

UC Irvine

UC Irvine Previously Published Works

Title

Dating and substance use in adolescent peer networks

Permalink

<https://escholarship.org/uc/item/9mz8s2cb>

Journal

Addiction, 108(3)

ISSN

0965-2140

Authors

Kreager, Derek A

Haynie, Dana L

Hopfer, Suellen

Publication Date

2013-03-01

DOI

10.1111/j.1360-0443.2012.04095.x

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed



Published in final edited form as:

Addiction. 2013 March ; 108(3): 638–647. doi:10.1111/j.1360-0443.2012.04095.x.

DATING AND SUBSTANCE USE IN ADOLESCENT PEER NETWORKS: A REPLICATION AND EXTENSION

Derek A. Kreager¹, Dana L. Haynie², and Suellen Hopfer³

¹Department of Sociology and Crime, Law, and Justice, Pennsylvania State University, University Park, PA, USA

²Department of Sociology, The Ohio State University, Columbus, OH, USA

³Department of Communication Arts and Sciences, Pennsylvania State University, University Park, PA, USA

Abstract

Aims—The current report examined associations between romantic partner, peer, and individual substance use behaviors in a sample of American adolescents.

Design—The report used two waves of data (8th and 9th grade) from the PROSPER intervention project and focused on dating couples and their friends in 54 sampled school-cohorts. Hierarchical logistic regression models examined the associations between friend, partner, and friend-of-partner substance use and daters' future drinking and smoking.

Setting—Surveys administered in rural Pennsylvania and Iowa secondary schools.

Participants—744 dating couples.

Measurements—Student participants completed questionnaires that assessed substance use, background characteristics, and dating and friend nominations. Friend, partner, and friend-of-partner substance use were assessed at each wave directly from respective reports.

Findings—Consistent with a bridging hypothesis, friends-of-partner drinking had a strong and independent association with subsequent drunkenness ($b=1.44, p<.05$) and drinking ($b=.67, p<.05$) among daters, and these associations did not vary by gender. A similar association was not observed for smoking, where partner ($b=.74, p<.01$) and direct friends ($b=1.26, p<.01$) smoking showed strong and significant associations with future smoking, but friends-of-partner smoking did not ($b=-.30, p>.10$).

Conclusion—Romantic partner and peer behaviors have substantially different associations with adolescent drinking and smoking. Intervention efforts aimed at reducing teenage smoking should be aimed at proximal peer and romantic relationships, whereas interventions of teenage drinking should also include the wider circle of indirect friends.

INTRODUCTION

The emergence and spread of substance use in adolescent peer networks are salient concerns of researchers and policy-makers alike. Behaviors such as binge drinking and smoking are uncommon in early adolescence, yet more than double in prevalence during middle adolescence and continue to escalate into young adulthood (1, 2). Moreover, the strong links between these behaviors and negative health outcomes (e.g., drunk driving, dependence, and

poor physical health) make understanding their diffusion and possible interventions critical research goals.

In a recently published study, Kreager and Haynie (3) proposed that romantic relationships offer a key diffusion mechanism for problem drinking in school-based peer networks. Building on Granovetter's (4, 5) concept of "weak ties", the authors argued that romantic ties likely act as bridges whereby daters become exposed to behaviors of a partner's friends. Following this logic, dating would be an important conduit by which drinking attitudes, opportunities, and techniques travel across peer group boundaries and diffuse in local networks. Kreager and Haynie (3) tested this bridging hypothesis with couple-level data of 898 adolescent daters from the second wave of the National Longitudinal Study of Adolescent Health (Add Health). Consistent with expectations, they found that friends-of-partners' drinking had strong and independent associations with daters' problem drinking.

The current research replicates Kreager and Haynie's (3) study with a more contemporary sample. Although Add Health continues to be widely used in health and developmental research, its school-based sample was collected almost fifteen years ago and may not be representative of current student populations. The current study follows a similar analytical strategy to Kreager and Haynie (3), but relies on student data of 54 school-cohorts collected in 2003–4, over a decade after Add Health. It thus tests if the previous results generalize to the current generation of adolescents.

Smoking, Peers, and Romantic Partners

This study also extends Kreager and Haynie's (3) analyses by comparing dating and peer behaviors across two forms of substance use: drinking and smoking. Prior research suggests that drinking typically has positive associations with peer centrality and status, while smoking shows null or negative associations with the same measures (6–10). Two studies did find positive smoking-popularity associations, but did not include drinking in their analyses (11–12). Additionally, several recent studies of network dynamics have documented strong peer influence and selection effects for adolescent drinking, but only peer selection effects for smoking (13–15). Such findings suggest that drinking and smoking diffuse quite differently in the informal structure of schools. These patterns are likely to be visible when examining the romantic contexts of substance use.

