Behavioral Risks during the Transition from High School to College

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Abstract

The transition from high school to college is an important developmental milestone that holds the potential for personal growth and behavioral change. A cohort of 2,025 students was recruited during the summer before they matriculated into college and completed Internet-based surveys about their participation in a variety of behavioral risks during the last three months of high school and throughout the first year of college. Alcohol use, marijuana use, and sex with multiple partners increased during the transition from high school to college, whereas driving after drinking, aggression, and property crimes decreased. Those from rural high schools and those who elected to live in private dormitories in college were at highest risk for heavy drinking and driving after drinking.

Keywords

Behavioral risks; adolescents; college students; developmental transitions

At the cusp of emerging adulthood (ages 18−25; Arnett, 2000), 60% of individuals begin college in the year following high school (Arnett, 2004). Whereas a small number of college students continue to live at home with parents or guardians, the majority move away from home into university or privately owned dormitories during their first year of college. These students therefore find themselves in an environment where direct supervision of their behavior is typically limited and opportunities to engage in a variety of behavioral risks (e.g., heavy alcohol use, casual sex) are often abundant. In part due to these environmental factors, college students report heavier episodic drinking (Wechsler, Dowdall, Davenport, & Castillo, 1995; O'Malley & Johnston, 2002; Slutske et al., 2004), greater increases in marijuana use (Schulenberg et al., 2005), more sexual partners (MacDonald et al., 1990), and higher morbidity and mortality rates (Hingson, Heeren, Winter, & Wechsler, 2005) than their same age non-college student peers.

There is, however, tremendous variability in students' responses to college life. For example, the mean trajectory is one of increased drinking during the college years, but about 1 in 3

college students do not change their alcohol use, and a third reliably decrease their drinking and related problems (Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001). Thus individual factors, such as socioeconomic status (SES), gender, and race/ethnicity, as well as environmental factors, such as high school and college residence, may moderate the effects of the college transition on engagement in behavioral risks.

A key developmental question is whether there is stability or change in behavioral risks during the transition from high school to college. If patterns of behavioral risks are established in high school, and perhaps have shared underlying causes (see Dryfoos, 1990, for review), one would expect few changes during the transition to college. Problem behavior theory, for example, suggests substantial continuity from the problem behaviors of adolescence to those of young adulthood (Jessor, Donovan, & Costa, 1991). If, however, behavioral risks are sensitive to environmental factors, such as decreased supervision and increased personal freedom, they might change during the transition from high school to college. For example, increases in drinking, drug use and sexual behaviors might be expected, whereas decreases in driving after drinking could result from the opportunity to drink in one's own residence. The current study is among the first to systematically investigate the question of change or stability in a variety of behavioral risks as students move from high school to college and transition from adolescence to adulthood.

In the current research, a large cohort of students was recruited during the summer between their senior year in high school and entry into college. While still living at home, and again after matriculating into college, students completed Internet-based surveys. Multiple individual, environmental, and social factors were assessed in this project, but the current short report is limited to characterizing patterns of change or stability in behavioral risks during the transition to college, and the effects of environmental factors on the trajectories of these behaviors. Specifically, we examined the effects of type of high school (i.e., rural, suburban, urban) and type of college residence (e.g., dormitory; with parents) on changes in behavioral risks from high school to college. We also examined the effects of SES, gender, and race/ethnicity on overall rates of engagement in behavioral risks.

Method

Participants and Procedures

Participants (n = 2,245; 59.9% female) were incoming students at a large public university who were between the ages of 17−19, unmarried, and had not previously attended college. Of the 2210 participants who provided valid data, the majority were Caucasian (53.9%), with 18% Asian-American, 15.2% Hispanic/Latino, 4.1% African-American, 6.8% multi-racial, and .5% belonging to other ethnic/racial groups. During their first year of college, 69.6% lived in university dormitories, 16.4% lived in private dormitories, 9.9% lived in off-campus apartments or other private housing, and 4% lived with parents or other family members.

During the summer prior to the start of their freshman year of college, students who met inclusion criteria and provided informed consent completed the high school survey. Three weeks before the end of the Fall and Spring semesters, they completed similar on-line surveys. Participants received $30, $20, and $25 for completing the high school, Fall, and Spring surveys, respectively. More detailed information about recruitment and other procedures can be found in Hatzenbuehler, Corbin, & Fromme (2008).

