Published in final edited form as:

J Ethn Subst Abuse. 2010 ; 9(4): 301–319. doi:10.1080/15332640.2010.522898.

Substance Use Trajectories of Black and White Young Men from Adolescence to Emerging Adulthood: A Two-Part Growth Curve Analysis

Chioun Lee,

Center of Alcohol Studies, Rutgers University, 607 Allison Road, Piscataway, NJ 08854-8001, 732-445-2190 (office); 732-445-3500 (fax); chnlee68@gmail.com

Eun Young Mun,

Center of Alcohol Studies, Rutgers University, 607 Allison Road, Piscataway, NJ 08854-8001, 732-445-3580 (office); 732-445-3500 (fax); eymun@rci.rutgers.edu

Helene R. White, and

Center of Alcohol Studies, Rutgers University, 607 Allison Road, Piscataway, NJ 08854-8001, 732-445-3579 (office); 732-445-3500 (fax); hewwhite@rci.rutgers.edu

Patricia Simon Rutgers

Center of Alcohol Studies, Rutgers University, 607 Allison Road, Piscataway, NJ 08854-8001, 732-445-2190 (office); 732-445-3500 (fax); pasimon@eden.rutgers.edu

Abstract

This study examined trajectories of substance use among black and white young men (N=983) from adolescence to emerging adulthood using two-part growth curve analysis. Controlling for parental socioeconomic status, blacks were significantly less likely to use alcohol and hard drugs than whites at age 17 and drank significantly fewer drinks. The alcohol prevalence gap between blacks and whites further increased over time. Blacks in the older cohort had higher growth in the frequency of alcohol use than whites. Blacks and whites did not differ in prevalence of marijuana use, although blacks in the younger cohort reported higher growth in prevalence and higher frequency at age 17. Different prevention approaches may be needed to reduce substance use among blacks and whites.

Researchers and practitioners are interested in racial/ethnic differences in substance use and whether different prevention approaches are needed based on race and ethnicity. Therefore, it is important to understand racial/ethnic differences in the development of substance use patterns from adolescence into adulthood. Numerous studies have found higher prevalence rates of alcohol use and binge drinking for white adolescents, compared to black adolescents (Wallace & Murdoff, 2002). For example, data from the 2008 Monitoring the Future (MTF) survey showed that when annual prevalence rates were examined, whites were more likely to drink than blacks in the 8th, 10th and 12th grades (Johnston, O'Malley, Bachman, & Schulenberg, 2009). Similarly, results from the 2007 National Survey on Drug Use and Health (NSDUH) indicated that white, compared to black, adolescents between the ages of

Address correspondence and reprint requests to Helene R. White, Center of Alcohol Studies, Rutgers, The State University of New Jersey, 607 Allison Road, Piscataway, NJ 08854; hewwhite@rci.rutgers.edu, Phone: 732-445-3579, Fax: 732-445-3500..

¹ Figures 2 – 5 were drawn using estimated means at each age from two-group (race), two-part growth curve models analyzed separately for each cohort. The younger and older cohort trajectories were overlaid using MS Excel. Parental SES was not adjusted. However, given very small or nonexistent effects of parental SES on growth trajectories (see Table 3), we expect that there would be very little difference between the shown trajectories and those adjusted for parental SES.

12 and 17 were more likely to report current use of alcohol (Substance Abuse and Mental Health Services Administration [SAMHSA], 2008; see also Center for Disease Control [CDC], 2008). Community and school-based studies have replicated these national findings regarding racial differences in prevalence of alcohol use during adolescence (e.g., Warheit & Gil, 1998; Williams et al., 2007). Yet, some research suggests that whites, compared to blacks, are more likely to mature out of heavy drinking as they reach adulthood (Caetano & Kaskutas, 1998; Nielsen, 1999).

Findings regarding racial differences in marijuana use have been less consistent. According to the 2007 Youth Risk Behavior Survey (YRBS), black high school students were equally likely to have ever used marijuana as white high school students in all grades (CDC, 2008). Nonetheless, several studies have found higher rates of marijuana prevalence for white than black high school students (Tragesser, Beauvais, Swaim, Edwards, & Oetting, 2007; Wallace, Brown, Bachman, & Laveist, 2003), whereas others have found higher prevalence rates for black than white adolescents (Lee & Abdel-Ghany, 2004; White, Jarrett, Valencia, Loeber, & Wei, 2007). These inconsistencies may reflect the possibility that race differences in marijuana use depend on age and gender (Wallace, Bachman, et al., 2003; White, Loeber, & Chung, 2010). For example, results from the MTF survey showed that white students, compared to black students, reported lower annual prevalence in 8th grade but reported higher lifetime prevalence by the 12th grade (Johnston et al., 2009).

In contrast to marijuana, data on racial/ethnic differences in hard drug use during adolescence are fairly consistent. Cross-sectional data from the MTF study indicated that in 8th, 10th, and 12th grades, white adolescents reported higher rates of lifetime and 30-day use of hard drugs (i.e., inhalants, hallucinogens, cocaine, heroin, and stimulants) than black adolescents (Wallace, Bachman, et al., 2003). Moreover, according to the 2007 YRBS, white, compared to black, high school students reported higher lifetime prevalence rates for most hard drugs (e.g., cocaine, inhalants, hallucinogens, methamphetamine, and ecstasy). Lifetime prevalence for heroin use, however, appeared to be similar among both groups (CDC, 2008). As well, McCabe and colleagues (2007) found that before entering college and while in college, white students were more likely to report past year drug use than black students.