A related hypothesis concerns potential differences in partner preferences for smoking and drinking. Do daters who smoke prefer smoking partners more than daters who drink prefer drinking partners? If smoking is a more visible and less socially accepted behavior than drinking, adolescents may have stronger partner preferences for smoking than drinking (16). In addition, segregation of smokers in peer networks would increase the likelihood that a couple's friends would have similar smoking behaviors. This should heighten the importance of direct friendships while reducing the indirect influence from friends-of-partners. Little is known empirically about the similarities between romantic partners and their friends at the beginning of relationships. The current study is among the first to examine the influence of romantic partners and partners' friends' on adolescent smoking.

METHODS

Participants

The Promoting School-community-university Partnerships to Enhance Resilience (PROSPER) study design and sampling procedures have been described in detail elsewhere (17). Briefly, PROSPER is a community-based substance use prevention program targeted at two grade cohorts in 28 rural Iowa and Pennsylvania communities from 6th grade to young adulthood. At each wave, students completed confidential pencil and paper questionnaires

administered during school hours. The current study uses data from the 8th and 9th grade waves, when dating questions were introduced and peer network measures were available for analyses. The surveyed ages (13–15 years old) cover a period of rapid romantic involvement. By age 15, 40–50% of American adolescents report a current romantic relationship (18). One school did not agree to participate in the peer network study, providing a final sample of 27 schools (54 school-cohorts) and 10,000 surveyed students, with a median age of 13–15 in the sampled waves, 50% female, 81% Caucasian, and 29% reporting that they received free lunch vouchers, the latter indicating that approximately one-third of the students came from families with incomes at or below 130 percent of the poverty level (19).

Beginning in the 8th grade, students were asked to report the name of their “current or most recent boyfriend or girlfriend, if you had any within the last year.” In the 9th grade, 5804 (41%) students reported dating someone in the prior year and 3162 (31%) reported a current romantic partner at the time of the survey. Of the current daters, 929 could be matched by name to a partner in the PROSPER sample, where neither partner had missing data on the substance use outcomes or primary peer network measures and were both surveyed at the 8th grade. As our analytical method requires partners to be uniquely identified by gender, 29 homosexual couples were deleted from the sample. A further 156 couples were deleted because one of the partners was involved in multiple dating relationships, creating between-couple dependence. Our final sample is 744 9th grade dating couples and 1,488 individual daters. Less than 5% of the couples had missing data on one or more covariates for either partner. To maintain statistical power, missing values were imputed into five datasets using the SPSS v.19.0 multiple imputation procedure.

Measures: outcome variables

The outcomes are 9th grade self-reported *drunk*, *drink*, and *smoke*. The three variables refer to behavior within the past month of the 9th grade interview. *Drunk* is assessed from the item, “During the past month, how many times have you been drunk from drinking wine, wine coolers, or other liquor?” Similarly, *Drink* is assessed from the item, “During the past month, how many times have you had beer, wine, wine coolers, or other liquor?” Finally, *Smoke* is assessed from the item, “During the past month, how many times have you smoked any cigarettes?” Responses for the three items were originally on a Likert scale ranging from ‘never’ to ‘more than once a week’. *Drunk* and *Smoke* were dichotomized (1=yes, 0=no) to remove extreme positive skew. Table 1 lists descriptive statistics, by partner gender, for all outcomes and independent variables. Although the male daters are somewhat more likely to get drunk and drink more than their female partners, there are no significant gender differences across our dependent measures.

Measures: primary independent variables

Partner Substance Use—*Partner Drunk*, *Partner Drink*, and *Partner Smoke* are assessed using partner-reported items from the 8th grade survey. The individual items are identical to the 9th grade survey items outlined above, but refer to use in the month prior to the 8th grade survey. *Partner Drunk* and *Partner Smoke* were dichotomized to reduce skew and maintain similar metrics to the outcomes.

Peer Substance Use—*Friends Drunk*, *Friends Drink*, and *Friends Smoke* and *Friends-of-Partner Drunk*, *Friends-of-Partner Drink*, and *Friends-of-Partner Smoke* are assessed using peer-reported items from the 8th grade survey. In each survey, participants were asked to nominate up to seven friends from the same grade. Taken together, the nominations allow for the creation of (egocentric) behavioral averages for all friends who are nominated by, or who nominate, each respondent. These behavioral averages are constructed for both the respondent’s and his or her partner’s friendships. Items

for each behavior are the same as the outcome and partner variables. The items are dichotomized prior to aggregation, so that each measure captures the percentage of a respondent's or partner's friends who report using each substance in the prior month. In addition to the behavior measures, we also introduce *Network Size* for friends and friends-of-partner networks.