Measures

Demographics—Age, gender, race/ethnicity, and family SES were assessed. A revised Hollingshead Index (Hollingshead & Redlich, 1958) was calculated from mother's and father's

occupation and education variables, with scores ranging from 11 to 52. The internal reliability of the four items comprising the index was good (alpha = .78).

Environmental Factors—Participants indicated whether their high school was rural, urban, or suburban, and where they elected to live during college: at home with parents, university dormitory, private dormitory, or their own apartment or house. University policy does not allow freshmen to live in Fraternity or Sorority houses.

Behavioral Risks—Frequency of participation in six behavioral risks was measured for the last three months of the participant's senior year in high school, and the Fall, and Spring semesters of their freshman year in college. Alcohol use and number of sexual partners were measured continuously. All other behavioral risks were measured on seven-point scales: 0 = never, 1 = 1 time, 2 = 2 times; 3 = 3−5 times, 4 = 6−10 times, 5 = 11−20 times, 6 = 21 or more times. Summary variables were computed for behavioral risks with multiple items, items with non-normal distributions were subjected to log (alcohol use variables) or inverse (driving after drinking, and marijuana use) transformations, and values were z-score transformed to allow direct comparison of behavioral risks across time. When items could not be normalized, they were summed by risk behavior and then recoded as dichotomous variables as indicated below.

Alcohol Use was measured by a composite score that combined the number of drinking days and the number of drinks per drinking day during a typical week (from the Daily Drinking Questionnaire; DDQ; Collins, Parks, & Marlatt, 1986), the frequency of being "drunk" (Jackson, Sher, Gotham, & Wood, 2001), and the frequency of binge drinking (four/five or more drinks at a sitting for women/men; Wechsler & Issac, 1992). Internal reliability of the alcohol use composite was excellent (alpha = .92). *Driving after Drinking* was calculated based on two items that assessed the number of times "drove home from a bar or party after drinking" and "drove after having 1−3 alcoholic beverages." The correlation between these two items was .88. *Aggression* was assessed with three indicators of verbally and/or physically aggressive behaviors; specifically, how often participants "said or did rude things," "lost [their] temper," and "got into a physical fight or verbal argument." The internal reliability of the aggression composite was good (alpha = .82). *Drug Use* was assessed for frequency of using marijuana, ecstasy or other designer drugs, drugs other than marijuana or designer drugs, and steroids not prescribed by a physician. Only marijuana use was endorsed with sufficient frequency to be included in the current analyses. *Property Crimes* were measured with two items for the frequency with which participants destroyed property (public or private) or stole something. Due to severely non-normal distributions that could not be corrected with transformation, these items were summed and recoded into a dichotomous variable (0 = none endorsed; 1 = at least one property crime endorsed). *Number of Sexual Partners* assessed the number of different men and women with which the participants had oral, vaginal, or anal sex. Responses were summed to create the total number of sexual partners for each three month period. A dichotomous variable signifying multiple sexual partners was created for each assessment period (0 = one or no partners; 1 = two or more sexual partners).

Attrition Analyses—Analyses of those who completed all three surveys (n = 1,947) and those who failed to complete the Fall and/or Spring survey (n = 298) revealed significant differences for alcohol use, t (2237) = 5.372, $p < .001$, driving after drinking, t (2233) = 3.609, $p < .001$, marijuana use, t (2230) = 2.687, $p < .007$, and property crimes. Non-completers reported higher levels of behavioral risks. Effects for aggression and multiple sexual partners were not significant (p values > .19). A significant gender difference indicated that women were more likely to complete all surveys than men, $\chi^2 = 31.44$, $p < .001$, but no differences were found for race/ethnicity, χ^2 (7) = 7.81, $p = .350$. See Table 1 for endorsement and frequency of behavioral risks.

