p < .01. ***p < .001.

Table 5. Average Marginal Effects of Friendship Retention on Disaggregated Dyad/Ego Characteristics in PROSPER

	Model 1 AME [CI]	Model 2 AME [CI]	Model 3 AME [CI]	Model 4 AME [CI]	Model 5 AME [CI]
White-Hispanic	-0.063*** [-0.088, -0.037]	-0.031** [-0.054, -0.009]	-0.025* [-0.049, -0.001]	-0.024+ [-0.048, 0.0001]	-0.018 [-0.042, 0.006]
White-Black	-0.074*** [-0.106, -0.042]	-0.041** [-0.069, -0.013]	-0.03* [-0.066, -0.007]	-0.035* [-0.065, -0.006]	-0.021 [-0.050, 0.009]
Hispanic-White	-0.053*** [-0.078, -0.029]	-0.033** [0.054, -0.012]	-0.027* [-0.050, -0.005]	-0.027* [0.004, 0.002]	-0.010 [-0.033, 0.013]
Hispanic-Black	-0.076** [-0.127, -0.024]	-0.017 [-0.063, 0.029]	0.004 [-0.046, 0.055]	0.002 [-0.048, 0.052]	0.010 [-0.039, 0.060]
Hispanic-Hispanic	-0.050*** [-0.074, -0.025]	-0.018+ [-0.039, 0.003]	-0.015 [-0.037, 0.007]	-0.018 [-0.040, 0.004]	-0.020+ [-0.041, 0.001]
Black-White	-0.062** [-0.097, -0.026]	-0.028+ [-0.058, 0.003]	-0.027 [-0.059, 0.006]	-0.025 [-0.057, 0.007]	-0.024 [-0.055, 0.008]
Black-Hispanic	-0.026 [-0.083, 0.031]	-0.025 [-0.073, 0.023]	-0.009 [-0.061, 0.043]	-0.011 [-0.063, 0.041]	-0.012 [-0.063, 0.039]
Black-Black	-0.019 [-0.067, 0.029]	-0.001 [-0.043, 0.040]	0.011 [-0.033, 0.055]	0.009 [-0.034, 0.053]	0.013 [-0.030, 0.057]
Time period					
Wave 2-3	-0.175*** [-0.196, -0.153]	-0.182*** [-0.202, -0.162]	-0.180*** [-0.201, -0.160]	-0.183*** [-0.208, -0.158]	-0.201*** [-0.225, -0.178]
Wave 3-4	-0.164*** [-0.185, -0.144]	-0.185*** [-0.204, -0.165]	-0.185*** [-0.204, -0.165]	-0.193*** [-0.218, -0.167]	-0.214*** [-0.238, -0.190]
Wave 4-5	-0.155*** [-0.176, -0.134]	-0.158*** [-0.178, -0.138]	-0.159*** [-0.179, -0.138]	-0.170*** [-0.195, -0.146]	-0.206*** [-0.230, -0.182]
Duration	0.350*** [0.331, 0.369]	0.350*** [0.325, 0.369]	0.344*** [0.325, 0.363]	0.341*** [0.305, 0.378]	0.279*** [0.253, 0.305]
Merge	-0.050** [-0.083, -0.017]	-0.050** [-0.089, -0.021]	-0.055** [-0.089, -0.021]	-0.066*** [-0.101, -0.032]	-0.073*** [-0.109, -0.038]
Same gender					
GPA difference					
Same SES					
Racial heterogeneity					
Outdegree					
Mutual friendship					
N of shared friends					
Observations	18,868	18,868	17,872	17,872	17,872

Note: SES = socioeconomic status. +p < .10. *p < .05. **p < .01. ***p < .001.

the organizational context are taken into consideration. The effect size of a cross-race dyad is also reduced in this model, but still significant, predicting about 3% lower probability of retention.