In sum, for the most part, white adolescents report higher rates of substance use than blacks, although differences may depend on developmental stage and type of drug examined. Nevertheless, drinking and drug use may have more negative consequences for blacks when they reach adulthood (Galvan & Caetano, 2003; Kandel, 1991; SAMHSA, 2010). Thus, although understanding racial differences in prevalence (use vs. nonuse) at the aggregate level may be important, a better understanding of use patterns, such as levels of substance use (quantity or frequency) over time within individuals, may be more useful for developing age-appropriate interventions. Longitudinal studies can provide information about developmental patterns of substance use at the individual level, allowing characterization of racial differences in terms of growth parameters such as levels of substance use at a key time point, linear rates of growth, and accelerated or decelerated growth rates in substance use over time.

A few recent studies have examined growth curves of drinking behavior from adolescence to emerging adulthood (Jacob, Bucholz, Sartor, Howell, & Wood, 2005; Oesterle et al., 2004; Tucker, Orlando, & Ellickson, 2003; White, Johnson & Buyske, 2000; Windle, Mun, & Windle, 2005). Orlando, Tucker, Ellickson, and Klein (2005) found that whites were more likely than blacks to engage in high levels of drinking and blacks continued to exhibit lower levels of drinking into their early 20s. Examining different trajectory groups, Flory et al. (2006) found that there was a nonuser group for blacks but not for whites. Similarly, blacks

were less likely to be found in trajectory classes characterized by relatively high levels of concurrent alcohol and cigarette use than in a class of nonusers, while the opposite was true for whites.

Within-individual analyses have also focused on racial differences in marijuana use trajectories. For example, Brown, Flory, Lynam, Leukefeld, and Clayton (2004) examined distinctive marijuana use frequency trajectories among black and white adolescents who were assessed in grades 6 through 10 and then again at age 20. The researchers found a nonuser group for whites but not for blacks.

To date, longitudinal studies have been limited in several ways in the information that they can provide about developmental patterns of drinking among blacks. First, several studies have not included enough blacks to compare rates by race (e.g., White et al., 2000; Windle et al., 2005). Second, substance use was not assessed at small enough intervals to catch important transitions such as the point of escalation (e.g., Horton, 2007; White et al., 2000). Third, some of the studies examined trajectories over a relatively short time period that did not extend much beyond late adolescence (e.g., Brown et al., 2004; Flory et al., 2006; Horton, 2007; Williams et al., 2007). Finally, only some of the studies reviewed above controlled for socioeconomic status (SES), which might be confounded with race in the United States (Adler & Snibbe, 2003).

Thus, our understanding of racial differences in developmental patterns of substance use from adolescence into emerging adulthood still has many gaps. The present study uses a two-part growth curve modeling approach to document natural trajectories of alcohol, marijuana, and hard drug use among black and white young men during key developmental periods from early adolescence to emerging adulthood using data from a large prospective longitudinal study. The two-part growth modeling will enable us to examine natural trajectories of substance use both in terms of prevalence (use vs. nonuse) and patterns of growth in substance use. A better understanding of substance use trajectories across black and white young men during adolescence and emerging adulthood is important as relatively little is known about racial differences in transitions during emerging adulthood (Schulenberg, Sameroff, & Cicchetti, 2004). Furthermore, substance use among young men is associated with numerous negative consequences, including violence, driving under the influence, reduced education attainment, and physical and mental health problems (Brook, Balka, & Whiteman, 1999; Hingson, Heeren, Winter, & Wechsler, 2005; Volkow, 2005).

Methods

Participants

Data were collected as part of the Pittsburgh Youth Study (PYS), which is a prospective longitudinal study of the development of delinquency, substance use, and mental health problems (Loeber, Farrington, Stouthamer-Loeber, & White, 2008). In 1987-88, random samples of first and seventh grade boys from the Pittsburgh public schools were selected for a screening. Approximately 850 boys in each grade (85% of the target sample) were screened. Families were paid for their participation, and informed written consent was obtained from both the participants and their legal guardians. The 15% nonparticipation rate did not result in sample selection bias in regard to achievement test results and racial distribution, which were the only two variables that could be compared from school records (Loeber et al., 2008). Boys who ranked in the top 30% in anti-social behavior (based on the screening assessment of boys, their primary caretaker and their teacher), as well as a relatively equal number of boys randomly selected from the remainder, were chosen for longitudinal follow-up, which resulted in 506 boys in the older cohort and 503 in the younger cohort. During the first three years of the study, the boys were followed up at six-

month intervals and then assessments were conducted annually. We combined the two six-month assessments in the early waves to create a uniform annual assessment at all ages.

Attrition has remained relatively low and the completion rate has averaged over 90% during 14 years of data collection. The sampling pool was 57.5% black, with the remainder almost all non-Hispanic white (less than 2% of the sample were Hispanic or Asian). In addition, 36.2% of the boys' families received public assistance or food stamps at the time the boys entered the study. For greater detail on participant selection and sample characteristics see Loeber et al. (2008). For this study, we limit the sample to blacks ($n = 562$) and whites ($n = 421$). For the trajectory analyses we use 14 annual time points (ages 12 through 25) for the older cohort. For the younger cohort we use 12 annual time points (ages 8 through 19) for alcohol use and 9 annual time points (ages 11 through 19) for marijuana and hard drug use because prevalence of the latter two substances was almost nonexistent prior to age 11.

Measures

Alcohol, marijuana, and other drug use—At each wave, participants were asked to indicate the number of times in the past year (a frequency variable ranging from zero to 365 days) that they used each of the following substances separately: beer, wine, hard liquor, marijuana or hashish, hallucinogens, cocaine, crack, heroin, phencyclidine (PCP), tranquilizers, barbiturates, codeine, amphetamines, and other prescription medications for nonmedical reasons. Alcohol use frequency was scored as the sum of the frequencies for beer, wine, and hard liquor. Hard drug use was scored as the sum across the latter 10 substances listed above. For alcohol, participants also reported on their typical quantity of use of beer, wine, and hard liquor, ranging from 0 = *none* to 5 = *6+ drinks*. We took the maximum quantity of beer, wine, and hard liquor for alcohol quantity, which is consistent with measures in alcohol use research (Sobell & Sobell, 1995). Self-report substance use measures are widely used as valid and reliable measures in the literature (O'Malley, Bachman, & Johnston, 1983).