Results

Analytic Strategy

Only participants who completed the Spring survey (n = 2074) were included in the primary analyses as college residence was not assessed at high school. Forty-five participants did not report race/ethnicity (n = 35) or identified as "other" race/ethnicity (n = 10), 22 did not provide valid data for high school residence, and four cases were outliers, resulting in a final sample of 2,003. All analyses were conducted using Hierarchical Linear Modeling (HLM 6.0; Scientific Software Incorporated, 2005; Raudenbush, Bryk, Cheong, Congdon, & duToit, 2004). Restricted maximum likelihood estimation with robust standard errors was used for continuous variables (i.e., frequency of behavioral risks), and a binomial model using a Bernoulli distribution with Laplace estimation was used for dichotomous variables (i.e., prevalence of behavioral risks). For demographic variables of gender, SES, and race/ethnicity, only intercepts (average values for each behavioral risk across time) were included in the models. Unconditional models for each behavior were tested first, and when significant variance components were identified (suggesting substantial between subjects variability), random effects were included. Demographic variables were then entered simultaneously as predictors of average levels of behavioral risks. Four dummy variables were created to contrast Caucasian participants against each of the other racial/ethnic groups, as past studies of behavioral risks have generally shown Caucasian students to be at greatest risk. Chi-square tests were used to identify overall effects of race/ethnicity (comprised of the four individual contrasts), and t-tests were used to identify significant differences between Caucasian students and each of the other groups.

For the environmental variables of high school and college residence type, both intercepts (reflecting high school levels of behavioral risks) and slopes (representing changes in behavioral risks from high school to college) were included in the models. Once again, unconditional growth models tested the variance components (for both intercepts and slopes), and random effects were included when variance components were significant. The same coding strategy used for race/ethnicity was used for both environmental variables. The largest group with respect to high school area of residence (suburban) was contrasted to the other two groups (urban and rural), and the most common college residence (campus dorms), was contrasted to the other residence types (with family, private dorms, off-campus apartment/ house). Gender and interactions between gender and the environmental variables were also included in all models. Because multiple outcome measures (six in total) were included in the models, p values < .01 were considered statistically significant. Effect sizes for continuous variables are reported as Cohen's d values with effect sizes for dichotomous variables presented as odds ratios.[1]

Analyses of Gender, SES, Race, and Ethnicity

Table 1 provides means and standard deviations for each of the behavioral risks at all three time points, but analyses of demographic variables used average scores across the three assessment points. Gender differences were found for property crime, $B = 1.02$, SE = .14, $t (1986) = 7.299$, $p < .001$, $OR = 2.78$, and marijuana use, $B = .11$, SE = .04, $t (1985) = 2.71$, $p = .007$, $d = .12$. In both cases, men reported higher levels of engagement than women. SES was not significantly associated with the frequency or prevalence of any behavioral risk. In contrast, racial/ethnic group differences were identified for all of the behavioral risks: alcohol

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[1]There is currently no consensus regarding the best way to report effect sizes for multilevel models (See Roberts & Monaco, 2006, for a discussion of the topic). Thus, we adopted the method reported by Oishi, Lun, & Sherman (2007) of converting t values from the HLM analyses into Cohen's d values. Although this might not ultimately be the ideal approach to generating effect sizes in HLM, it does provide some index of the magnitude of the effects reported.

use, $\chi^2 = 72.46$, $p < .001$, driving after drinking, $\chi^2 = 11.33$, $p < .001$, aggression, $\chi^2 = 12.06$, $p < .001$, marijuana use, $\chi^2 = 19.97$, $p < .001$, property crime, $\chi^2 = 8.52$, $p = .004$, and multiple sexual partners, $\chi^2 = 22.46$, $p < .001$. Relative to Caucasian students, Asian-American, $B = -.58$, SE = .05, $t(1986) = -12.93$, $p < .001$, $d = .58$, African-American, $B = -.52$, SE = .08, $t(1986) = -6.18$, $p < .001$, $d = .28$, and Hispanic/Latino students, $B = -.18$, SE = .06, $t(1986) = -3.06$, $p = .003$, $d = .14$ reported lower levels of alcohol use. Compared to Caucasian students, Asian-American students reported less frequent driving after drinking ($d = .43$) and marijuana use ($d = .34$), and a lower prevalence of having multiple sexual partners (OR = .22; all p values < .001), and African-American students reported less frequent driving after drinking, $B = -.21$, SE = .08, $t(1986) = -2.71$, $p = .007$, $d = .12$. The only behavior for which a racial/ethnic minority group was at higher risk than Caucasian students was having multiple sexual partners, with Hispanic/Latino students at highest risk, $B = .72$, SE = .26, $t(1986) = 2.77$, $p = .006$, OR = 2.06.