Model 3 indicates that homophily on factors other than race significantly predicts retention. All three factors added here show that homophily contributes to tie maintenance, with being the same gender and SES predicting increased likelihood of friendship retention, while the difference in GPA predicts decreased retention. In Model 4, racial heterogeneity has a strong positive effect on friendship stability, suggesting that increased racial heterogeneity at the school level (within the range observed in these data) makes friendships more likely to be retained.

Finally, Model 5 adds the structural network variables representing relational embeddedness. Outdegree predicts about a 3% increase in the probability of retention, indicating that those who are more active in making nominations are more likely to make stable ties. Relations that are reciprocated or that share many common friends are more likely to be stable than non-embedded nominations. Mutual friendships are about 11% more likely to persist, while each shared friend increases the probability of retention about 1%. In Model 5, different race no longer significantly predicts retention, suggesting that once structural network features are considered, cross-race dyads are no less likely to be retained than same-race ties (visualized in figures of AME provided in the supplemental appendix).

Similar to Rytina and Morgan (1982), we disaggregate racial/ethnic similarity to look at alter and ego race/ethnicity in each dyad in table 4. In Model 1, results mirror those in table 4. For example, Hispanic-Black dyads are the least stable, with roughly 8% lower probability of retention, followed by White-Black ties (at about 7%), then White-Hispanic and Black-White ties (about 6%), and Hispanic-White and Hispanic-Hispanic ties (about 5%). Note that uncertainty around many estimates is high, and some estimates may be statistically underpowered due to small sample size (e.g., Black-Hispanic and Black-Black dyads).

In Model 2, with the addition of duration and merge variables, White-Hispanic, White-Black, and Hispanic-White ties remain significantly less likely to be retained. As in table 4, adding these measures reduces the effect size for most racial-dyad groups. After adding homophily terms for gender, GPA, and SES in Model 3 and racial heterogeneity in Model 4, only White-Black and Hispanic-White ties remain significantly less likely to be retained.

Interestingly, in Model 5, dyadic racial differences in stability do not persist, with no group significantly differing in the probability of retention (as Hispanic-Hispanic dyads are only marginally significant). As in table 4, greater relational embeddedness within the peer social environment positively predicts tie retention. White-Black and Hispanic-White ties, which remain significantly less likely to be retained after accounting for duration, changes to the organizational setting, and homophily on other major characteristics (Model 4), are no less likely to be retained once relational embeddedness is accounted for (also shown in figures in the Supplemental Appendix). This pattern suggests that once these diverse ties cross the threshold to mutual recognition and integration within the wider friendship community, there is no statistical difference between cross-race and same-race ties. That is, while structurally weak ties—those that are asymmetric or not reinforced by a wider shared friendship circle—are affected by dyadic racial composition, strong ties embedded within a peer group are less affected.

As a further test, we conducted ancillary analyses (available upon request) with interaction terms between every dyad type and the relational variables. While these interactions were largely non-significant, interaction effects of Hispanic-White ties with outdegree and with shared friends were significant and positive. This pattern suggests that social activity and reinforcement by mutual friends may be particularly important in the retention of friendship ties from Hispanic to White youth. Additional models that cluster dyads within egos (results available upon request) also did not change the pattern of results shown here.

Discussion

The primary motivation of our work originates from the promise of integrated education. Even though school communities are often seen as the ideal environment in which to foster integration through cross-race relations (Allport 1954; Pettigrew et al. 2007; Pettigrew and Tropp 2008), such benefits may be hindered if these relationships fail. Insufficient attention has been paid to the stability over time of cross-race friendships embedded within the school peer social ecology. This study specifically focused on the stability of cross-race friendships among students, net of multiple levels of factors, within a longitudinal framework. The use of unique data enabled comparing the stability of cross-race friendships to same-race friendships over years using structural network data, with a five-wave subsample of the PROSPER data containing 2,190 students from ten school communities with 18,868 friendship nominations.