Race and parental socioeconomic status—Race was coded 1 for blacks and 0 for whites. Parental socioeconomic status (SES) was measured based on the Hollingshead's (1975) index of social status from data collected from the primary caretaker at the first follow-up assessment. The SES index is the product of occupational status and highest educational level (the higher score attained between two caretakers or the score attained by the single caretaker). SES scores ranged from 6 to 66 (mean = 35.1, $SD = 12.8$ for the younger cohort; mean = 36.5, $SD = 13.1$ for the older cohort). In this analysis, SES was grand-mean centered. Whites (noncentered means = 38.6, 38.7) reported significantly higher SES than blacks (noncentered means = 32.6, 34.8) in the youngest, $t(447) = 5.23$, $p < .01$, and oldest $t(447) = 3.24$, $p < .01$, cohorts, respectively.

Analysis

Analyses were conducted separately for each cohort given their different age periods assessed and potential cohort differences in patterns of substance use (see White et al., 2010). To address our study questions, we employed a two-part latent growth curve modeling approach (Olsen & Schafer, 2001). Two-part growth modeling is advantageous for modeling substance use measures that typically show excess zeros and extremely skewed distributions. A two-part model analyzes two distinctive components of substance use behavior simultaneously in one model: 1) whether the individual engaged in this behavior (i.e., binary component of a behavior; 1 = use; 0 = no use) and 2) how frequently or extensively the individual engaged in this behavior given that the individual reported some levels of substance use (i.e., continuous component; non-zero responses). Change across time in the log-odds that an individual used a substance is modeled in the first part of the

analysis in tandem with change in the conditional frequency or quantity of substance use across time. Thus, the analysis addresses two important questions in the substance use literature: 1) the probability of substance use initiation and prevalence, and subsequent change over time; and 2) the growth trajectory of substance use frequency or quantity conditional on use.

To identify the overall trajectory patterns of alcohol, marijuana, and hard drug use, we first tested unconditional models separately for each cohort and for each substance use behavior. We tested both linear (i.e., a constant rate of increase or decrease) and quadratic (i.e., change in the rate of a linear increase or decrease) trends of growth for use vs. nonuse, as well as for conditional frequencies of alcohol and marijuana use and conditional quantity of alcohol use. The intercept was centered at age 17 for both cohorts to derive substantively more meaningful, and mathematically more efficient estimates. In each of the two-part models, we estimated two covariance elements between latent growth factors: 1) between the two intercept covariances to model that the individual differences in the likelihood of substance are related to the individual differences in the severity of substance use at given age (i.e., age 17), and 2) between the intercept and the linear slope in the second, continuous component of substance use behavior to specify that the individual differences in substance use levels at age 17 are related to the individual differences in rates of change. When the variance of the quadratic slope was close to zero, or not significantly different from zero, it was fixed to zero because we assumed there was little or no significant heterogeneity across individuals around the fitted mean trajectory.

After determining the shape of the trajectory, we tested conditional models that included race and SES (see Figure 1). The fit of model was assessed using the Bayesian Information Criterion (BIC). For the present analysis, we weighted the data using individual sampling weights to adjust for the oversampling of boys at risk for antisocial behaviors within each race group, thus representing the two cohort samples from the original screening populations of the PYS study. The participation rate exceeded 90% for each and every assessment wave, and the average number of missing observations through the study period was less than 10%. Using Mplus (Muthén & Muthén, 2009), parameters were directly estimated using the Maximum Likelihood estimation method with robust standard errors.

Results

Table 1 presents the results from the unconditional two-part growth curve models for the alcohol use frequency and quantity measures. The probability of alcohol use (i.e., prevalence) increased linearly for the younger cohort (ages 8 to 19), while the rate of increase accelerated for the older cohort (ages 12 to 25). For the younger cohort, the mean conditional frequency of alcohol use accelerated whereas the mean conditional quantity of alcohol use decelerated over time. Reflecting differences in the period of observation, for the older cohort, both the mean frequency and quantity of alcohol use exhibited decelerated growth patterns. The results for marijuana use and hard drug use are shown in Table 2. Both the younger and older cohorts exhibited decelerated growth trajectories in terms of the probability to use marijuana and the conditional frequency of marijuana use. For hard drug use, we tested only the binary component (use vs. nonuse) because the average prevalence rate of hard drug use was less than 9% for both the younger (ranging from 0.2% to 7.3%) and older (ranging from 0.3% to 8.3%) cohorts. The results showed that a linear growth model approximated hard drug use data well for the younger cohort, while decelerated growth trajectories fit well for the older cohort.

Racial Differences in Substance Use Trajectories

To investigate racial differences in substance use trajectories while adjusting for parental SES, conditional growth models were analyzed (see Figure 1 and Table 3). Results indicated that blacks were significantly less likely than whites to use alcohol at age 17 in both the younger and older cohorts (see Figures 2 and, 3a), with the racial gap in the prevalence of alcohol use further increasing over time in both cohorts. Blacks in both cohorts drank significantly fewer drinks than whites at age 17 (Figure 3b). Figure 3b shows the results based on log transformed data. Using the original scale unit, at age 17 the average black drinker in the older cohort drank approximately 2.5 drinks per occasion compared to an average of 3.3 drinks for whites. In the younger cohort, the average black drinker drank 1.3 drinks per occasion compared to 2.5 drinks for the white drinkers. Blacks in the younger cohort also showed slower rates of growth in the quantity of alcohol use than whites. However, blacks in the older cohort had higher rates of growth in the frequency of alcohol use than whites. Higher levels of parental SES were associated with higher rates of growth in the probability and conditional frequency and quantity of alcohol use among the older cohort.