Changes in Behavioral Risks from High School to College

The unconditional growth models for alcohol use, marijuana use, and sex with multiple partners showed significant increases across time: $t(1992) = 17.83$, $p < .001$ (alcohol use); $t(1991) = 5.83$, $p < .001$ (marijuana use); $t(5713) = 4.35$, $p < .001$ (multiple sexual partners). The remaining continuous and dichotomous variables showed significant decreases during the transition to college: driving after drinking, $t(1992) = -7.12$, $p < .001$; aggressive behaviors, $t(1991) = -30.53$, $p < .001$; and property crimes, $t(5835) = -5.396$, $p < .001$. Figure 1 depicts changes over time for the frequency of behavioral risks that were measured continuously. Because values for each behavior were z-score transformed, the size of the effects can be directly compared across behaviors. Changes over time for the prevalence of behavioral risks that were measured dichotomously are presented in Figure 2 with corresponding odds ratios.

Environmental Influences on Behavioral Risks

Conditional Growth Models tested the effects of high school and college residence on behavioral risks in high school and changes in behavioral risks during the transition to college. The main effects model for alcohol use is presented in Table 2 for illustrative purposes.

Type of High School Residence—A significant effect of high school residence was found for alcohol use during high school (intercept), $\chi^2 = 22.64$, $p < .001$, with students from rural, $t(1985) = 3.52$, $p < .001$, and urban, $t(1985) = 3.72$, $p < .001$ areas reporting heavier consumption than students from suburban areas (see Table 2 for coefficients, SEs and effect sizes and Figure 3 for a graphic depiction of group means at each time point). A similar pattern emerged for driving after drinking, $\chi^2 = 15.44$, $p < .001$, and multiple sexual partners, $\chi^2 = 11.95$, $p < .001$, though only students from rural areas reported significantly higher levels of engagement relative to suburban students, $B = .30$, SE = .08, $t(1985) = 3.84$, $p < .001$, $d = .17$; $B = 1.14$, SE = .35, $t(1985) = 3.29$, $p = .001$, OR = 3.14. The remaining behavioral risks in high school (marijuana use, aggression, and property crime) did not differ by type of high school residence, nor did high school residence predict changes across time for any of the behaviors.

College Residence—A significant selection effect of college residence was found for high school alcohol use (intercept), $\chi^2 = 22.64$, $p < .001$, and driving after drinking, $\chi^2 = 9.17$, $p = .003$. Relative to students who planned to live in university dorms, those who selected private dorms were heavier drinkers, $t(1985) = 4.93$, $p < .001$, and reported more frequent driving after drinking, $t(1985) = 3.30$, $p < .001$ (see Table 2 for coefficients, SEs, and effect sizes). A significant interaction between gender and college residence for aggressive behavior (intercept), $\chi^2 = 7.45$, $p = .006$, was also found. Analyses of simple main effects found a significant effect for women only, such that women who elected to live in private dorms during

college were less aggressive in high school than those who selected university dorms, $B = -.18$, $SE = .07$, $t(1213) = -2.69$, $p = .008$, $d = .15$. The remaining behavioral risks in high school (marijuana use, property crime and multiple sexual partners) did not differ by choice of college residence.

For change across time (slopes), students who lived in private dormitories in college had larger increases in alcohol consumption whereas students living with family or in off-campus housing had smaller increases in alcohol use relative to students who lived in university dorms, $\chi^2 = 12.84$, $p < .001$. Despite the significant overall effect of residence, none of the individual contrasts were statistically significant (see Table 2 for coefficients, SEs, and effect sizes). The patterns of alcohol use for the four residence types are provided in Figure 4.

Discussion

Results provided support for both continuity and change as students transitioned from the adolescence of high school to the emerging adulthood of college. Those individuals who were most likely to engage in behavioral risks during their senior year in high school continued to engage more frequently in behavioral risks during their first year of college. Still evident, however, were increases in the number of sexual partners and the frequency of alcohol and marijuana use in college. At the same time, decreases in aggression, driving after drinking, and property crimes were observed during the transition from high school to college. Few gender differences were found, with men reporting only a higher prevalence of property crimes and greater frequency of marijuana use. No effects were found for SES, but Caucasian students reported greater involvement in all behavioral risks except having multiple sexual partners.

Decreased adult supervision, overall greater personal freedom, and increased availability and opportunity are likely contributors to the increases observed for drinking, marijuana use, and sexual behavior. College students have ready access to alcohol and marijuana and have the freedom to drink and smoke in their own residence. This is especially true in private dorms, which tend to have a lower student to Resident Assistant ratio. Likewise, the increased privacy afforded by living outside of their parents' home provides greater opportunity for sexual behavior. Unlike their high school experience, when students are typically under the watchful eye of parents, colleges offer an environment in which students feel immune to the close scrutiny of others. Students describe a sense of perceived anonymity in the college community where their drinking, drug use, and sexual behaviors are unknown to their parents and the majority of their peers (Wetherill & Fromme, 2007; Wetherill, Neal, & Fromme, 2008).