Results at first show that cross-race friendships are less likely to be maintained over time relative to same-race friendships, similar to prior research (Jugert et al. 2013; Rude and Herda 2010; Schneider et al., 2007). Cross-race friendships may be less able to provide enduring social benefits associated with peer relations in adolescence, questioning the promise of co-presence for true racial integration, as enduring ties between teens from different racial backgrounds seem to face substantial barriers. Moreover, the significant role of duration suggests that cross-race tie instability can compound over time: to the extent that same-race ties are more stable and likely to persist across grade and school transitions, this persistence itself further solidifies relationships that in turn increase tie stability, which, to the extent that stable ties confer greater long-term benefits, increases advantages of same-race friendships compared to cross-race ties.

However, differences in cross-race friendship are not significant after accounting for relational embeddedness factors. This result suggests that cross-race friendships can be just as stable as same-race friendships over time when they are reinforced with social connections. This finding aligns with prior work that finds no racial difference in stability after accounting for other characteristics (McDonald et al. 2013) but extends this pattern to relational, not just behavioral, factors. Structurally strong friendships that are reinforced by mutuality and shared friends or sent by socially active teens may last longer than ties that lack similar social embeddedness. The effects of relational measures such as outdegree and shared friends can also compound with successive nominations. These results suggest a threshold model, where cross-race ties that are strong (indicated by mutuality), and socially reinforced by a broader peer group (indicated by shared friends) are no less likely to be retained than same-race ties. Cross-race ties may not be inherently more fragile, but rather may be more likely to be less socially embedded within peer friendship circles, which in turn confers fragility compared to more accepted, durable same-race ties. Notably, such patterns would not be visible when examining separate dyads or ego networks, as sociometric data enable assessing the wider shared context of ties.

This positive effect of activity and shared friends may be especially critical for Hispanic-White friendships. Ancillary results suggest that Hispanic students are more likely to maintain their friendships with white peers when they are socially active youth and when ties are reinforced by shared friends, even if the friendship is not mutual. We did not find evidence for symmetry in these effects (of white students who nominated Hispanic peers) nor similar tendencies in other dyads.

Additional factors might make fragile relationships more stable. Homophily on gender, GPA, and SES predicts greater stability. For these homophily effects, the magnitude of GPA is slightly smaller, SES is comparable, and gender is slightly larger, compared to the effect of a dyad being cross-race in general, although these factors have smaller effects than many dyadic groups in disaggregated models. Similar to the effects of racial homophily, GPA and gender homophily are no longer significant after accounting for relational embeddedness, while the effects of SES homophily persist. Together, these results suggest that racial homophily is one of several salient factors, each contributing modestly to friendship retention, but that can combine to make homophily a powerful factor shaping stability. These findings indicate the importance

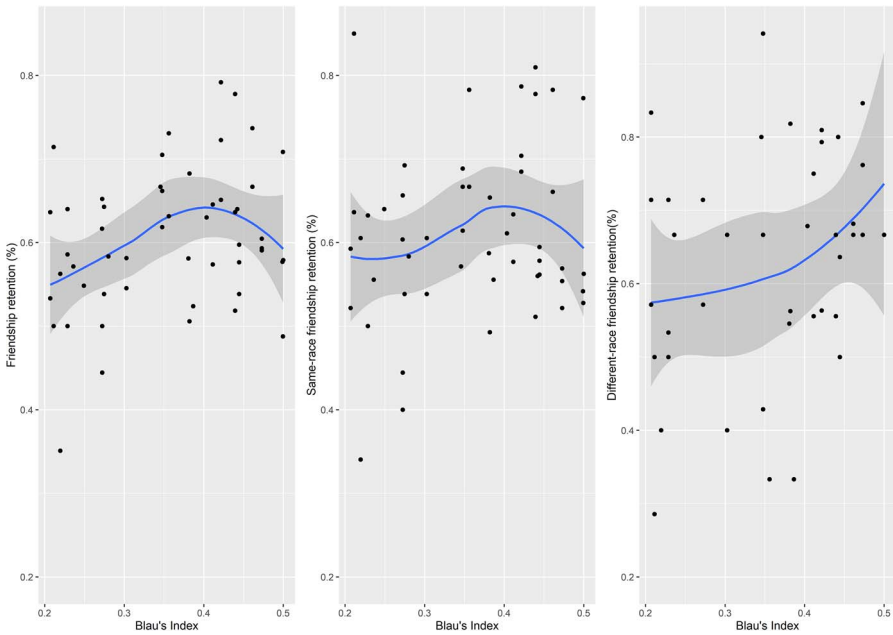


Figure 2. Racial heterogeneity and the likelihood of friendship retention for all dyads (left), same-race dyads (middle), and cross-race dyads (right).

of considering homophily on these characteristics when teasing apart the specific associations between tie stability and race.