With respect to marijuana, the prevalence of marijuana use did not differ across blacks and whites at age 17, although there was a trend of blacks reporting a higher probability of use than whites ($p = 0.06$ and 0.10 , for the younger and older cohorts, respectively). Blacks in the older cohort reported higher rates of growth in the prevalence of marijuana and higher conditional frequencies at age 17 than whites (see Table 3 and Figures 4a and 4b). In both cohorts, blacks were significantly less likely than whites to use hard drugs at age 17 (see Table 3 and Figure 5). Higher levels of parental SES were associated with greater rates of increase in the probability of marijuana and hard drug use in the older cohort. However, in the younger cohort, higher levels of parental SES were associated with lower probability to use marijuana at age 17.

Discussion

The purpose of this study was to examine the racial differences in both the probability of use (i.e., prevalence) and the frequency and quantity of substance use from adolescence into emerging adulthood. Overall, the results indicated that blacks were less likely to engage in drinking than whites, with this gap further increasing over time during adolescence and into emerging adulthood. In addition, blacks reported fewer drinks than whites on their drinking occasions. These findings are consistent with a recent national epidemiological survey that reported the prevalence rates of alcohol use and heavy drinking for blacks aged 18 and older were significantly lower than the national adult average (SAMHSA, 2010), as well as with available longitudinal studies (e.g., Horton, 2007). Thus, the different patterns of alcohol use for whites and blacks suggest that white adolescents and young adults may be at a higher risk for negative consequences of alcohol use, which are directly related to intoxication. The present study also discovered that, although blacks may have fewer drinks on their drinking occasions, their frequency of alcohol use increased at the faster rate than whites especially during emerging adulthood. Thus, as these young men reach adulthood, blacks may drink significantly more frequently than whites, which could account for the higher rates of negative consequences experienced by black compared to white adults (Galvan & Caetano, 2003; Kandel, 1991; SAMHSA, 2010).

The prevalence of marijuana use at age 17 was not statistically different for blacks and whites, although there was a trend of blacks reporting higher probability of use than whites. In the older cohort, blacks also reported higher frequencies of use at age 17 than whites, and higher rates of growth in the probability of use. Thus, the findings on marijuana use suggest that racial differences in developmental patterns of marijuana use may not fully emerge until

late adolescence. However, similar to the inconsistent findings for racial differences in marijuana use in the literature, our findings indicate that evidence of racial differences in marijuana use is strong in one cohort but not so in the other perhaps having to do with historical changes in norms surrounding marijuana use (Hawkins, Hill, Guo, & Battin-Pearson, 2002).

We found that blacks in both cohorts were less likely to use hard drugs at age 17. This finding is consistent with other studies (e.g., CDC, 2008; McCabe et al., 2007; Wallace, Bachman, et al., 2003). In contrast, a recent national epidemiological survey found higher rates of hard drug use among blacks compared to whites, although that study sampled adults (SAMHSA, 2010). These differences across studies could also reflect differential availability of substances in Pittsburgh compared to nationally.

The effects of parental SES on substance use trajectories were generally positive. Higher levels of parental SES were related to greater rates of growth in the prevalence of alcohol, marijuana, and hard drugs in the older cohort. In addition, higher levels of parental SES were associated with higher rates of increase in the frequency of alcohol use in the older cohort. However, in the younger cohort, those with higher levels of parental SES were less likely to use marijuana at age 17. Previous research has found no clear pattern of association between parental SES and alcohol and marijuana use among adolescents (Hanson & Chen, 2007). While Droomers, Schrijvers, Casswell, and Mackenbach (2003) found father's occupational status was negatively associated with alcohol consumption, Stewart and Power (2002) found there was no significant association between parental education and children's alcohol consumption. Studies of adults, on the other hand, have consistently found that higher SES is related to greater prevalence of drinking (e.g., Parker & Harford, 1992). Likewise, In relation to marijuana use, some studies found that parental SES was negatively associated with marijuana use (Miller & Miller, 1997; Wichstrom & Pederson, 2001), whereas others found a positive association (Dornbusch, Erickson, & Laird, 2001; Youniss, McLellan, & Su, 1999). Studies on the relationship between hard drug use and SES have generally found that lower SES is related to higher rates of hard drug use during adolescence and that lower SES in adolescence predicts greater drug use in adulthood (Curran & White, 1998).

This study had several limitations that need to be considered. First, we could not examine trajectories of the frequency of hard drug use because of its low prevalence in this sample. Second, no comparable data were available for girls. Given that racial differences in substance use appear to vary by gender (White et al., 2010), research is needed to study girls/young women. Third, the sample was taken from only one geographical area; thus, the findings may not generalize to other areas of the country. Fourth, we only focused on blacks and whites because other ethnic groups' representation did not allow any meaningful investigation in the sample. Finally, this sample was considered high risk, which could inflate levels of substance use. However, we weighted the sample back to the original screening group in order to overcome this problem.

This present study had several strengths when compared to the previous research in this area. First, we followed youth annually from childhood to early adulthood without any gaps in data collection. Second, this study had a large sample evenly divided by blacks and whites. Third, we examined both the frequency and quantity of alcohol consumption, while taking into account the lower prevalence rates for blacks (when compared to whites). Fourth, we adjusted for parental SES to avoid potential confounding between race and socioeconomic status. Finally, we used two birth cohorts that did not share the historical and social circumstances in substance use and replicated the major findings. The findings from this present study underscore the importance of a better understanding of racial differences

in alcohol, marijuana, and hard drug use. Future studies should examine how use patterns differentially impact outcomes for blacks and whites. Additionally, future research should examine the cultural and environmental factors that affect patterns of substance use by race, which may inform the development of racial-specific preventive interventions.

