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Temporal Associations of Popularity and Alcohol Use Among Middle School Students

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Abstract

Purpose—The goal of this study is to better understand the longitudinal cross-lagged associations between popularity, assessed through self-rating and peer nominations, and alcohol use among middle school students.

Methods—The analytic sample is 1,835 6th–8th grade students who were initially recruited from three California middle schools and surveyed in the fall and spring semesters of two academic years. Students reported on their background characteristics, past month alcohol use, and perceived popularity. Additionally, students provided school-based friendship nominations, which were used to calculate peer-nominated popularity. A cross-lagged regression approach within a structural equation modeling framework was used to examine the longitudinal relationship between popularity (self-rated and peer-nominated) and alcohol use.

Results—There was a statistically significant ($p = 0.024$) association between peer-nominated popularity and the probability of alcohol consumption at the subsequent survey, but not vice versa. Our results suggest that in a scenario where 8% of students are past month drinkers, each increase of 5 friendship nominations is associated with a 30% greater risk of being a current drinker at the next wave. We found no evidence of longitudinal associations between past month alcohol consumption and self-rated popularity.

Conclusions—Popularity is a risk factor for drinking during the middle school years, with peer-nominated popularity being more predictive of use than self-perceptions of popularity. To inform alcohol prevention efforts for middle school students, additional research is needed to better understand why adolescents with a larger number of school-based friendship ties are more inclined to drink.

Keywords

popularity; adolescent; longitudinal; alcohol; middle school; cross-lagged

INTRODUCTION

Although popularity among one's peers is undoubtedly coveted by most middle school students, its association with underage drinking may be cause for concern. A study of 185 7th–8th graders examined associations of popularity with a composite substance use measure that included alcohol and marijuana use and problems from use [1]. Assessing popularity as the number of schoolmates who nominated the student as someone with whom they would "most like to spend time on a Saturday night," results indicated that more popular students tended to show increases in the substance use measure one year later. Another study of 5104 6th–8th graders, assessing popularity as the number of friendship nominations received by each student, found that relatively popular adolescents were more likely to be drinkers two years later at age 13 or 15 [2]. A third study of 156 7th graders assessed popularity in terms of "most popular" nominations by schoolmates [3]. Current drinkers in the fall semester

were more likely than non-drinkers to be nominated as popular by their schoolmates, and maintained this higher social standing in the spring semester regardless of whether they continued or stopped drinking.

As these studies illustrate, the association between being popular in middle school and subsequent alcohol use has received some support. However, none examined whether the association might be reciprocal: is it the case that being popular increases a student's risk of alcohol use *and* students who engage in alcohol use experience increased popularity over time? Certainly, social motives are commonly endorsed by adolescents as reasons why they drink or want to drink [4], but it is unclear whether middle school students who drink alcohol might actually reap social benefits from engaging in this risky behavior. To the best of our knowledge, only one study has examined the reciprocal associations of adolescent popularity and alcohol use, albeit in an older sample of high school students. Among 405 10^{th} graders from a Northeastern high school, Mayeux and colleagues [5] assessed popularity in terms of "most popular" nominations received by schoolmates. Students who were viewed as most popular in 10^{th} grade reported more frequent alcohol use in 12^{th} grade, but alcohol use at 10^{th} grade did not predict their subsequent level of popularity. It is unclear whether the two-year lag between assessments in this study may have diluted the effect of alcohol use on students' popularity given the dynamic nature of adolescent friendships. The present study will determine whether this result replicates using more proximal, twice-yearly assessments.