Racial heterogeneity in the overall setting also relates positively to friendship retention, with a fairly substantial effect compared to that of a dyad itself being cross-race. However, further consideration of this pattern indicates that overall racial heterogeneity operates somewhat differently for same-race and cross-race dyads. The likelihood of a stable same-race friendship increases when racial heterogeneity is between ~ 0.25 and ~ 0.4 , but there is a reverse effect outside this range (0.2–0.25; 0.4–0.5, shown in figure 2). On the other hand, racial heterogeneity seems to have a linear positive effect on the stability of cross-race friendships, at least over the range observed in this study. This pattern suggests that same-race ties are most stable when the racial heterogeneity in the school setting is at a low-moderate level, but lower and higher heterogeneity threaten stability, while for cross-race ties, greater heterogeneity only improves stability. Such trends may represent cross-race ties facing greater obstacles to stability in predominantly white settings, consistent with expectations of structural racism in cultural white school contexts (Stanton-Salazar, 1997). Results here extend these patterns to cross-race friendship retention specifically and also suggest that the availability of non-white friends may prove a key ingredient in lasting racially diverse friendships among adolescents.

Results indicate the importance of considering cross-race ties embedded within social contexts at the individual, dyadic, and relational levels. Socially salient dyadic factors (e.g., gender and SES), factors within the school setting, such as overall racial heterogeneity, as well as relational factors indicating a wider social embeddedness of ties, all predict stability. After accounting for these multilevel factors, cross-race ties are no longer significantly less stable than same-race ties. The wider social context of friendships and identities, beyond simply whether ties are same- or cross-race, shapes tie stability, and results suggest that failing to account for these factors may overestimate the extent to which dyadic racial similarity affects stability.

Results speak to broader sociological questions of how race/ethnicity and the structure of social life shape social relations. Cross-race contact alone may not be enough to facilitate meaningful integration, but once cross-race ties are socially embedded in the larger web of peer friendships, belonging to a different racial/ethnic group from a friend confers no specific risk to tie stability over time, suggesting that broader norms about social acceptability or interconnections across race in the wider peer setting may be a key ingredient to the long-held promise of contact theories. Results also speak to which factors predict advantages or challenges in maintaining the crucial developmental resource of peer connections in adolescence. For example, racial minority youth with cross-race friendships that are not relationally embedded among peers in predominantly white schools may face additional obstacles to reaping the psychosocial benefits of adolescent friendships. Future research should examine the mechanisms and processes that contribute to relational embeddedness in ways that may foster persistent cross-race ties.

Results here can also speak to classic sociological in/out group social identity explanations. An internal social identity explanation suggests that the predominance of a large, privileged-status white out-group might lead Hispanic or Black students to devalue ties with other racial minority students (Tajfel 1974; Turner 1975), if members of the lower-status group internalize wider social evaluations of oppression (Gregor and McPherson 1966; Milner 1975; Tajfel and Turner 1979) to dissociate themselves from their in-group in favor of the privileged out-group. Descriptive results at first suggest support for this theory, as rates of Hispanic and Black teens' nominations to white teens increase over time. However, models show that these ties are generally less stable unless they meet a threshold of wider social recognition, at odds with this classic internalized evaluation explanation. This explanation is also implausible given that results are consistent in ancillary models that include additional controls for school climate (available upon request), although we have no measure of status perceptions of in/out-group preference to examine directly. Instead, results here are more consistent with structural relational explanations: while white peers may be more numerically available as friends in these predominantly white settings, cross-race ties face barriers to stability that can be overcome by strong friendships that persist over time and are supported by others.