Still, not all behavioral risks that were prevalent in high school continued unabated into college, as aggression, property crimes, and driving after drinking decreased as students transitioned from high school to college. Changes in peer groups and alternative avenues for entertainment may lead to lower aggression and property crimes, respectively. Decreases in driving after drinking may largely be explained by the opportunity to drink in one's own residence (outside of parental supervision) and decreased access to vehicles on campus by UT freshman. As students move out of the dormitories and into off-campus residences, and begin to frequent bars and nightclubs, we expect to see increases in the frequency of driving after drinking that meets or exceeds levels observed in high school.

Both selection and socialization processes were evident during the transition from high school to college. This was especially evident for the relation between alcohol use and college residence. Students who elected to live in private dormitories in college were already drinking at heavier levels in high school, but they also increased their alcohol use at a greater rate once arriving at college than students who had other living arrangements. The smallest increases in alcohol use occurred for students who continued to live at home with family. More permissive

social norms and direct modeling by peers within college residences likely contribute to the escalation of risky patterns of behavior during the transition from high school to college.

Students from rural high schools reported heavier drinking, more frequent driving after drinking, and were more likely to have multiple sexual partners while in high school. The fact that changes in behavioral risks during the transition to college did not differ by type of high school residence, suggests that students adapted similarly to the college transition regardless of their high school background. Nonetheless, students from rural high schools remained at higher risk in college due to the pre-existing differences in behavioral risks upon college entry.

Implications and Limitations

As students who engaged in more frequent behavioral risks during the last three months of their senior year in high school continued to engage in the highest frequency of behavioral risks during their freshman year of college, early identification and intervention in high school may help reduce behavior problems in college. Whereas many colleges and universities offer universal prevention programs to all incoming students (often in conjunction with freshman orientation), a more effective approach may be to offer targeted programs to college bound high school seniors, especially men, Caucasian students, students from rural high schools, and those electing to live in private dormitories. Universities might also consider policies that promote greater supervision in private dorms.

It should be noted that the current study included a single cohort of college-bound high school students who attended a large public university in the Southwest United States. Results cannot be generalized to non-college bound adolescents who are transitioning into emerging adulthood but did not enter a 4-year college. The greater likelihood of marriage and full-time employment among those who do not attend 4-year colleges has important implications for the occurrence of behavioral risks among these individuals (Bachman et al., 2002). In addition, attrition analyses indicated that those at greatest risk were least likely to complete all assessments in the current study. Although a range of behavioral risks was still evident among those who completed, findings should be tempered to acknowledge that they may not apply to those individuals who are at greatest risk. Lastly, the current study examined only a few of the possible influences on changes in behavioral risks from high school to college. Further examination of the myriad of potential influences on students' behavior, including individual, social, and cultural factors, as well as longitudinal assessments across subsequent years in college will provide greater insights into the continuity and change in behavioral risks. The tendency to "mature out" of heavy drinking has been well established (Jochman & Fromme, in press) but "The UT Experience!" will provide an opportunity to examine changes and stability in other behavioral risks across the college years.