Measures: covariates

Individual Characteristics—We include several participant-level covariates assessed at the 8th grade into our analyses. *Age*, *White* race, and *Female* gender are straightforward measures. As religious participation may impact sexual development, peer networks, and substance use, particularly in rural settings (19), we include a *religiosity* measure that distinguishes participants who do or do not attend church at least once a week. *Parental Monitoring* asked how often my parents know where I am during the day. *Intact Family* identifies participants who live with two parents (biological or stepparents) for most of the year. *Grades* captures self-reported school grades, ranging from 1, mostly lower than D's, to 5, mostly A's.

Couple Characteristics—*Reciprocal* identifies couples where both respondents nominated each other as their most recent dating partner. Note that a lack of reciprocation may not mean that one partner denies the relationship, as respondents were asked only about their most recent dating partner and the unreciprocated nomination may result from a more recent and unobserved dating relationship. *8th Grade Couple* captures those couples where at least one partner reported dating the same partner at 8th and 9th grades. This variable identifies couples that have been together for an extended period, although it is unknown if there were between-wave breaks in the relationship.

School Characteristics—*Pennsylvania* distinguishes Iowa and Pennsylvania schools to account for potential between-state differences in substance use. *Condition* identifies schools that received the 6th grade PROSPER intervention program, a blend of student life skills and peer-intervention curricula administered in the 6th grade, and a home-based family strengthening facilitated program (17). We control for the intervention program as it may be associated with later romantic involvement and substance use behaviors. In addition, we include several school-level characteristics that may be associated with friendship and/or romantic ties. *Network Transitivity Ratio* and *Network Centrality* are network structure measures that capture the degree of local clustering in the network and whether the network is hierarchically organized with central actors having many ties and peripheral actors having few (21). *Proportion Dating* captures the percentage of respondents in a school who reported currently dating at the 9th grade survey. *Proportion White* is the percentage of a school's respondents who self-identify as white race.

Analysis Plan

Our primary hypotheses center on differences in romantic partner and friendship patterns across drinking and smoking behaviors. We begin by comparing correlations between partners' prior drinking and smoking behaviors, controlling for whether the couple was together in 8th grade. These correlations provide preliminary evidence of partner selection processes across the three substance use behaviors. We hypothesize that, prior to dating, partners will be more similar for smoking than the drinking behaviors. We next examine the stability of each sampled dater's drinking and smoking behaviors between 8th and 9th grades. This analysis helps ascertain how much behavioral change remains to be explained by dating partners or partners' friends. We also examine school-level differences in between-friends smoking and drinking correlations at 9th grade, with friendship defined as the union of sent and received friendship nominations. This provides evidence of network

segregation for the behaviors in question. For example, a high behavioral correlation between friends suggests that the behavior is highly clustered in the peer network, rather than randomly distributed among friends. Our final set of analyses consist of actor-partner interdependence models (APIMs) (22) of the three substance use outcomes in the sample of 744 heterosexual couples. These analyses approximate the models of Kreager and Haynie (3) with a more recent sample and the addition of a smoking outcome. Two reviewers suggested that we use actor-based continuous time methodologies (e.g., SIENA). However, such methods have not yet been developed for addressing our research question, which centers on indirect peer influences from one friendship network (friendships) by way of a second network (dating dyads).

The estimated APIMs are multilevel models with partners at level one and couples at level two, which allow for the estimation of individual-level effects while accounting for between-partner dependence. As PROSPER is a school-based sample, school is also added at level three. Gender uniquely identifies each person in the heterosexual couples and is coded as -1 , for males, and 1 , for females, to make the intercept interpretable for the average dater, regardless of gender (18). Following our initial models, we explore potential gender differences by repeating the analyses with interactions between gender and our primary independent variables. We estimate logistic APIMs for two dichotomous outcomes (drunkenness and smoking) and ordinal logistic APIMs for the ordinal drinking outcome. See Kreager and Haynie (3) for additional modeling information.

RESULTS

To examine partner selection, behavioral stability, and network segregation for different substances, Table 2 lists 1) substance use correlations between dating partners at 8th grade, 2) the correlation between 8th grade and 9th grade substance use for each dating individual, and 3) the school mean differences in substance use friendship segregation at 9th grade. Controlling for whether the same dating relationship was reported in the 8th and 9th grades, the between-partner correlation in 8th grade smoking ($r=.44$, $p<.001$) is over twice that for drunkenness ($r=.16$, $p<.05$) and four times that for drinking ($r=.10$, $p>.05$). This pattern suggests that partners are much more likely to share smoking than drinking behaviors prior to dating. There is also evidence that smoking is a more stable behavior over time. The correlation between respondents 8th and 9th grade smoking prevalence ($r=.83$, $p<.001$) is 23% larger than the same correlation for drunk ($r=.72$, $p<.001$) and 53% larger than the same correlation for drink ($r=.39$, $p<.001$). Finally, school differences appear in 9th grade substance use correlations between friends. On average, school friendships are significantly ($p<.001$) more likely to be clustered by smoking (mean $r=.22$) than drunk (mean $r=.14$) and drink (mean $r=.14$). Together, these results provide evidence that partner selection, stability, and friendship segregation are higher for smoking than drinking behaviors.