The literature on adolescent popularity and substance use has tended to assess popularity in one of two ways. The first is to use a peer nomination measure (e.g., who is their friend, who is most popular) and calculate popularity based on the number of nominations each adolescent receives [1, 3, 5–8]. The other is to use a self-report measure, such as rating their popularity on a Likert scale or categorizing themselves as "very popular," "somewhat popular" or "not popular" [9–10]. A recent cross-sectional study based on a portion of the data used in the present study [11] found that self-rated popularity was weakly related to the number of friendship nominations which students received from their schoolmates. However, both measures of popularity were positively associated with concurrent past month drinking. Although the research reviewed above suggests that popularity based on peer nominations is a risk factor for later alcohol use, it is unknown whether perceiving oneself as popular has a similar effect given the lack of longitudinal studies including both types of measures.

The present study extends the limited longitudinal literature on adolescent popularity and alcohol use in three respects. First, it builds on the cross-lagged study of high school students by Mayeux and colleagues [5] by examining these associations in a younger cohort of 6^{th}–8^{th} graders who were surveyed twice a year over two academic years. Second, it extends the literature by including both peer-nominated and self-rated measures of popularity, focused on popularity in the adolescent's local social context, to evaluate their relative importance as potential risk factors and consequences of alcohol use. Third, it examines these associations in a predominantly Hispanic sample of middle school students. Hispanic youth are sometimes found to have higher rates of substance use than their non-Hispanic White, African American and Asian peers [12–13], and there is some evidence that peer relationships [14–15] (including difficulty resisting offers to use [13]) may have a particularly strong influence on the risk of substance use of Hispanic youth during this period.

METHODS

Participants

Participants were part of the evaluation of CHOICE [16], a voluntary after-school substance use prevention program. Students in 6–8th grades (*N*=8932) from 16 middle schools were enrolled in the study and completed four in-school surveys: fall 2008, spring 2009, fall 2009, and spring 2010. Students at three of the schools (*n*=2002 at baseline) were administered a friend nomination survey at the time that they completed each in-school survey [17]. The present analyses are based on 1835 respondents who completed at least one in-school survey and were not missing demographic information (see Table 1). Study materials and procedures were approved by the individual schools, the school districts, and the institution's Internal Review Board. A Certificate of Confidentiality was obtained from the National Institutes of Health.

Measures

Background covariates—All analyses controlled for age (in years), gender, race/ethnicity [dummy coded: non-Hispanic white (reference), non-Hispanic black, Hispanic, other], and which of the three schools the student attended (dummy coded; note that two schools received the intervention and thus controlling for school also controls for any treatment effect).

Alcohol use—Students were asked the number of days they had at least one drink of alcohol during the past month (1=*0 days* to 7=*20–30 days*) [18–19]. Due to the very rare responses at higher levels of use, we dichotomized this measure to *any use* (= 1) versus *no use*.

Popularity—Self-rated popularity was assessed with a 5-item scale based on a measure of social goals [20]. Sample items include "When I'm with people my own age, everyone wants to be my friend" and "When I'm with people my own age, I'm the most popular" (1=*strongly agree* to 4=*strongly disagree*). Items were averaged and higher scores indicate greater self-rated popularity (alpha=0.84).

For peer-nominated popularity, students were asked to nominate up to 10 "friends at this school who you hang out with." They listed their friends' first and last names, grade and gender. An analytic script matched as many names as possible against a confidential survey respondent/ID list maintained by the RAND Survey Research Group (SRG), who oversaw the data collection. For names that were not matched analytically, SRG made final determinations based on student characteristics (e.g., grade, gender). Name matching against a roster of consented students ranged from a low of 88% to a high of 97% across waves 1–4. Students initially in 8th grade are missing this measure at waves 3 and 4 due to their transition out of middle school. Peer-nominated popularity was calculated by summing the total number of friendship nominations received by each student using UCINet [21] and then mean centering this value within schools to adjust for school-based differences in the average number of nominations. This measure corresponds to the "indegree centrality" network measure that assesses popularity as measured by direct linkages with others [22].