Acknowledgements

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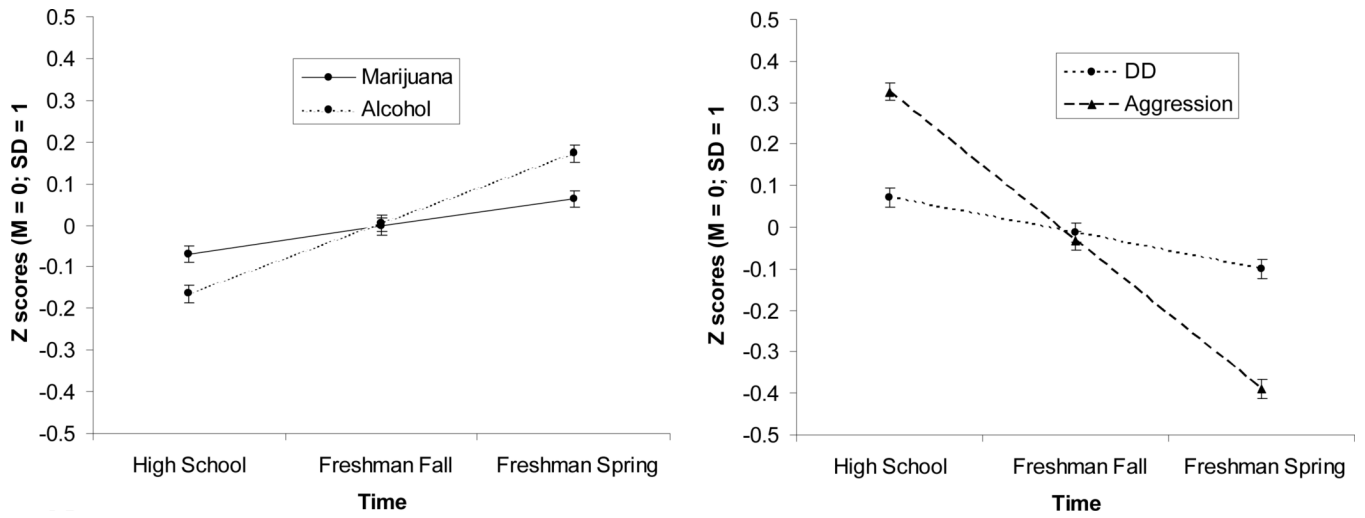
Figure 1.
Continuously measured behavioral risks that increased (alcohol and marijuana) and decreased (gambling, driving after drinking, aggression) from senior year in high school through freshman year in college
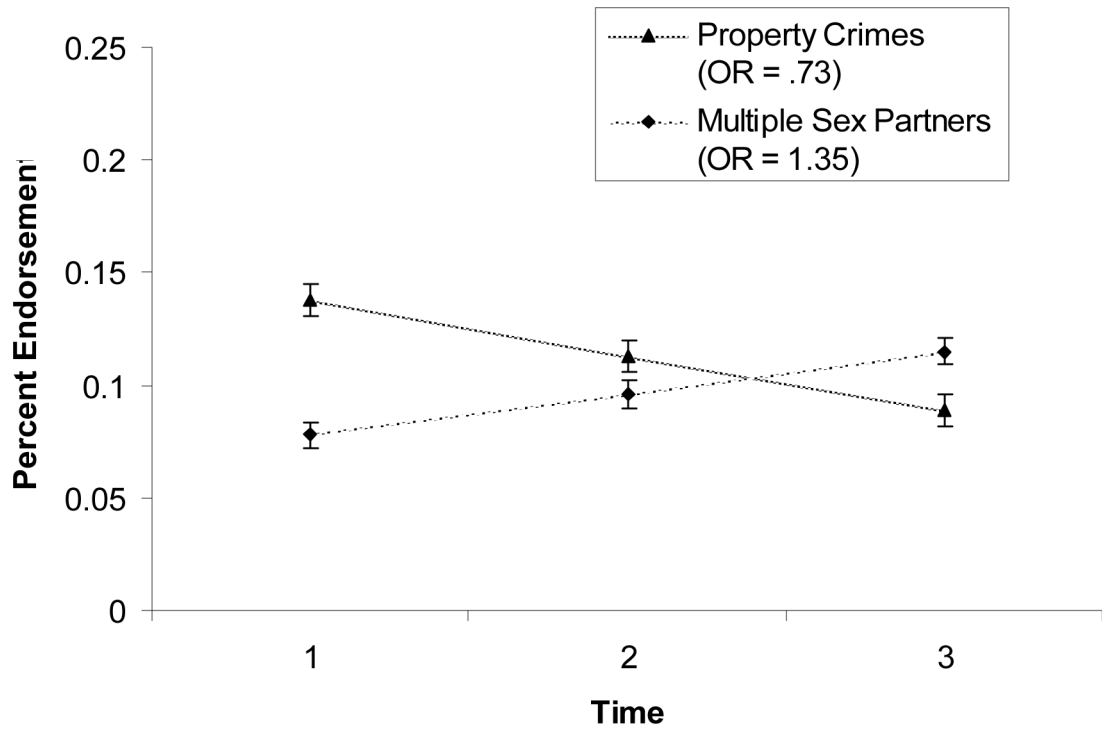
Figure 2.
Dichotomously measured behavioral risks from senior year in high school through freshman year in college

Figure 3.
Alcohol use from senior year in high school through freshman year in college by type of high school