Table 3 lists unstandardized coefficients from logistic APIMs of drunk and smoke and ordinal logistic APIMs of drinking in 9th grade romantic relationships (N=744). Looking across all of the models, we see several control variables with generally consistent associations with the three dependent variables. Partner religiosity, parental monitoring, and grades tend to have significant negative associations with substance use. It is also interesting that friendship network size (introduced in Model 2) is positively associated with substance use, significant for drinking and smoking, suggesting a positive correlation between substance use and network popularity. Coefficients for the primary independent variables, however, appear quite different across the drinking and smoking outcomes. In the first models for each outcome, partner's behavior appears a much larger correlate of smoking than of drinking. Partner's drunkenness and drinking do not have significant associations

with the drinking outcomes, but partner smoking has a strong and persistent association with 9th grade smoking prevalence.

Model 2 adds friend and friend-of-partner behavior to the substance use equations. Consistent with Kreager and Haynie (3), friend-of-partner behavior shows strong and significant associations with the drinking outcomes, net of friend and partner behavior estimates. In contrast to the prior study, however, the friend-of-partner coefficients are not larger than the friend coefficients. Also consistent with Kreager and Haynie (3), the introduction of prior drunkenness and drinking behaviors in Model 3 attenuate more of the friend than the friend-of-partner coefficients. Prior drunkenness attenuates approximately 35% of the friend drunk coefficient, but only 18% of the friend-of-partner drunk coefficient. Similarly, prior drinking attenuates approximately 43% of the prior drink coefficient, but only 16% of the friend-of-partner drink coefficient. These results suggest that prior drinking behavior is more likely to directly connect daters with drinking friends (i.e., selection) than connect them indirectly with drinking peers through a partner.

In contrast to the drinking outcomes, friend-of-partner behavior has a nonsignificant association with smoking, net of other covariates. Indeed, with the introduction of the lagged dependent variable (Model 3), the association between friend-of-partner and respondent smoking becomes negative. These results provide no evidence of the bridging hypothesis for smoking, in that the smoking behaviors of indirect friends through a partner have no association with a dater's future smoking.

We also examined possible gender moderation by including interaction terms between gender and our primary independent variables. Table 4 lists coefficients and standard errors for the interaction terms, by substance use outcome. Overall, and consistent with Kreager and Haynie (3), friend-of-partner behavior tends to be a weaker correlate of substance use for girls than boys, and this pattern is reversed for friend behavior. However, none of the interactions is significant, so we make no strong conclusions from these patterns.

DISCUSSION

This study replicated the work of Kreager and Haynie (3) by examining peer behavior and substance use in a sample of adolescent dating couples. Kreager and Haynie (3) argued that dating is likely to create a network bridge whereby daters are exposed to the behaviors of new peers through romantic partners. They asserted that, because friends-of-partners are potentially unlike daters, and there is incentive to create friendships with a partner's friends, influence from these indirect ties is likely. Central aims of the current study were to test this bridging hypothesis in a recent adolescent sample and for drinking and smoking behaviors. For the latter, we hypothesized that greater partner selection, behavioral stability, and network segregation for smoking than drinking may alter behavioral diffusion processes from romantic relationships.

Correlational analyses suggested strong differences between smoking and drinking social processes. Romantic partners were more similar in their prior smoking than drinking, suggesting greater partner selection for the former; daters were more stable in their smoking than drinking between waves; and school friendship networks were more highly clustered by smoking than drinking behaviors. Together, these results suggest that smokers are more likely than drinkers to date one another, and that there is lower likelihood that dating will connect smokers, relative to drinkers, to dissimilar friends. In other words, dating and friendship networks appear more homophilous for smoking than drinking behaviors. It is therefore less likely that dating serves as a network bridge to new friends with differential smoking behaviors or opportunities than for drinking.