Data Analysis

First, we examined the correlation matrix of the measures over time, focusing on correlations of the same measures in different waves and the two popularity measures within waves. Second, we employed cross-lagged correlation analysis to determine the temporal association between past month alcohol consumption and popularity. Our general approach to modeling involved the implementation of cross-lagged path analysis [23–24] using the

Mplus 6.11 software program [25]. At each wave, the two variables of interest were regressed on the same variables measured at the previous wave. This modeling technique is widely used to assess causal models in data derived from non-experimental, longitudinal research designs [23]. We use the weighted least squares with mean and variance adjustment (WLSMV) estimator in Mplus. In these models, categorical outcome variables are modeled using probit regression. The path diagram representation of the model is shown in Figure 1. To account for sample attrition, we conducted all analyses using full information maximum likelihood estimation [26–27]. This technique avoids sample biases that can occur when one excludes from the analyses those participants who missed one or more follow-up surveys, as well as provides an unbiased method for increasing inferential power when data are missing at random or completely at random [28].

The remainder of this section provides details of the modeling procedure. A sequence of models was estimated twice, once with the popularity variable representing self-rated popularity, and once representing peer-nominated popularity. In the first instance, the model was estimated with all paths freely estimated. We tested whether additional autoregressive paths from popularity or alcohol consumption at each wave to the equivalent measures two waves later (e.g., a direct path from alcohol at wave 1 to alcohol at wave 3) were required to improve model fit. These paths are sometimes required to account for regression to the mean in models with three or more measurement waves. If these paths were statistically significant we added them to the model. We then added constraints in the interest of parsimony [29], testing constraints in sets using the Wald test. In the first set of tests, we tested the regression coefficients from the covariates to the same measure at waves 2, 3, and 4 to be equal (e.g., the coefficients from male to popularity at wave 2, male to popularity at wave 3, and male to popularity at wave 4 were set to be equal to each other).

We next tested for stationarity in the autoregressive component of the model. Stationarity refers to whether analogous paths at each wave are equal (i.e., that the path from popularity at wave 1 to popularity at wave 2 was equal to the path from popularity at wave 2 to popularity at wave 3). Finally, we added and tested stationarity constraints to the cross-lagged paths, such that the path from alcohol consumption at wave 1 to popularity at wave 2 was equal to the path from alcohol consumption at wave 2 to alcohol consumption at wave 3. We then evaluated the fit of the model to determine if the global fit was adequate and, if fit was adequate, we examined and interpreted the parameter estimates.

RESULTS

The correlation matrix of all measures is shown in Table 2. The correlations of alcohol consumption in the last 30 days (alcohol 1 through 4) are only moderately intercorrelated, with most of the correlations ranging from 0.30 to 0.45. The intercorrelations for peer-nominated popularity are higher, with correlations for adjacent waves at or close to 0.60, and reducing as measurements become increasingly separated in time. For self-rated popularity, the correlations at adjacent waves are close to 0.50. The fact that the measures are fluid and not completely stable indicates that it is possible that prior events may affect them. Also worthy of note are the cross-sectional correlations between peer-nominated and self-rated popularity; these are all low, with the highest being between the two measures at wave 2 (r=0.11).

A series of cross-lagged models were fit separately for peer-nominated and self-rated popularity. In each subsection, we first describe the series of models, along with measures of fit, which we took to lead to the final model (labeled *model development*); we then describe the final model and present the parameter estimates of interest.