Contact theory requires four conditions under which intergroup relations are more likely to develop: groups have an equal status, a shared goal, intergroup cooperation, and support of authorities (Allport 1954; Pettigrew 1998). This study is limited by the lack of information specific to these conditions, suggesting caution when judging the theoretical predictions from these results. Other studies have found that attachment to school, extracurricular activities, diverse teacher populations, and supportive class climates can promote the development of interracial friendships (Epstein 1983; Hallinan and Teixeira 1987; McFarland et al. 2014; Moody 2001; Schofield 1979). Results here extend this work by suggesting that administrators and teachers may benefit from promoting contexts that support the relational embeddedness of cross-race ties in the peer environment. Fostering greater social embeddedness of cross-race ties may also help to mitigate social barriers to stable friendships faced by Hispanic and Black youth in predominantly White, rural contexts, who may face additional risk for racism and social exclusion. Future work should extend research here to uncover mechanisms for maintaining durable, beneficial peer ties for rural Hispanic and Black adolescents.

While our data are the best currently available for a study of this kind, the regional sample poses a limitation, and relations in more racially diverse settings might differ. Analyses required dropping the most racially homogeneous white settings in the dataset, which may exclude Hispanic and Black youth who face the greatest risks of exclusion in overwhelmingly white contexts. In this dataset, measures of race/ethnicity at each wave were revised to match prior waves, making them time-invariant. However, racial identification can vary, and changing identification likely affects and is affected by peer relations, but such questions cannot be examined here. Future work with relational data on wider samples should examine these outcomes in more settings, consider changes in identification, and extend work here to consider processes related to friendship selection and influence using longitudinal network methods.

Another limitation is that the only available measure of SES is the dichotomous measure of eligibility for free/reduced-price school lunch. If differences in more detailed aspects of social class are differentially correlated with race and friendship retention, then results here may overestimate the effects of dyadic racial diversity on tie stability. However, results suggest that such differences are not salient once relational embeddedness is considered, even if such differences are attributable to an unobserved combination of SES and race. Future work with more granular measures of SES should examine these questions.

Furthermore, our sample includes only available peers, as dyads where individuals leave the school setting at subsequent time points are excluded. Differential rates of out-of-grade friendships or school mobility by race cannot be examined here. Such differences would imply that current results are conservative if Hispanic and Black populations experience greater school mobility that jeopardizes tie stability. Future work should consider the role of wider friendship environments and school mobility in the patterns described here.

Despite these limitations, results here advance existing literature on adolescent friendship dynamics, contextual influences on tie stability, and race and social ties by examining factors that suppress or support sustained cross-race relations. Analyses examine racial/ethnic minority youth in predominantly white, rural school settings, who may face the greatest risks for structural racism and exclusion, supporting the role of sociology in risks for historically marginalized groups. In particular, findings highlight the importance of dyadic, organizational, and relational contexts for the persistence of cross-race relations, while speaking to the multi-layered social factors that shape social relations in adolescence overall.

Endnotes

1. Most national work on adolescent relational dynamics uses Add Health, a study with which we are highly familiar. Longitudinal data in Add Health are limited to one mainly white suburban school; one large, racially diverse urban school; and 14 small schools with low racial diversity. The sample used here includes repeated opportunities for interaction over a longer period across several school contexts for a better test of theorized processes.
2. While “Hispanic” represents ethnicity, we use the term “race” throughout as a shorthand to indicate the racial or ethnic identification of respondents marked on the survey.
3. All dyads are selected to ensure that the target is in the risk set for nomination at t , so this effect is not due to a simple lack of opportunity, e.g., students leaving the school setting.

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Supplementary Material

Supplementary material is available at *Social Forces* online, <http://sf.oxfordjournals.org/>.

Data Availability

Data used in this study cannot be shared for ethical/privacy reasons. For more information about accessing the PROSPER Peers data, contact James Moody (jmoody77@duke.edu).

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