The APIMs of drinking and smoking test the bridging hypothesis for the two substances. For the drinking outcomes, the similarity to Kreager and Haynie's (3) Add Health results builds confidence in bridging as a drinking diffusion mechanism. It should be noted, however, that the influence from friends-of-partner drinking appears smaller in the current analyses than in Kreager and Haynie (3), and not significantly larger than the coefficients for direct friends. A possible explanation for this difference is the shorter time span between the network measures and the outcomes in the PROSPER study (12 months) than Add Health (18 months). The closer temporal relation of the friendship measures to the outcomes increases the likelihood that partners will share friends and reduce bridging processes. Further research should explore the dynamic nature of dating and overlapping friendship networks.

The models of smoking showed no significant association between friend-of-partner smoking and dater smoking, failing to support the bridging hypothesis for this behavior. Instead, partner and direct friend smoking were strongly correlated with daters' smoking, suggesting that peer influence for smoking is likely to stem from more proximal social ties. This is consistent with the idea that smoking homophily leaves little room for influence from indirect peer contacts.

Two limitations qualify this study's findings. First, the sample consists of adolescents living in rural Iowa and Pennsylvania communities, limiting our ability to generalize findings to the national adolescent population. Unfortunately, little is known about how the experience and interpretation of romantic relationships differs for youth growing up in a rural compared to suburban or urban communities. On the one hand, there is likely to be a smaller pool of potential romantic partners in rural locations. On the other hand, dating and romantic involvement may be of greater importance in rural locations as there is less competition from other activities compared to more urban settings where opportunities to pursue a multitude of interests is possible. We are encouraged, however, by the replication of drinking results from Kreager and Haynie's (3) results with a nationally representative sample. Moreover, PROSPER's recency builds our confidence that the observed bridging pattern for drinking extends across time and continues to operate in adolescent peer networks. Second, the sample consists of dating couples where both partners are within the same school and grade cohort. We are thus unable to observe several dating subpopulations of considerable interest, including partners who are older/younger or out of school. Again, we are heartened by the similarity of the current results with those of Kreager and Haynie (3), which relied on a sample with greater age variation and covered all middle and high school grades. In both cases, however, out-of-school partners are omitted and these may be of most interest for access to substance use opportunities and other high-risk behaviors. To gain leverage on this issue, we compared variable descriptive statistics across sampled and unsampled PROSPER daters (Appendix). As can be seen, our sample of in-grade daters is generally more conventional and advantaged than is the group of unsampled daters. We are therefore cautious in generalizing our results to other dating populations. Future research should test our hypotheses among other dating couples, including out-of-school partnerships and age-asymmetrical couples.

This study's findings have intervention implications. The segregation of smokers in peer networks suggests intervention strategies aimed specifically at smoking groups and couples. In addition, the strong stability in smoking behaviors highlights the importance of preventing adolescent smoking initiation. Smoking partners and peers appear ideal intervention contexts. As drinking is more evenly distributed in peer networks than smoking, drinking interventions aimed at the broader peer structure may be more effective than targeting specific drinking groups. Such interventions could also profit by reducing the correlation between drinking and peer status, as has been demonstrated in evaluations of the PROSPER intervention study (24).

Acknowledgments

The authors thank Mark Fienberg and three anonymous reviewers for their comments on an earlier draft. Dr. Kreager thanks the William T. Grant Foundation (8316) and DTRA (1-09-1-0054) for financial support. This study uses data from PROSPER, a project directed by R. L. Spoth and funded by grant R01-DA013709 from the National Institute on Drug Abuse.