Peer-Nominated Popularity

Model development—The initial fit of the model, prior to adding constraints, was good ($\chi^2(10)=15$, $p=0.013$; RMSEA=0.016; CFI=1.00). We then tested whether the additional autoregressive paths were required for the model fit. The multivariate Wald test for these paths was highly significant ($\chi^2(4)=193$; $p<0.001$) and these parameters were therefore retained. Next, we tested whether the effects of covariates at wave 2 through 4 could be held equal. The Wald test suggested that constraining the effects of covariates to equality was viable ($\chi^2(24)=36$, $p=0.052$). Similarly, the equality constraint on autoregressive paths for alcohol did not lead to a statistically significant decrement in the model ($\chi^2(2)=0.01$, $p=1.00$). This was not the case for peer-nominated popularity, $\chi^2(2)=24$, $p<0.001$; examination of the parameter estimates suggested that the consistency may have been reducing over time. The coefficient for peer-nominated popularity at wave 2 regressed on peer-nominated popularity at wave 1 was 0.69 (SE 0.02), for wave 3 regressed on wave 2 the coefficient was 0.62 (SE 0.02), and for wave 4 regressed on wave 3 the coefficient was 0.54 (SE 0.02). Hence the constraint was not retained for peer-nominated popularity. The final test was for stationarity of the cross-lagged coefficients. The Wald test suggested that these constraints could be added to the model, $\chi^2(4)=2.5$, $p=0.639$. This gave a final model $\chi^2(40)=49$, $p=0.153$; RMSEA=0.011; CFI=1.00, indicating very good fit.

Interpretation and parameters—The cross-lagged parameter for past month alcohol consumption at wave t regressed on peer-nominated popularity at wave $t-1$ was 0.03 (SE 0.014; $p=0.024$; standardized parameters were 0.06, 0.06, 0.05), indicating a statistically significant effect. Specifically, higher popularity at a wave is predictive of a greater likelihood of consumption at the next wave. As the regression parameters are probit regression estimates, the predicted probability of consumption of alcohol can be calculated for given values of the predictor [30]. For example, if a student who received 0 friendship nominations had an 8% probability of consuming alcohol (roughly, the average rate of drinking across waves in this study), someone who had 5 incoming nominations would be predicted to have a 10.4% probability of having consumed in the past 30 days (and thus a 30% greater risk). For peer-nominated popularity at wave t regressed on past month alcohol consumption at wave $t-1$, the effect was −0.01 (SE 0.06; $p=0.907$; standardized estimates all equal to 0.00), indicating no evidence of an effect from alcohol consumption to later popularity.

Self-Rated Popularity

Model development—As was the case for peer-nominated popularity, the initial fit of the model using self-rated popularity was good ($\chi^2(10)=13$, $p=0.209$; CFI=1.00; RMSEA=0.013). Testing the autoregressive ‘skip’ paths from waves 1 to 3 and waves 2 to 4 with a Wald test found that removal of these paths would have led to a significant decrement in the model ($\chi^2(4)=137$, $p<0.001$), and so these paths were retained. Next, we tested the equivalence of the effects of covariates, for this test $\chi^2(24)=20$, $p=0.688$, and so these constraints were added to the model. Testing stationarity constraints for alcohol gave a non-significant result ($\chi^2(2)=4$; $p=0.139$); however, the constraint for the self-rated popularity measure was not tenable ($\chi^2(2)=22$, $p<0.001$). The stability of self-rated popularity was considerably higher between waves 1 and 2 than other waves (0.50, SE 0.03 for waves 1 to 2, 0.28, SE 0.04 for waves 2 to 3, and 0.28, SE 0.03, for waves 3 to 4). The final constraints tested were the stationarity tests for the cross-lagged regressions, this constraint gave $\chi^2(4)=2.9$, $p=0.573$. The final model had excellent fit to the data, $\chi^2(40)=41$, $p=0.435$; RMSEA=0.003; CFI=1.00.

Interpretation and parameters—The cross-lagged regression parameters for self-rated popularity at wave t regressed on past month alcohol consumption at wave $t-1$ were equal to

0.02 (SE 0.02; p=0.466; standardized estimates 0.02, 0.02, 0.03), indicating no evidence that alcohol consumption predicted subsequent self-rated popularity. For past month alcohol consumption at wave t regressed on self-rated popularity at wave t−1, the estimate was 0.04 (SE 0.05; p=0.428; standardized estimates 0.03, 0.03, 0.02) and thus provided no evidence that self-rated popularity was predictive of later alcohol consumption.