Acknowledgments

This research was supported, in part, by grants from National Institute of Alcohol Abuse and Alcoholism (ARRA R01 AA016798), National Institute of Mental Health (P30 MH079920; R01 MH73941), National Institute on Drug Abuse (P20 DA17552; R01 DA 411018), the Office of Juvenile Justice and Delinquency Prevention (OJJDP 2005-JK-FX-0001; 96-MU-FX-0012), and the Department of Health of the Commonwealth of Pennsylvania. Points of view in this document are those of the authors and do not necessarily represent the official position or policies of the U.S. Department of Justice. We thank Kristen McCormick and Rebecca Stallings for their assistance in preparing the data files.

References

- Adler NE, Snibbe AC. The role of psychosocial processes in explaining the gradient between socioeconomic status and health. *Current Directions in Psychological Science*. 2003; 12:119–123.
- Brook JS, Balka EB, Whiteman M. The risks for late adolescence of early adolescent marijuana use. *American Journal of Public Health*. 1999; 89:1549–1554. [PubMed: 10511838]
- Brown TL, Flory K, Lynam DR, Leukefeld C, Clayton RR. Comparing the Developmental trajectories of marijuana use of African American and Caucasian adolescents: Patterns, antecedents, and consequences. *Experimental and Clinical Psychopharmacology*. 2004; 12:47–56. [PubMed: 14769099]
- Caetano R, Kaskutas LA. Trends in alcohol consumption patterns among whites, blacks and Hispanics: 1984 and 1995. *Journal of Studies on Alcohol*. 1998; 56(5):558–565. [PubMed: 7475037]
- Center for Disease Control. Youth Risk Behavior Surveillance - United States, 2007. *Morbidity & Mortality Weekly Report*. 2008; 57(SS-4):1–131. [PubMed: 18185492]
- Curran, GM.; White, HR. Adolescents at risk: Low socioeconomic status and early onset drug use in the U.S.. In: Jayasuriya, DC.; Nayak, RK.; Wells, A., editors. *Global drugs law*. Har-Anand Publications; New Delhi, India: 1998. p. 414-429.
- Dornbusch SM, Erickson KG, Laird J. The relation of family and school attachment to adolescent deviance in diverse groups and communities. *Journal of Adolescent Research*. 2001; 16:396–422.
- Droomers M, Schrijvers CTM, Casswell S, Mackenbach JP. Occupational level of the father and alcohol consumption during adolescence; Patterns and predictors. *Journal of Epidemiology and Community Health*. 2003; 57:704–710. [PubMed: 12933777]
- Flory K, Brown TL, Lynam DR, Miller JD, Leukefeld C, Clayton RR. Developmental patterns of African American and Caucasian adolescents' alcohol use. *Cultural Diversity and Ethnic Minority Psychology*. 2006; 12:740–746. [PubMed: 17087533]
- Galvan FH, Caetano R. Alcohol use and related problems among ethnic minorities in the United States. *Alcohol Research & Health*. 2003; 27:87–94. [PubMed: 15301403]
- Hawkins, JD.; Hill, KG.; Guo, J.; Battin-Pearson, SR. Norms and transitions in substance use.. In: Kandel, DB., editor. *Stages and pathways of involvement in drug use: Examining the gateway hypothesis*. Cambridge University Press; Cambridge, UK: 2002. p. 42-64.
- Hanson MD, Chen E. Socioeconomic status and substance use behaviors in adolescents: The role of family resources versus family social status. *Journal of Health Psychology*. 2007; 12:32–35. [PubMed: 17158838]
- Hingson R, Heeren T, Winter M, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24: Changes from 1998 to 2001. *Annual Review of Public Health*. 2005; 26:259–279.
- Hollingshead, AB. Four factor index of social status. Department of Sociology at Yale University, MA; 1975. Unpublished manuscript