References

1. Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the Future national survey results on drug use, 1975–2009 Volume 1: secondary school students. Bethesda, MD: National Institute on Drug Abuse; 2010.
2. Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the Future national survey results on drug use, 1975–2009 Volume II: College students & adults 19–50. Bethesda, MD: National Institute on Drug Abuse; 2010.
3. Kreager DA, Hanie DL. Dangerous liaisons? Dating and drinking diffusion in adolescent peer networks. *American Sociological Review*. 2011; 76(5):737–763.
4. Granovetter M. The strength of weak ties: network theory revisited. *Sociological theory*. 1983; 1:201–233.
5. Granovetter M. The strength of weak ties. *American Journal of Sociology*. 1973; 78(6):1360–1380.
6. Alexander C, Piazza M, Mekos D, Valente T. Peers, Schools, and Adolescent Cigarette Smoking. *Journal of Adolescent Health*. 2001; 29:22–30. [PubMed: 11429302]
7. Ennett ST, Bauman KE. Peer group structure and adolescent cigarette smoking: A social network analysis. *Journal of Health and Social Behavior*. 1993; 34:226–236. [PubMed: 7989667]
8. Ennett ST, Bauman KE, Hussong A, Faris R, Cai L. The peer context of adolescent substance use: Findings from social network analysis. *Journal of research on adolescence*. 2006; 16(2):159–186.
9. Mayeux L, Sandstrom MJ, Cillessen AH. Is being popular a risky proposition? *Journal of Research on Adolescence*. 2008; 18(1):49–74.
10. Tucker JS, Edelen MO, Go M, Pollard MS, Green MS, Kennedy DP. Resisting smoking when a best friend smokes: Do intrapersonal and contextual factors matter? *Journal of Research on Adolescence*. 2011; 22(1):113–122. [PubMed: 22389575]
11. Fidler JA, West R, Jarvis MJ, Wardle J. Early dating predicts smoking during adolescence: A prospective study. *Addiction*. 2006; 101:1805–1813. [PubMed: 17156180]
12. Valente TW, Unger JB, Johnson CA. Do popular students smoke? The association between popularity and smoking among middle school students. *Journal of Adolescent Health*. 2005; 37(4): 323–329. [PubMed: 16182143]
13. Kiuru N, Burk WJ, Laursen B, Salmela-Aro K, Nurmi J. Pressure to drink but not to smoke: Disentangling selection and socialization in adolescent peer networks and peer groups. *Journal of Adolescence*. 2010; 33:801–812. [PubMed: 20732711]
14. Mercken L, Sniijders TAB, Steglich C, Vartiainen E, De Vries H. Dynamics of adolescent friendship networks and smoking behavior. *Social Networks*. 2010; 32(1):72–81.
15. Steglich C, Sniijders TA, Pearson M. Dynamic networks and behavior: Separating selection from influence. *Sociological Methodology*. 2010; 40(1):329–393.
16. Aikens JW, Simon VA, Prinstein MJ. Romantic partner selection and socialization of young adolescent' substance use and behavior problems. *Journal of Adolescence*. 2010; 33:813–826. [PubMed: 20810161]
17. Spoth R, Redmond C, Shin C, Greenberg M, Clair S, Feinberg M. Substance use outcomes at 18 months past baseline from the PROSPER community-university partnership trial. *American Journal of Preventive Medicine*. 2007; 32:395–402. [PubMed: 17478265]
18. Carver, K.; Joyner, K.; Udry, JR. National Estimates of Adolescent Romantic Relationships. In: Florsheim, P., editor. *Adolescent Romantic Relations and Sexual Behavior: Theory, Research, and Practical Implications*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers; 2003. p. 23–56.
19. US Department of Agriculture. Washington D.C: US Government Printing Office; 2011. *Eligibility Manual for School Meals: Determining and verifying eligibility*.

20. Milot AS, Ludden AB. The effects of religion and gender on well-being, substance use, and academic engagement among rural adolescents. *Youth and Society*. 2009; 40(3):403–425.
21. Bonacich P. Power and centrality: A family of measures. *American Journal of Sociology*. 1987; 92:1170–1182.
22. Kenny, DA.; Kashy, DA.; Cook, WL. *Dyadic data analysis*. NY, NY: Guilford Press; 2006.
23. Becker, GS. *Accounting for Tastes*. Cambridge, MA: Harvard University Press; 1996.
24. Gest SD, Osgood DW, Feinberg M, Bierman KL, Moody J. Strengthening prevention program theories and evaluations: Contributions from social network analysis. *Prevention Science*. 2011; 12(4):349–360. [PubMed: 21728069]

Appendix

Comparisons across Sampled and Unsampled Daters

	<u>Sampled Daters</u> (N=1488)	<u>test</u>	<u>Unsampled Daters</u> (N= 2477)
Variables (Wave 4 – 8th Grade)	Mean(%)	p-value	Mean(%)
Drunk	.08	***	.11
Drink	1.38	***	1.46
Smoke	.08	***	.13
Male	.50	***	.46
White	.85	*	.81
Religiosity	4.92	***	4.73
Free Lunch	.20	***	.28
Parental Monitoring	1.52	***	1.59
Intact Family	.81	**	.77
Grades	4.16	***	4.02
Friends' Drunk	.10	***	.11
Friends' Drink	.26	***	.28
Friends' Smoke	.10	***	.13
Network Size	7.01	***	6.23

* p<.05,

** p<.01,

*** p<.001 (two-tailed)

NOTE: t-tests for ordinal and continuous variables and chi-square tests for binary variables