DISCUSSION

Our previous cross-sectional study found that middle school students were more likely to be past month drinkers if they either perceived themselves as being popular or received more school friendship nominations [11]. Longitudinal results from the present study indicate, however, that perceptions may be less important than reality. Students' perceptions of their own popularity were largely unrelated to the number of friendship nominations they received, suggesting that adolescents may not be fully aware of others' impressions of them [31]. Further, students who viewed themselves as popular were not necessarily more likely to drink in the future. Given that reported associations between self-rated popularity and substance use to date have been based solely on cross-sectional data [9–11], the lack of a prospective association in the present study is a noteworthy finding.

In contrast, adolescents who received more friendship nominations had a significantly higher likelihood of future alcohol use than their less popular classmates. One commonly offered explanation is that popular students engage in substance use as a means of maintaining their popularity. However, this explanation seems unlikely given that students who perceived themselves as popular were not more likely to subsequently drink and, as discussed more below, drinking did not predict a student's social status over time. Rather, popular adolescents may be more likely to use alcohol because their larger number of friends affords them greater direct exposure to drinking role models, easier access to alcohol, and more social opportunities to use alcohol across different social contexts. Another possibility is that adolescents with a relatively large number of friends experience social stress [32] – for example, from having greater demands on their time and attention, requests for assistance, exposure to interpersonal conflict –and deal with this social stress by self-medicating with alcohol. These explanations (and there are certainly others) point to very different targets for alcohol prevention efforts. An important direction for future research is to better understand the mechanisms through which receiving more friendship nominations increases the risk of adolescent drinking.

A unique feature of this study was the ability to examine cross-lagged associations between popularity and alcohol use during middle school. Given that drinking is not yet normative at this age, this behavior might be expected to have some effect on an adolescent's social standing –students who drink might become more or less popular depending on whether this behavior is viewed as desirable by their schoolmates. However, we did not find this to be the case. One explanation is that drinking during middle school is not as common or observable as it is for older adolescents (who are going to parties or other gatherings where alcohol is being used) and thus social standing is not yet based on this behavior. Although possible, we note that the only other cross-lagged study in this area was conducted with an older cohort of high school students and similarly found that alcohol use did not predict changes in popularity [5]. The lack of association may have to do with peer selection processes associated with substance use. There is increasing evidence that adolescents form friendships with peers who are similar to themselves on substance use [33–35]; abstainers tend to become friends with peers who do not use, whereas smokers and drinkers tend to seek out peers who engage in these behaviors. The result of this assortative friendship formation process may be no overall social advantage to either engaging in or refraining from substance use during adolescence.

In considering this study's findings, it is important to keep in mind that results may not generalize to adolescents who differ on demographics or geographic area, and findings may have differed if alternative measures of peer-nominated popularity were used (e.g., asking students to nominate the "most popular" students). In addition, our findings are based on retrospective self-reports of alcohol use, although we do not feel that this is a major limitation given: our particular measure of use (any vs. none); the various procedures used during survey administration to increase the validity of these reports [16]; and the similar rates of past month substance use in our baseline sample of 7th and 8th graders compared to national samples [36]. One problem that is always associated with cross-lagged regression studies is the choice of the time between waves; the hypothesized causal effects should not occur immediately, but should develop over time. Failure to detect a temporal effect may be due to the time between waves being too long or too short to detect the effect. Finally, it is a limitation that our modeling approach, although the most appropriate for addressing our research questions, did not allow us to address all the possible independencies in the data.

In sum, popularity appears to be a risk factor for alcohol use during middle school, with peer-nominated popularity being more important than self-perceptions of popularity. The association between peer-nominated popularity and alcohol use is modest in magnitude, similar to other research with middle school students [37]. Nonetheless, where middle school drinking is concerned, our finding of a 30% increase (i.e., 8% to 10.4%) in the predicted risk of alcohol use associated with gaining five friendship nominations is of considerable interest. In order to inform alcohol prevention efforts for this younger age group, additional research is needed to better understand the effects of having a larger number of school-based friendship ties on drinking behavior and the mechanisms through which this may occur.

