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Racial Differences in Trajectories of Heavy Drinking and Regular Marijuana Use from Ages 13 through 24 Among African-American and White Males

Andrea K. Finlay[a], **Helene R. White**[b], **Eun-Young Mun**[b], **Courtney C. Cronley**[b], and **Chioun Lee**[b]

[a]Human Development and Family Studies, The Pennsylvania State University, 110 South Henderson Building, University Park, PA 16802, USA

[b]Center of Alcohol Studies, Rutgers University, 607 Allison Road, Piscataway, NJ 08854, USA

Abstract

Background—Although there are significant differences in prevalence of substance use between African-American and White adolescents, few studies have examined racial differences in developmental patterns of substance use, especially during the important developmental transition from adolescence to young adulthood. This study examines racial differences in trajectories of heavy drinking and regular marijuana use from adolescence into young adulthood.

Methods—A community-based sample of non-Hispanic African-American ($n = 276$) and non-Hispanic White ($n = 211$) males was analyzed to identify trajectories from ages 13 through 24.

Results—Initial analyses indicated race differences in heavy drinking and regular marijuana use trajectories. African Americans were more likely than Whites to be members of the nonheavy drinkers/nondrinkers group and less likely to be members of the early-onset heavy drinkers group. The former were also more likely than the latter to be members of the late-onset regular marijuana use group. Separate analyses by race indicated differences in heavy drinking for African Americans and Whites. A 2-group model for heavy drinking fit best for African Americans, whereas a 4-group solution fit best for Whites. For regular marijuana use, a similar 4-group solution fit for both races, although group proportions differed.

Conclusions—Within-race analyses indicated that there were clear race differences in the long-term patterns of alcohol use; regular marijuana use patterns were more similar. Extended follow ups are needed to examine differences and similarities in maturation processes for African-

American and White males. For both races, prevention and intervention efforts are necessary into young adulthood.

Keywords

developmental trajectories; heavy drinking; regular marijuana use; racial differences; transition to adulthood

1. Introduction

The probability of substance use gradually increases during adolescence, peaks in the late teens or early 20s, and slowly declines thereafter (Chen and Kandel, 1995; Johnston et al., 2009b; White and Jackson, 2004/2005). Few studies, though, have examined racial differences in developmental patterns of substance use, despite research showing significant differences in the prevalence of substance use between African-American and White adolescents (Lee et al., 2010; Wallace et al., 2003). Whereas African American adolescents drink less alcohol than their White peers (Godette et al., 2009; Pascall et al., 2005), among those African Americans who drink, heavy drinking and alcohol abuse peak later and persist longer than for Whites (Cooper et al., 2008; White and Jackson, 2004/2005). In contrast, prevalence rates of marijuana use are generally similar for African American and White youth (Brown et al., 2004).

It is important to examine salient patterns of alcohol and marijuana trajectories during the transitional period from adolescence to young adulthood for Whites and African Americans because racial differences in the timing of heavy drinking and regular marijuana use, as well as maturational processes, may be uniquely observable during this period. However, few studies have examined racial differences in developmental trajectories of alcohol and marijuana use from adolescence into young adulthood, despite research showing that substance use habits change substantially in the early twenties (Johnston et al., 2009a). Two articles reporting on one study examined racial differences in trajectories of alcohol and marijuana use (Brown et al., 2004; Flory et al., 2006, respectively) using data collected annually from the 6th-10th grade and again at age 20. The alcohol use trajectories showed three-class solutions for both African Americans and Whites, though their patterns differed in timing of onset and increases as well as in intensity (Flory et al., 2006). A three-class solution fit best for marijuana use trajectories for both African Americans and Whites but again there were clear race differences in levels and shapes (Brown et al., 2004). These studies, which were the only ones to examine trajectories of alcohol and marijuana use separately by race, showed that developmental patterns of alcohol and marijuana use were not the same for White and African-American adolescents. Tucker et al. (2003) examined trajectories of binge drinking from ages 13 to 18. Although the authors did not analyze trajectories separately by race, they found race differences in the proportions across groups; African Americans were more likely to belong to the nonbinging and increasing groups, whereas Whites were least likely to belong to the nonbinging group. The question remains, however, whether patterns converge or diverge more for African-American and White youth as they transition from adolescence into young adulthood. As Brown et al. (2004) and Flory et al. (2006) pointed out, their results were limited because data were not collected beyond age 20 and there was a gap in annual data from the 10th grade through age 20, which is a very important developmental period for increases in alcohol and marijuana use (Chen and Kandel, 1995). The present study extends this research by using annual data from ages 13 through 24, and thus, expanding the follow-up period to the end of emerging adulthood.