Table 1

Variable Descriptions and Descriptive Statistics

Variable Name	Description	Females (N=744)		Males (N=744)		t-test
		Mean(%)	SD	Mean(%)	SD	
<i>Individual-level</i>						
<i>Dependent Measures (Wave 5, 9th Grade)</i>						
Drunk	"During the past month, have been drunk from drinking wine, wine coolers, or other liquor?" 0 = no, 1 = yes	.17				.20
Drink	"During the past month, how many times have you had beer, wine, wine coolers, or other liquor?" 0 = not at all to 4 = at least once a week	1.60	.90			1.71 1.06
Smoke	"During the past month, have you smoked any cigarettes?" 0 = no, 1 = yes	.15				.16
<i>Independent Measures (Wave 4, 8th Grade)</i>						
White	"Choose the category that best describes you:" 1 = White, 0 = Non-White	.85				.84
Religiosity	"How often do you go to church or religious services?" 1=never to 8= greater than once a week	4.93	2.58			4.87 2.60
Free Lunch	"What do you usually do for lunch on school days?" 1=reduced or free lunch; 0=other	.19				.21
Parental Monitoring	Index of 5 items of parental monitoring. 1=never to 5=always	4.59	.71		***	4.38 .79
Intact Family	"Who do you live with most of the year?" 1=mother and father; 0=other	.81				.80
Grades	"What grades do you generally get in school?" 1=mostly lower than D's to 5=mostly A's	4.29	.80		***	4.02 .89
Partner's Drunk	Partner's Wave 4 response to "During the past month, have been drunk from drinking wine, wine coolers, or other liquor?" 0 = no, 1 = yes	.09				.07
Partner's Drink	Partner's Wave 4 response to "During the past month, how many times have you had beer, wine, wine coolers, or other liquor?" 0 = not at all to 4 = at least once a week	1.42	.79		*	1.34 .70
Partner's Smoke	Partner's Wave 4 response to "During the past month, have you smoked any cigarettes?" 0 = no, 1 = yes	.09				.08
Friends' Drunk	Percentage of friends who reported being drunk in last month	.09	.13		**	.11 .15
Friends' Drink	Percentage of friends who reported drinking in last month	.25	.22			.27 .22
Friends' Smoke	Percentage of friends who reported smoking cigarettes in last month	.10	.17			.10 .15
Network Size	Number of friends in send-or-receive network	7.26	2.66		***	6.75 3.05
 Couple-Level (Wave 5, N=744)						
Reciprocal	Both partner's reported involvement in dating relationship at Wave 5, 0 = unreciprocated, 1 = reciprocated					.34
8th Grade Couple	At least one partner nominated the other at Wave 4					.30
 School-Level (Wave 5, N=54)						
Pennsylvania	1=Iowa school, 2=Pennsylvania School					Mean(%) SD 1.48

Variable Name	Description	Females (N=744)		t-test	Males (N=744)	
		Mean(%)	SD		Mean(%)	SD
Condition	School received the PROSPER treatment condition, 1 = yes, 0 = no			.48		
Network Transitivity Ratio	Proportion of friendship triples that are transitive (i.e., balanced)			.31	.06	
Network Centrality	Extent to which friendship network has highly central and peripheral actors (Bonacich weighted centrality)			.26	.10	
Proportion Dating	Proportion of school currently dating			.44	.05	
Proportion White	Proportion of school reporting white race			.83	.10	

* p<.05,

**

p<.01,

p<.001 (two-tailed)

Table 2

Drinking and Smoking differences in Selection, Stability, and Segregation

N=1488 persons, 744 couples, 54 schools	Drunk		Smoke	
Between-Partner Correlation, 8th Grade ^a	.16	*	.10	*
Within-Partner Correlation, 8th-9th Grade ^a	.72	***	.39	***
Mean School-Level Behavioral Correlations, 9th Grade Friends	.14		.14	

* p<.05,

** p<.01,

*** p<.001 (two-tailed)

^aCorrelations for Drunk and Smoke are Tetrachoric. Correlations for Drink are Pearson

^bSmoking significantly larger than drunk (p<.001) and drink (p<.001)

Table 3

APIM of Deviant Behaviors in Adolescent 9th Grade Dating Relationships

Fixed Effects	Drunk			Drink			Smoke		
	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)
<i>Individual-Level Variables (Wave 4, 8th Grade)</i>									
Female	.01	.00	-.02	.01	.00	-.01	.12	.06	-.02
White	.07	.08	.08	.05	.05	.05	.08	.08	.09
Religiosity	-.20	-.19	-.24	-.23	-.23	-.20	-.30	-.30	-.23
Free Lunch	.25	.27	.27	.16	.17	.17	.28	.29	.27
Parental Monitoring	-.07	-.06	-.05	-.04	-.04	-.05	-.10	-.09	-.08
Intact Family	.03	.03	.03	.02	.02	.02	.03	.03	.03
Grades	-.06	-.09	-.11	.02	.04	.04	.44	.38	.44
Partner's Behavior	.19	.19	.21	.15	.15	.14	.19	.21	.22
Friends' Behavior	-.63	-.60	-.47	-.53	-.51	-.22	-.39	-.39	-.16
Network Size	.09	.09	.10	.08	.08	.09	.12	.12	.11
Friends-of-Partner Behavior	-.24	-.27	-.23	-.04	-.05	-.04	-.10	-.12	-.08
Partner's Network Siz	.19	.18	.18	.14	.14	.14	.18	.18	.21
	-.26	-.23	-.21	-.20	-.18	-.14	-.57	-.51	-.42
	.08	.08	.09	.06	.06	.06	.09	.08	.11
	.30	-.07	.07	.14	.03	.08	.99	.68	.77
	.25	.25	.26	.09	.09	.09	.27	.29	.29
		2.07	1.34		1.13	.64		2.59	1.19
		.43	.49		.22	.22		.46	.52
		.06	.04		.07	.05		.07	.05
		.03	.03		.02	.02		.04	.03
		1.71	1.40		.98	.82		.25	-.44
		.57	.61		.28	.29		.52	.57
		.03	.02		.03	.02		-.04	-.05