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IMPLICATIONS AND CONTRIBUTIONS

Future alcohol use is more likely among middle school students who receive a greater number of friendship nominations from classmates. Further research is needed to understand whether this effect is due to greater direct exposure to drinking role models, access to alcohol, opportunities to use, social stress, or other factors.

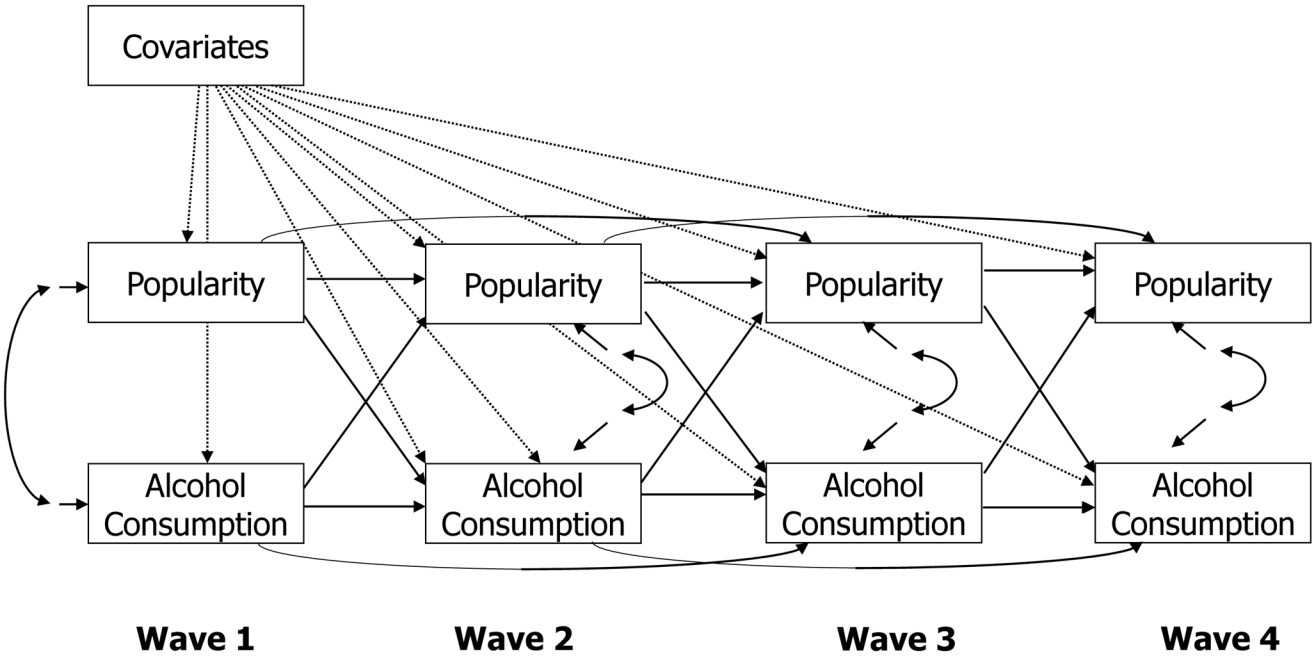
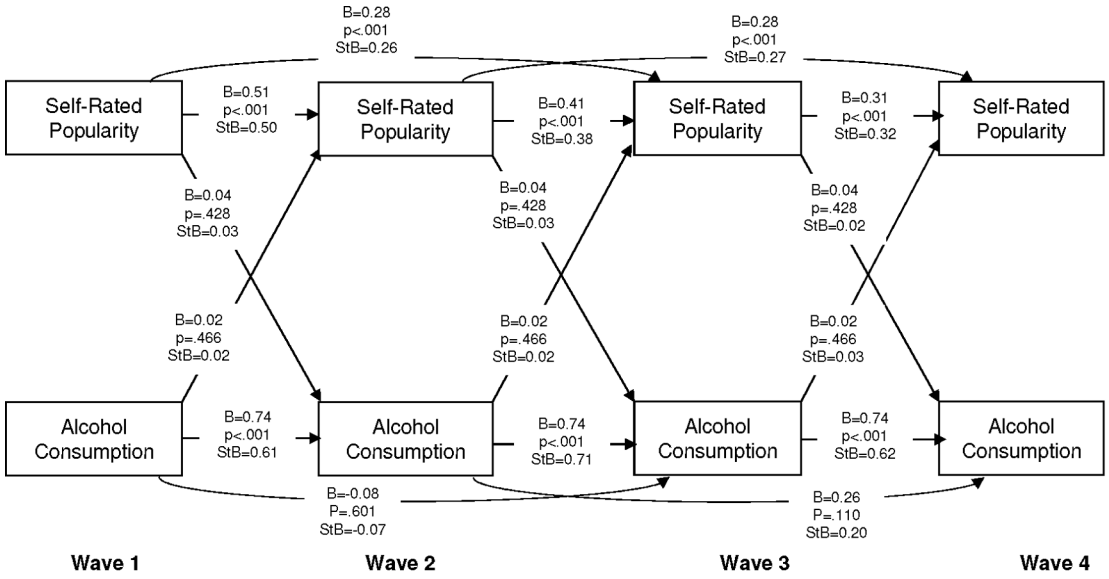