There have been some studies which have examined trajectories of heavy drinking and marijuana use for individuals during emerging adulthood but none examined trajectories

separately for African Americans and Whites. Schulenberg and colleagues (1996, 2005) examined race/ethnicity as a predictor of trajectory group membership. Using four waves of national data from ages 18 to 24, Schulenberg et al. (1996) identified six trajectories of frequent heavy drinking (5+ drinks in a row at least twice in the last two weeks): never, rare, developmentally limited (decreased), late-onset (increased), chronic, and "fling" (those who were low at the first and last waves but higher in the middle). White men, compared to non-White men, were more likely to be in the chronic vs. decreased group and White women, compared to non-White women, were more likely to be in the increased vs. rare, increased vs. fling, chronic vs. increased, decreased vs. rare, and decreased vs. fling groups. Schulenberg et al. (2005) identified the same six groups for frequent marijuana use (3+ times in the past month and/or 20+ times in the past year). They found that African Americans, compared to Whites, were less likely to be in the chronic, decreased, fling, and rare groups and more likely to be in the never group. Although these two studies identified distinct trajectories of alcohol and marijuana use during emerging adulthood and some racial differences, they did not include data prior to age 18. Thus, they were not able to examine differences in trajectories characterized by early onset use or by rapid increases in use during adolescence. Ellickson and colleagues (2004) identified five trajectory groups for marijuana use frequency from ages 13 through 23: abstainers, occasional light users, early highs, steady increasers, and stable light users. Although they did not compare trajectories across race, within race, African Americans were most likely to be stable light users and Whites were most likely to be steady increasers and stable light users. Like previous studies (i.e., Brown et al., 2004; Flory et al., 2006), there was a substantial gap in data collection (no data were collected between ages 18 and 23). Thus, fluctuations in patterns during this important developmental period may have been missed.

The current study aims to address gaps in the literature by examining between- and within-race heterogeneity in developmental patterns of heavy drinking and regular marijuana use in a community sample of young men who were followed annually from early adolescence through their mid-20s. We focus on heavy drinking and regular marijuana use rather than any use to describe developmental patterns that may be implicated for adult alcohol and marijuana use disorders.

2. Method

2.1 Participants

The sample came from the Pittsburgh Youth Study (PYS), a longitudinal study of adolescent males enrolled in the City of Pittsburgh, PA, public schools in 1987, which oversampled high-risk boys. Students in 7th grade were screened for antisocial behavior and approximately 250 boys who were in the top 30% for antisocial behavior risk and 250 from the remainder of the sample were selected for follow ups (n = 506). Details of the larger study are described in Loeber and colleagues (2008). These analyses were limited to non-Hispanic African Americans ($n = 276$) and non-Hispanic Whites ($n = 211$) ($M_{age} = 13.11$, $SD = 0.85$). The remaining participants who were another race or mixed race (4% of the sample) were excluded in the present study. As there were no Hispanics included in this analysis, for brevity we refer to non-Hispanic African Americans as African Americans and non-Hispanic Whites as Whites for the remainder of the paper. The participants were followed up every six months for the first three years and subsequently every year until they were at age 24/25. The early 6-month surveys were combined to provide annual data at each age by taking the maximum score across the two 6-month periods.

2.2 Measures

Heavy drinking was measured as a dichotomous variable (0 = *5 or fewer* and 1 = *6 or more drinks*) using questions asking participants the number of standard drinks (of beer, wine, and liquor) in a row they consumed per occasion (original responses were: 0 = *does not drink*, 1 = *less than 1 drink*, 2 = *1 drink*, 3 = *2-3 drinks*, 4 = *4-5 drinks*, and 5 = *6+ drinks*). Although heavy drinking is usually defined as five or more drinks on one occasion (Johnston et al., 2009a), the response options (listed above) on the original survey did not allow for a cutoff point of five or more drinks. We chose six or more drinks rather than four or more drinks as heavy drinking to represent a riskier drinking pattern. Regular marijuana use was based on how many times respondents reported smoking marijuana in the past year, which ranged from 0 to 365. It was coded as 0 = *11 or fewer times* and 1 = *12 or more* times to approximately reflect at least monthly use.