- Horton EG. Racial differences in the effects of age of onset on alcohol consumption and development of alcohol-related problems among males from mid-adolescence to young adulthood. *Journal of Ethnicity in Substance Abuse*. 2007; 6:1–13. [PubMed: 17430813]
- Jacob T, Bucholz KK, Sartor CE, Howell DN, Wood PK. Drinking trajectories from adolescence to the mid-forties among alcohol dependent males. *Journal of Studies on Alcohol*. 2005; 66:745–755. [PubMed: 16459936]
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the Future national survey results on drug use, 1975-2008: Vol. I, Secondary school students (No. 09-7402). National Institute on Drug Abuse; Bethesda, MD: 2009.
- Kandel DB. The social demography of drug use. *Milbank Quarterly*. 1991; 69:365–414. [PubMed: 1805113]
- Lee YG, Abdel-Ghany M. American youth consumption of licit and illicit substances. *International Journal of Consumer Studies*. 2004; 28:454–465.
- Loeber, R.; Farrington, DP.; Stouthamer-Loeber, M.; White, HR., editors. Violence and serious theft: Development and prediction from childhood to adulthood. Routledge; New York: 2008.
- McCabe SE, Morales M, Cranford JA, Delva J, McPherson MD, Boyd CD. Race/ethnicity and gender differences in drug use and abuse among college students. *Journal of Ethnicity and Substance Abuse*. 2007; 6:75–95.
- Miller DS, Miller TQ. A test of socioeconomic status as a predictor of initial marijuana use. *Addictive Behaviors*. 1997; 22:479–489. [PubMed: 9290858]
- Muthén, LK.; Muthén, BO. Mplus user's guide. 5th ed. Author; Los Angeles: 2009.
- Nielsen AL. Testing Sampson and Laub's life course theory: Age, race/ethnicity and drunkenness. *Deviant Behavior*. 1999; 20:129–151.
- Olsen MK, Schafer JL. A two-part random effect model for semicontinuous longitudinal data. *Journal of American Statistical Association*. 2001; 96:730–745.
- O'Malley PM, Bachman JG, Johnston LD. Reliability and consistency in self-reports of drug use. *Substance Use & Misuse*. 1983; 18:805–824.
- Orlando M, Tucker JS, Ellickson PL, Klein DJ. Concurrent use of alcohol and cigarettes from adolescence to young adulthood: An examination of developmental trajectories and outcomes. *Substance Use & Misuse*. 2005; 40:1051–1069. [PubMed: 16040368]
- Oesterle S, Hill KG, Hawkins JD, Guo J, Catalano RF, Abbott RD. Adolescent heavy episodic drinking trajectories and health in young adulthood. *Journal of Studies on Alcohol*. 2004; 65:204–212. [PubMed: 15151351]
- Parker DA, Harford TC. The epidemiology of alcohol consumption and dependence across occupations in the United States. *Alcohol Health & Research World*. 1992; 16:97–105.
- Schulenberg J, Sameroff AJ, Cicchetti D. The transition to adulthood as a critical juncture in the course of psychopathology and mental health. *Development and Psychopathology*. 2004; 16:799–806. [PubMed: 15704815]
- Sobell, LC.; Sobell, MB. Alcohol consumption measures.. In: Allen, JP.; Columbus, M., editors. Assessing alcohol problems. National Institute on Alcohol Abuse and Alcoholism; Bethesda, MD: 1995. p. 55-73.
- Stewart C, Power TG. Identifying patterns of adolescent drinking: A tri-ethnic study. *Journal of Studies on Alcohol*. 2002; 63:156–168. [PubMed: 12033692]
- Substance Abuse and Mental Health Services Administration. Results from the 2007 National Survey on Drug Use and Health: National findings (No. SMA 08-4343). Office of Applied Studies; Rockville, MD: 2008.
- Substance Abuse and Mental Health Services Administration. [March 4, 2010] New study reveals that black adults' alcohol use and binge drinking levels are below the national average. 2010. from <http://www.samhsa.gov/newsroom/advisories/100224alcohol2257.aspx>
- Tragesser SL, Beauvais F, Swaim RC, Edwards RW, Oetting ER. Parental monitoring, peer drug involvement, and marijuana use across three ethnicities. *Journal of Cross-Cultural Psychology*. 2007; 38:670–694.
- Tucker JS, Orlando M, Ellickson PL. Patterns and correlates of binge drinking trajectories from early adolescence to young adulthood. *Health Psychology*. 2003; 22:79–87. [PubMed: 12558205]

- Volkow ND. NIDA intensifies focus on marijuana abuse. *NIDA Notes*. 2005; 20:1.
- Wallace JM Jr, Bachman JG, O'Malley PM, Schulenberg J, Cooper SM, Johnston LD. Gender and ethnic differences in smoking, drinking, and illicit drug use among American 8th, 10th, and 12th grader students, 1976-2000. *Addiction*. 2003; 98:225–234. [PubMed: 12534428]
- Wallace JM Jr, Brown TN, Bachman JG, Laveist TA. The influence of race and religion on abstinence from alcohol, cigarettes and marijuana among adolescents. *Journal of Studies on Alcohol*. 2003; 64:843–848. [PubMed: 14743948]
- Wallace JM Jr, Murdoff JR. Preventing substance abuse among African American children and youth: Race differences in risk factor exposure and vulnerability. *Journal of Primary Prevention*. 2002; 22:235–261.
- Warheit, GJ.; Gil, AG. Substance use and other social deviance.. In: Vega, WA.; Gil, AG., editors. *Drug use and ethnicity in early adolescence*. Plenum Press; New York: 1998. p. 37-70.
- White HR, Jarrett N, Valencia EY, Loeber R, Wei E. Stages and sequences of initiation and regular substance use in a longitudinal cohort of African-American and white male adolescents. *Journal of Studies on Alcohol and Drugs*. 2007; 68:173–181. [PubMed: 17286335]
- White HR, Johnson V, Buyske S. Parental modeling and parenting behavior effects on offspring alcohol and cigarette use: A growth curve analysis. *Journal of Substance Abuse*. 2000; 12:287–310. [PubMed: 11367605]
- White, HR.; Loeber, R.; Chung, T. Racial differences in substance use: using longitudinal data to fill gaps in knowledge.. In: Thomas, YF.; Price, LN., editors. *Drug use trajectories among minority youth*. Springer; New York: 2010. in press
- Wichstrom L, Pederson W. Use of anabolic-androgenic steroids in adolescence: Winning, looking good or being bad? *Journal of Studies on Alcohol*. 2001; 62:5–13. [PubMed: 11271964]
- Williams JH, Van Dorn RA, Ayers CD, Bright CL, Abbott RD, Hawkins JD. Understanding race and gender differences in delinquent acts and alcohol and marijuana use: a developmental analysis of initiation. *Social Work Research*. 2007; 31:71–81.
- Windle M, Mun EY, Windle RC. Adolescent-to-young adulthood heavy drinking trajectories and their prospective predictors. *Journal of Studies on Alcohol*. 2005; 66:313–322. [PubMed: 16047520]
- Youniss J, McLellan JA, Su Y. The role of community service in identity development: Normative, unconventional, and deviant orientations. *Journal of Adolescent Research*. 1999; 14:248–261.

Figure 1.

Path diagram for the two-part latent growth model reported in Table 3; the top portion of diagram describes a binary part of model (nonuse vs. use) while the bottom part depicts a continuous part of model (nonzero frequency of use). Covariances were estimated between intercepts of the binary and continuous growth models, and between intercepts and linear slopes of the continuous part. Intercepts were at age 17 for the younger and older cohorts.

Figure 2. Estimated mean growth trajectories of alcohol use probability (Figure 2a) and conditional nonzero frequency levels (Figure 2b) by race and cohort. YW = Younger Cohort White; YB = Younger Cohort Black; OW = Older Cohort White; and OB = Older Cohort Black.

Figure 3.