Figure 1.
Conceptual cross-lagged path model of popularity and alcohol consumption



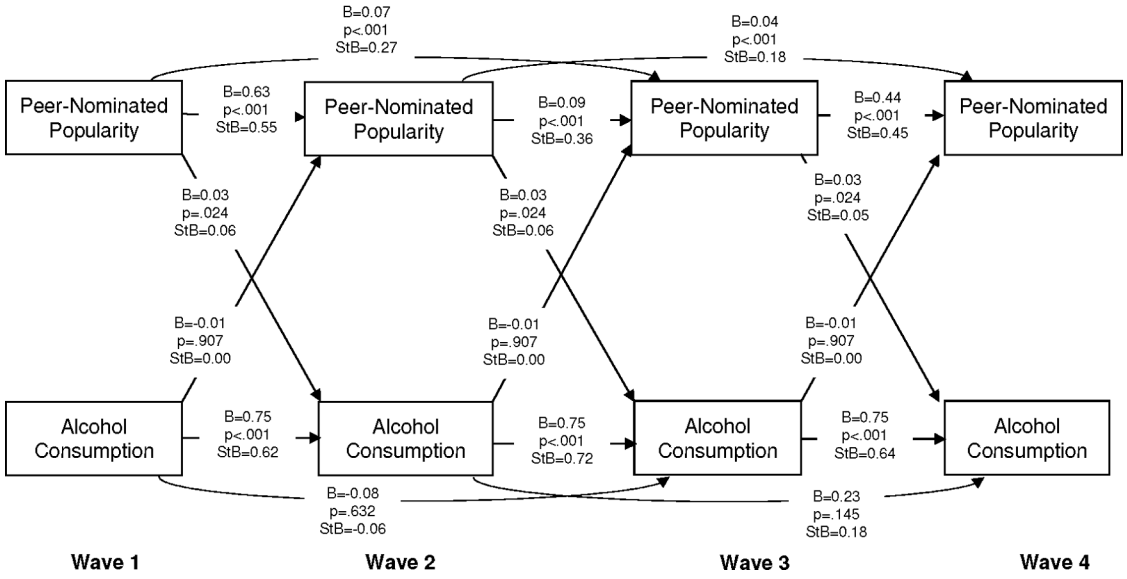


Figure 2.

Figures 2a and 2b. Cross-lagged path models of popularity (peer-nominated, self-rated) and alcohol consumption. Only autoregressive and cross-lagged parameters are shown (the figure omits within wave correlations and covariates). B = regression coefficient, StB = standardized regression coefficient.