2.3 Analysis

For all analyses, the data were weighted to reflect the original population from which the sample was drawn because high-risk youth were over-sampled. Descriptive statistics of heavy drinking and regular marijuana use rates of African Americans and Whites were examined at each age. Chi-squared tests were utilized to determine racial differences in substance use.

Semi-parametric group-based trajectory analysis (Nagin, 1999) was utilized to identify trajectories based on probabilities of heavy drinking and regular marijuana use each year. A SAS macro, PROC TRAJ (Jones et al., 2001), was used to identify the number of groups that best fit the data. Quadratic trajectory models with increasing numbers of groups were tested, and the Bayesian Information Criterion (BIC) was utilized to determine model fit. Age 17 was selected as the intercept time point because most participants at this age had not yet transitioned out of high school.

Trajectory analyses were first conducted for the combined sample of African-American and White youth. After the best fitting model for the combined sample was selected, race by group chi-squared tests were utilized for both heavy drinking and regular marijuana use to test racial differences in group membership and the standardized residuals were used to evaluate which groups were significantly different. Next, race was added as a time-stable covariate into the trajectory model. Results of the covariate tests indicated that the trajectories varied by race for both heavy drinking and regular marijuana use (see below). Thus, subsequent trajectory analyses were conducted separately for African Americans and Whites. The model with the lowest BIC value was selected and non-significant growth parameters were trimmed for parsimony. The average posterior probabilities in all analyses were .78 or higher and half were .85 or higher.

3. Results

3.1 Descriptive Statistics

Descriptive statistics for heavy drinking and regular marijuana use at each age are displayed in Table 1. Whites, compared to African Americans, were significantly more likely to be heavy drinkers at every age. A significant race difference in regular marijuana use was observed only at ages 23 and 24 when Whites were less likely than African Americans to regularly use marijuana.

3.2 Heavy Drinking Trajectories

3.2.1 Total sample—A series of models with an increasing number of groups was evaluated for model fit. The four-group solution fit best ($BIC_{one-class}$ = -2879, $BIC_{two-class}$ =

-2508, BIC$_{\text{three-class}}$ = -2475, BIC$_{\text{four-class}}$ = -2455, and BIC$_{\text{five-class}}$ = -2461): (1) nonheavy drinkers/nondrinkers (37%), (2) adolescent-limited heavy drinkers (28%), (3) late-onset heavy drinkers (16%), and (4) early-onset heavy drinkers (19%). The nonheavy drinkers/ nondrinkers showed a low probability of engaging in heavy drinking at all ages. The adolescent-limited group drank heavily from ages 17 to 20 and decreased thereafter. The late-onset heavy drinkers began drinking heavily at age 19 and remained heavy drinkers throughout their early 20s. The early-onset heavy drinkers represented chronic heavy drinkers who drank heavily from ages 15 through 24.

3.2.2 Racial differences—A race by group chi-squared test indicated that African Americans were more likely to be members of the nonheavy drinkers/nondrinkers group and less likely to be members of the early-onset heavy drinkers group than expected (Table 2). Race was added to the model as a time-stable covariate and results indicated that there were racial differences in heavy drinking (adolescent-limited: estimate = 0.68, *SE* = 0.32, *p* < .05; late-onset: estimate = 1.94, *SE* = 0.50, *p* < .001; early-onset: estimate = 2.42, *SE* = 0.39, *p* < . 001). Based on these results, trajectories of probabilities of heavy drinking were modeled separately by race.

3.2.3 African Americans—For African Americans, a two-group solution fit best (BIC$_{\text{one-class}}$ = -1327, BIC$_{\text{two-class}}$ = -1231, and BIC$_{\text{three-class}}$ = -1236): (1) nonheavy drinkers/nondrinkers (54%), and (2) moderate heavy drinkers (46%) (Figure 1a). The nonheavy drinkers/nondrinkers showed a low probability of engaging in heavy drinking at all ages. The moderate heavy drinkers increased their heavy drinking during middle adolescence, peaked drinking heavily around age 20 and continued heavy drinking throughout their early 20s with a likelihood of heavy drinking between 50-60% until a dropoff at age 24.