Figure 4.
Alcohol use from senior year in high school through freshman year in college by type of college residence

Table 1

Behavioral risks during Senior Year in High School, and Fall and Spring Semesters of Freshman Year

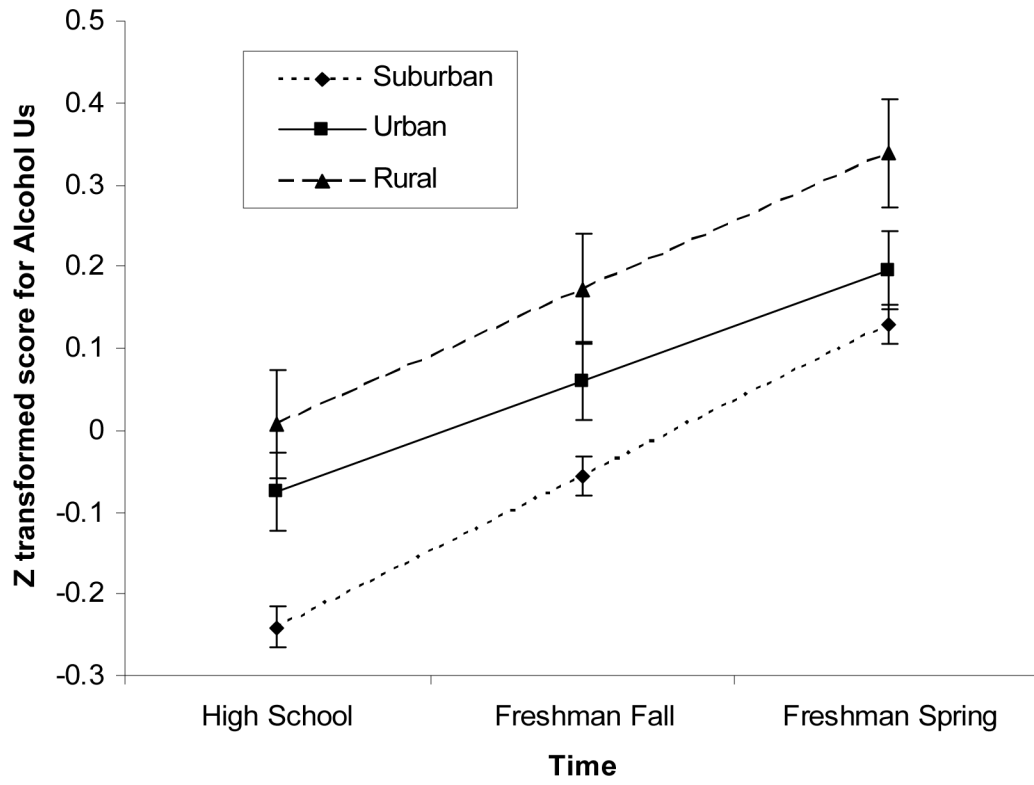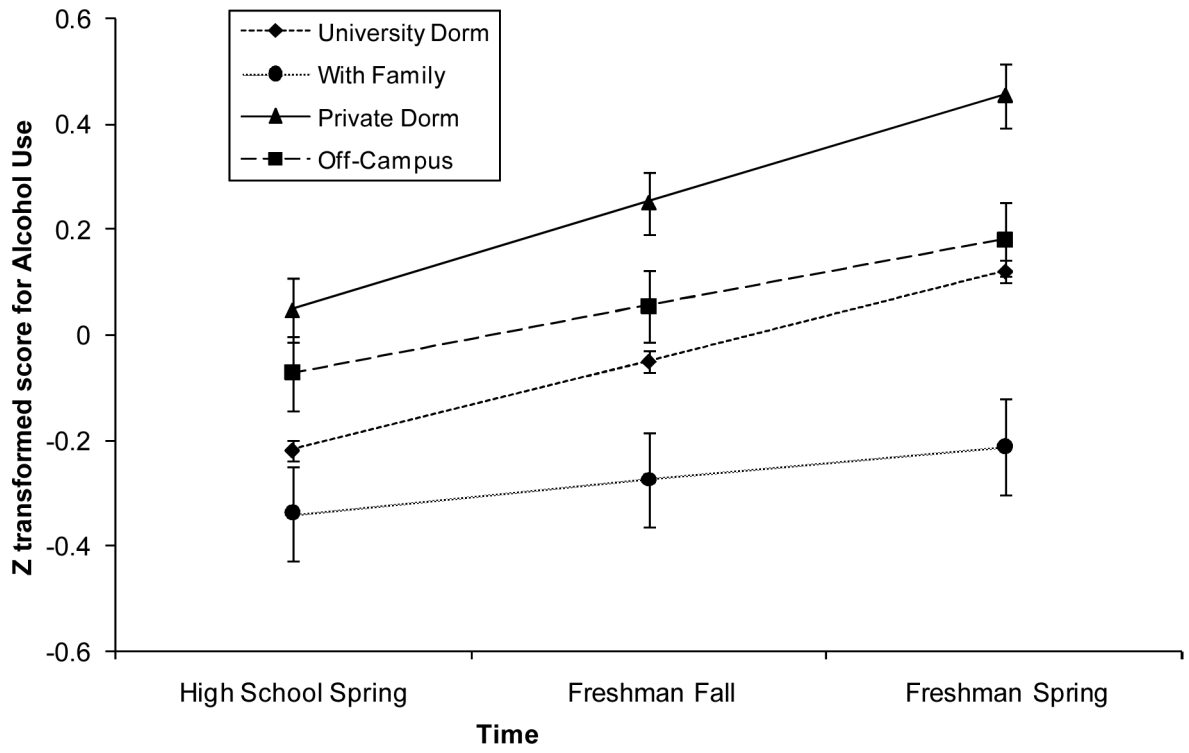| Risk Behavior	High School Survey			Fall Survey			Spring Survey		
	% Endorsement	Mean	SD	% Endorsement	Mean	SD	% Endorsement	Mean	SD
Drinking Days Average Week	51.2	0.90	0.89	61.7	1.19	1.06	63.4	1.23	1.05
Amount Typical Drinking Day	50.0	3.63	2.44	60.9	3.97	2.50	62.8	4.15	2.56
Drinking until "Drunk"	32.2	4.76	5.48	42.2	5.99	7.12	46.8	6.22	6.81
Binge Drinking (4 women; 5 men)	32.7	6.07	6.89	43.7	6.52	7.34	46.1	7.26	8.32
Driving After Drinking	26.3	3.93	2.57	16.8	2.98	2.10	18.4	3.39	2.38
Aggression	87.9	6.50	3.79	62.1	4.65	3.24	58.6	4.46	3.12
Marijuana Use	14.2	2.70	1.59	16.7	2.96	1.63	18.9	2.92	1.72
Property Crimes	13.7	2.33	1.64	11.1	2.16	1.68	8.7	2.12	1.52
Multiple Sex Partners (2 or more)	7.3	3.02	2.21	10.5	2.80	1.29	10.9	2.73	1.25