TABLE 1

Sample Description

	Mean (SD)	%
Age (range = 10–15)	12.0 (0.84)	
Male		50.2
Female		49.8
Hispanic		73.1
Non-Hispanic white		15.9
Non-Hispanic black		2.8
Other		8.2
Self-rated popularity 1	2.21 (0.84)	
Self-rated popularity 2	2.25 (0.87)	
Self-rated popularity 3	2.28 (0.92)	
Self-rated popularity 4	2.31 (0.87)	
Alcohol consumption 1		7.0
Alcohol consumption 2		8.9
Alcohol consumption 3		9.4
Alcohol consumption 4		9.2
Peer-nominated popularity 1 (range = 0–16)	2.48 (2.34)	
Peer-nominated popularity 2 (range = 0–22)	3.42 (2.80)	
Peer-nominated popularity 3 (range = 0–14)	3.03 (2.52)	
Peer-nominated popularity 4 (range = 0–13)	2.57 (2.22)	

TABLE 2

Correlation matrix of all measures

Age	1.00																		
Male	−0.02	1.00																	
Black (vs. white)	−0.05	−0.05	1.00																
Hispanic (vs. white)	0.05	0.00	−0.28	1.00															
Other (vs. white)	−0.01	0.00	−0.05	−0.49	1.00														
Self-rated popularity 1	0.07	0.02	0.03	−0.02	0.02	1.00													
Self-rated popularity 2	0.05	0.04	0.02	−0.01	−0.01	0.48	1.00												
Self-rated popularity 3	0.04	0.06	0.03	−0.03	0.00	0.42	0.52	1.00											
Self-rated popularity 4	0.03	0.04	0.02	0.01	−0.01	0.36	0.42	0.45	1.00										
Alcohol 1	0.16	−0.04	−0.03	0.08	−0.02	0.12	0.08	0.05	0.01	1.00									
Alcohol 2	0.15	−0.07	−0.04	0.09	−0.01	0.12	0.10	0.13	0.05	0.36	1.00								
Alcohol 3	0.11	−0.07	−0.01	0.07	−0.02	0.08	0.05	0.10	0.02	0.31	0.44	1.00							
Alcohol 4	0.13	−0.12	−0.03	0.06	−0.04	0.07	0.09	0.11	0.04	0.22	0.45	0.42	1.00						
Nominated popularity 1	0.09	−0.08	0.06	−0.13	0.00	0.04	0.09	0.07	0.10	0.06	0.11	0.03	0.06	1.00					
Nominated popularity 2	0.09	−0.12	0.01	−0.09	−0.03	0.08	0.11	0.05	0.07	0.04	0.03	0.05	0.09	0.54	1.00				
Nominated popularity 3	−0.03	−0.09	0.03	−0.10	−0.04	0.04	0.07	0.02	0.02	0.02	0.04	0.05	0.09	0.51	0.60	1.00			
Nominated popularity 4	0.04	−0.12	−0.03	−0.06	−0.02	0.03	0.03	0.02	0.08	0.02	0.03	0.03	0.06	0.36	0.48	0.56	1.00		
School 2 (vs. School 1)	−0.01	0.06	−0.02	0.16	−0.06	0.07	0.01	0.02	−0.02	−0.01	0.01	−0.01	0.00	−0.21	−0.24	−0.22	−0.19	1.00	
School 3 (vs. School 1)	0.17	0.00	−0.12	0.17	−0.04	−0.07	−0.08	−0.08	−0.02	0.03	0.01	0.05	0.02	0.00	0.18	0.14	0.22	−0.50	1
	Age	Male	Black	Hispanic	Other	Self-rated popularity 1	Self-rated popularity 2	Self-rated popularity 3	Self-rated popularity 4	Alcohol 1	Alcohol 2	Alcohol 3	Alcohol 4	Nominated popularity 1	Nominated popularity 2	Nominated popularity 3	Nominated popularity 4	School 2	School 3