	N=1488 partners, 744 couples, 54 Schools			Drunk			Drink			Smoke		
	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)
Fixed Effects												
Prior Behavior		.02	.03					.02	.02		.03	.03
			1.68 ***						.97 ***			2.68 ***
			.21						.09			.27
<i>Relationship-Level Variables</i>												
Reciprocal	-.08	-.19	-.20	-.27 *	-.34 **	-.34 **	.01	-.01	-.05			
	.16	.16	.17	.11	.12	.11	.18	.18	.19			
8th Grade Couple	-.17	-.26	-.21	-.04	-.07	-.02	-.06	-.09	-.21			
	.16	.16	.16	.13	.14	.13	.17	.18	.20			
<i>School-Level Variables</i>												
Pennsylvania	-.10	-.13	-.17	-.07	-.16	-.13	.32	.23	.06			
	.22	.20	.20	.17	.15	.13	.20	.19	.22			
Condition	-.17	-.11	-.11	.14	.15	.21	-.06	-.07	-.02			
	.18	.17	.18	.12	.12	.12	.16	.15	.18			
Network Transitivity Ratio	.05	.73	-.07	-.93	-.46	-.65	.72	1.18	-.89			
	2.70	2.50	2.50	1.99	2.02	2.00	2.32	2.03	2.50			
Network Centrality	.74	-.11	.08	1.92	1.19	1.00	1.89	2.03	2.92 *			
	1.56	1.51	1.54	.98	1.00	.98	1.10	1.10	1.44			
Proportion Dating	.75	.76	.18	.17	-.10	-.79	1.77	1.11	.87			
	2.21	.87	2.31	1.44	1.26	1.21	1.41	.70	1.96			
Proportion White	1.39	.35	1.05	.29	.12	.25	1.88 *	1.96	1.78			
	.91	2.09	.97	.57	.53	.61	.72	1.39	1.02			
Intercept	-1.53 ***	-1.62 ***	-1.64 ***	-2.86 ***	-2.96 ***	-3.23 ***	-1.86 ***	-1.93 ***	-1.95 ***			
	.10	.09	.10	.14	.14	.15	.08	.09	.10			
Threshold Parameter 1-2				1.44 ***	1.47 ***	1.62 ***						
				.11	.11	.12						
Threshold Parameter 2-3				2.43 ***	2.49 ***	2.74 ***						

N=1488 partners, 744 couples, 54 Schools		Drunk			Drink			Smoke		
Fixed Effects	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	Model 1 Coef. (Robust SE)	Model 2 Coef. (Robust SE)	Model 3 Coef. (Robust SE)	
Random Effects Variance Component ^a				.13	.13	.14				
Couple-Level (<i>r</i> 0)	.16	.17	.17	.28 *	.27 *	.25	.15	.31	.38	
School-Level (<i>u</i> 00)	.13 **	.06	.09 *	.01	.01	.01	.01	.03	.01	

* p<.05,

** p<.01,

*** p<.001 (two-tailed)

^aThe Level 1 variance for Binary and Ordinal Logistic HGLMs is fixed at $\pi^2/3 = 3.29$

Table 4

Gender Interactions

N=1488 persons, 744 couples, 54 schools			
	Drunk	Drink	Smoke
Model 3 (Table 2) results with interactions:	Coef. (Robust SE)	Coef. (Robust SE)	Coef. (Robust SE)
Female × Partners' Behavior	.12 (.25)	.04 (.08)	.04 (.40)
Female × Friends' Behavior	.70 (.57)	.08 (.24)	.38 (.63)
Female × Friends'-of-Partner Behavior	-.73 (.46)	-.12 (.24)	-.86 (.70)

*
p<.05,**
p<.01,***
p<.001 (two-tailed)