Notes. All variables were assessed over the 3 months prior to the assessment. Drinking variables and number of sexual partners were measured continuously. All other behavioral risks were measured on the following seven-point scale (0 = 0; 1 = 1; 2 = 2; 3 = 3–5; 4 = 6–10; 5 = 11–20; 6 = 21 or more). Means (SD) for multiple sexual partners represent values for students reporting two or more partners in the past 3 months. Means (SD) for all other behavioral risks represent values for those who report any participation in the behavior.

Table 2

Main Effects of HLM Model for Alcohol Use

Fixed Effect	High School					Change from High School to College				
	Coefficient	SE	T-ratio	p-value	d	Coefficient	SE	T-ratio	p-value	d
Intercept	−0.316	0.032	−9.755	.000		0.171	0.016	10.590	.000	
Gender	0.015	0.041	0.359	.719	.02	0.036	0.020	1.800	.072	.08
Urban	0.166	0.047	3.517	.001	.16	−0.050	0.022	−2.252	.024	.10
Rural	0.248	0.067	3.723	.000	.17	−0.020	0.030	−0.645	.519	.03
With Family	−0.183	0.090	−2.024	.043	.09	−0.100	0.039	−2.538	.012	.11
Private Dorm	0.301	0.061	4.934	.000	.22	0.048	0.026	1.832	.067	.08
Off-Campus	0.120	0.072	1.655	.098	.07	−0.043	0.030	−1.461	.144	.07

Note. Coefficients for all residence groups represent contrasts relative to campus dorms, and coefficients for area of residence represent contrasts relative to individuals from suburban high schools. Family structure was coded 0 for two-parent households and 1 for households without two resident parents such that positive coefficients reflect increased risk in households without two resident parents.