Estimated mean growth trajectories of alcohol use probability (Figure 3a) and conditional nonzero quantity levels (Figure 3b). YW = Younger Cohort White; YB = Younger Cohort Black; OW = Older Cohort White; and OB = Older Cohort Black.

Figure 4.

Estimated mean growth trajectories of marijuana use probability (Figure 4a) and conditional nonzero frequency levels (Figure 4b) by race and cohort. YW = Younger Cohort White; YB = Younger Cohort Black; OW = Older Cohort White; and OB = Older Cohort Black.

Figure 5.
Estimated mean growth trajectories of hard drug use probability by race and cohort. YW = Younger Cohort White; YB = Younger Cohort Black; OW = Older Cohort White; and OB = Older Cohort Black.

Table 1

Two-Part Unconditional Growth Model Results for Alcohol Use

	Younger Cohort		Older Cohort	
	Ages 8 - 19		Ages 12 - 25	
	Est.	SE	Est.	SE
<u>Alcohol Use Frequency</u>				
<i>Means:</i>				
Use intercept at age 17	0.00 ^a	--	0.00 ^a	--
Use linear slope	3.29 ^{**}	0.21	3.58 ^{**}	0.30
Use quadratic slope			1.51 [*]	0.75
Frequency intercept	2.42 ^{**}	0.07	2.61 ^{**}	0.06
Frequency linear slope	4.22 ^{**}	0.23	3.47 ^{**}	0.10
Frequency quadratic slope	2.15 ^{**}	0.29	-2.33 ^{**}	0.19
<i>Covariances:</i>				
Use intercept with frequency intercept	0.63 ^{**}	0.10	1.11 ^{**}	0.13
Frequency intercept with frequency linear slope	0.96 ^{**}	0.15	0.07	0.07
<i>Variances:</i>				
Use intercept	1.92 ^{**}	0.24	2.71 ^{**}	0.35
Use linear slope	3.59 ^{**}	0.72	14.88 ^{**}	2.49
Use quadratic slope			70.58 ^{**}	14.93
Frequency intercept	1.00 ^{**}	0.10	0.77 ^{**}	0.08
Frequency linear slope	1.35 ^{**}	0.26	1.14 ^{**}	0.20
Frequency quadratic slope	0.00 ^b	--	1.52 ^{**}	0.51
<u>Alcohol Use Quantity</u>				
<i>Means:</i>				
Use intercept at age 17	0.00 ^a	--	0.00 ^a	--
Use linear slope	3.36 ^{**}	0.21	3.04 ^{**}	0.29
Use quadratic slope			2.40 ^{**}	0.75
Quantity intercept	1.13 ^{**}	0.02	1.16 ^{**}	0.02
Quantity linear slope	0.96 ^{**}	0.07	0.91 ^{**}	0.04
Quantity quadratic slope	-0.42 ^{**}	0.10	-1.01 ^{**}	0.06
<i>Covariances:</i>				
Use intercept with frequency intercept	0.21 ^{**}	0.03	0.22 ^{**}	0.03
Quantity intercept with quantity linear slope	0.04 ^{**}	0.01	-0.03 ^{**}	0.01
<i>Variances:</i>				

	Younger Cohort		Older Cohort	
	Ages 8 - 19		Ages 12 - 25	
	Est.	SE	Est.	SE
Use intercept	1.98 ^{**}	0.25	2.46 ^{**}	0.31
Use linear slope	4.33 ^{**}	0.82	13.48 ^{**}	2.24
Use quadratic slope			69.22 ^{**}	14.17
Quantity intercept	0.06 ^{**}	0.01	0.06 ^{**}	0.01
Quantity linear slope	0.11 ^{**}	0.03	0.09 ^{**}	0.02
Quantity quadratic slope	0.00 ^b	--	0.00 ^b	--

Note.

^aConstrained to be zero by default

^bConstrained to be zero.

*
 $p < .05$

**
 $p < .01$.

Table 2

Two-Part Unconditional Growth Model Results for Marijuana and Hard Drug Use

	Younger Cohort		Older Cohort	
	Ages 11 - 19		Ages 12 - 25	
	Est.	SE	Est.	SE
<u>Marijuana Use Frequency</u>				
<i>Means:</i>				
Use intercept at age 17	0.00 ^a	--	0.00 ^a	--
Use linear slope	1.34 ^{**}	0.57	6.51 ^{**}	0.49
Use quadratic slope	-17.91 ^{**}	1.76	-11.39 ^{**}	1.01
Frequency intercept	3.52 ^{**}	0.11	2.93 ^{**}	0.10
Frequency linear slope	2.25 ^{**}	0.48	4.04 ^{**}	0.27
Frequency quadratic slope	-5.44 ^{**}	1.42	-4.66 ^{**}	0.45
<i>Covariances:</i>				
Frequency intercept with frequency linear slope	1.04	0.61	-0.33	0.39
<i>Variances:</i>				
Use intercept	6.33 ^{**}	0.86	7.64 ^{**}	0.99
Use linear slope	26.37 ^{**}	6.18	22.30 ^{**}	4.36
Use quadratic slope	0.00 ^b	--	20.24 ^{**}	10.14
Frequency intercept	1.48 ^{**}	0.18	1.34 ^{**}	0.23
Frequency linear slope	8.75 ^{**}	3.58	3.85 ^{**}	0.87
Frequency quadratic slope	0.00 ^b	--	0.00 ^b	--
<u>Hard Drug Use Frequency</u>				
<i>Means:</i>				
Use intercept at age 17	0.00 ^a	--	0.00 ^a	--
Use linear slope	5.15 ^{**}	0.81	3.17 ^{**}	0.49
Use quadratic slope			-7.30 ^{**}	1.20
<i>Variances:</i>				
Use intercept	7.62 ^{**}	1.95	5.47 ^{**}	0.86
Use linear slope	5.87	3.62	13.07 ^{**}	3.82
Use quadratic slope			0.00 ^b	--

*Note.** $p < .05$ ^aConstrained to be zero by default^bConstrained to be zero.

**
 $p < .01$.

Table 3

Parameter Estimates and Standard Errors of Alcohol, Marijuana, and Hard Drug Use

	Younger Cohort (Ages 8-19, 11-19)						Older Cohort (Ages 12-25)					
	Intercept			Linear Slope			Quadratic Slope			Intercept		
	Est.	SE		Est.	SE		Est.	SE		Est.	SE	
<i>Alcohol Use Frequency</i>												
Part 1: Use vs. nonuse	0.00 ^a	--		5.00 ^{**}	0.63		0.00 ^a	--		3.89 ^{**}	0.44	
Black (1; 0 = White)	-1.00 ^{**}	0.19		-1.13 ^{**}	0.36		-0.63 ^{**}	0.20		-0.61	0.54	
Parental SES	-0.01	0.01		-0.02	0.01		-0.00	0.01		0.05 [*]	0.02	
Part 2: Conditional use	2.84 ^{**}	0.23		4.68 ^{**}	0.39	2.14 ^{**}	2.62 ^{**}	0.09		3.21 ^{**}	0.15	
Black (1; 0 = White)	-0.27	0.14		-0.30	0.21		-0.01	0.12		0.43 [*]	0.20	
Parental SES	-0.00	0.01		0.00	0.01		0.00	0.00		0.02 [*]	0.01	
<i>Alcohol Use Quantity</i>												
Part 1: Use vs. nonuse	0.00 ^a	--		5.13 ^{**}	0.64		0.00 ^a	--		3.53 ^{**}	0.43	
Black (1; 0 = White)	-1.00 ^{**}	0.19		-1.18 ^{**}	0.36		-0.63 ^{**}	0.20		-0.80	0.53	
Parental SES	-0.01	0.01		-0.03	0.01		-0.00	0.01		0.04 [*]	0.02	
Part 2: Conditional use	1.47 ^{**}	0.05		1.25 ^{**}	0.12	-0.43 ^{**}	1.24 ^{**}	0.02		0.88 ^{**}	0.05	
Black (1; 0 = White)	-0.22 ^{**}	0.03		-0.21 ⁺	0.07		-0.15 ^{**}	0.03		0.06	0.04	
Parental SES	-0.00	0.00		0.01	0.00		0.00	0.00		0.00	0.00	
<i>Marijuana Use Frequency</i>												
Part 1: Use vs. nonuse	0.00 ^a	--		0.59	1.60	-17.74 ^{**}	0.00 ^a	--		4.86 ^{**}	0.65	
Black (1; 0 = White)	0.55	0.30		0.43	0.92		0.53	0.33		2.40 ^{**}	0.82	
Parental SES	-0.02 [*]	0.01		0.00	0.04		0.02	0.01		0.11 ^{**}	0.03	
Part 2: Conditional use	3.33 ^{**}	0.32		1.26	1.31	-5.59 ^{**}	2.64 ^{**}	0.15		3.81 ^{**}	0.33	
Black (1; 0 = White)	0.12	0.20		0.63	0.75		0.47 [*]	0.19		0.24	0.41	
Parental SES	-0.01	0.01		0.03	0.03		0.01	0.01		0.00	0.02	
<i>Hard Drug Use Frequency</i>												
Part 1: Use vs. nonuse	0.00 ^a	--		5.13 ^{**}	0.64		0.00 ^a	--		3.53 ^{**}	0.43	
Black (1; 0 = White)	-1.00 ^{**}	0.19		-1.18 ^{**}	0.36		-0.63 ^{**}	0.20		-0.80	0.53	
Parental SES	-0.01	0.01		-0.03	0.01		-0.00	0.01		0.04 [*]	0.02	
Part 2: Conditional use	1.47 ^{**}	0.05		1.25 ^{**}	0.12	-0.43 ^{**}	1.24 ^{**}	0.02		0.88 ^{**}	0.05	
Black (1; 0 = White)	-0.22 ^{**}	0.03		-0.21 ⁺	0.07		-0.15 ^{**}	0.03		0.06	0.04	
Parental SES	-0.00	0.00		0.01	0.00		0.00	0.00		0.00	0.00	
Part 1: Use vs. nonuse	0.00 ^a	--		0.59	1.60	-17.74 ^{**}	0.00 ^a	--		4.86 ^{**}	0.65	
Black (1; 0 = White)	0.55	0.30		0.43	0.92		0.53	0.33		2.40 ^{**}	0.82	
Parental SES	-0.02 [*]	0.01		0.00	0.04		0.02	0.01		0.11 ^{**}	0.03	
Part 2: Conditional use	3.33 ^{**}	0.32		1.26	1.31	-5.59 ^{**}	2.64 ^{**}	0.15		3.81 ^{**}	0.33	
Black (1; 0 = White)	0.12	0.20		0.63	0.75		0.47 [*]	0.19		0.24	0.41	
Parental SES	-0.01	0.01		0.03	0.03		0.01	0.01		0.00	0.02	

	Younger Cohort (Ages 8-19, 11-19)						Older Cohort (Ages 12-25)					
	Intercept			Linear Slope			Quadratic Slope			Intercept		
	Est.	SE		Est.	SE		Est.	SE		Est.	SE	
Part 1: Use vs. nonuse	0.00 ^a	--	--	7.00 ^{***}	1.93		0.00 ^a	--	--	2.93 ^{***}	0.52	
Black (1; 0 = White)	-2.93 ^{***}	0.55		-1.92	1.36		-2.32 ^{***}	0.34		-0.25	0.84	
Parental SES	0.03	0.02		0.06	0.05		0.02	0.01		0.06 [*]	0.03	

Note.

^aConstrained to be zero by default.

* $p < .05$

** $p < .01$.