3.2.4 Whites—For Whites, the four-group solution fit best (BIC$_{\text{one-class}}$ = -1359, BIC$_{\text{two-class}}$ = -1203, BIC$_{\text{three-class}}$ = -1183, BIC$_{\text{four-class}}$ = -1174, and BIC$_{\text{five-class}}$ = -1178): (1) nonheavy drinkers/nondrinkers (31%), (2) adolescent-limited heavy drinkers (24%), (3) late-onset heavy drinkers (24%), and (4) early-onset heavy drinkers (21%) (Figure 1b). The nonheavy drinkers/nondrinkers showed a low probability of engaging in heavy drinking at all ages. The adolescent-limited group drank heavily from ages 17 to 20 and decreased thereafter. The late-onset heavy drinkers began drinking heavily at age 19 and remained heavy drinkers throughout their early 20s. The early-onset heavy drinkers represented chronic heavy drinkers who drank heavily from ages 15 through 24.

3.3 Marijuana Use Trajectories

3.3.1 Total sample—A series of models with an increasing number of groups was evaluated for model fit. The four-group solution fit best (BIC$_{\text{one-class}}$ = -2331, BIC$_{\text{two-class}}$ = -1827, BIC$_{\text{three-class}}$ = -1770, BIC$_{\text{four-class}}$ = -1748, and BIC$_{\text{five-class}}$ = -1757): (1) nonregular users/nonusers (53%), (2) adolescent-limited regular users (11%), (3) late-onset regular users (25%), and (4) early-onset regular users (11%). The nonregular users/nonusers showed a low probability of engaging in regular marijuana use at all ages. The adolescent-limited users showed an increased probability of regular marijuana use from ages 16 to 20 and a decreased probability thereafter. The late-onset regular users were characterized by a likelihood of regular marijuana use starting at age 19 and continuing through their early 20s. The early-onset regular users included chronic marijuana users who used marijuana regularly from ages 17 through 24.

3.3.2 Racial differences—A race by group chi-squared test indicated that African Americans were more likely to be members of the late-onset regular marijuana use trajectory

group (Table 2). Race was added to the model as a time-stable covariate and results indicated that there were racial differences in regular marijuana use (nonregular users/ nonusers: estimate = 1.07, $SE = 0.36$, $p < .01$). Based on these results, trajectories of probabilities of regular marijuana use were modeled separately by race.

3.3.3 African Americans—For African Americans, the four-group solution fit best for regular marijuana use ($BIC_{one-class} = -1280$, $BIC_{two-class} = -1044$, $BIC_{three-class} = -1016$, $BIC_{four-class} = -1007$, and $BIC_{five-class} = -1009$): (1) nonregular users/nonusers (49%), (2) adolescent-limited regular users (10%), (3) late-onset regular users (32%), and (4) early-onset regular users (8%) (Figure 2a). The nonregular users/nonusers showed a low probability of engaging in regular marijuana use at all ages. The adolescent-limited users showed an increased probability of regular marijuana use from ages 17 to 20 and a decreased probability thereafter. The late-onset regular users were characterized by a likelihood of regular marijuana use starting at age 20 and continuing through their early 20s. The early-onset regular users included chronic marijuana users who used marijuana regularly from ages 15 through 24.

3.3.4 Whites—For Whites, the four-group solution also fit best for regular marijuana use ($BIC_{one-class} = -912$, $BIC_{two-class} = -641$, $BIC_{three-class} = -617$, $BIC_{four-class} = -613$, and $BIC_{five-class} = -615$): (1) nonregular users/nonusers (66%), (2) adolescent-limited regular users (15%), (3) late-onset regular users (13%), and (4) early-onset regular users (6%) (Figure 2b). The nonregular users/nonusers showed a low probability of engaging in regular marijuana use at all ages. The adolescent-limited users increased their regular marijuana use from ages 17 to 20 and decreased thereafter. The late-onset regular users began regularly using marijuana at age 20 and remained regular users through their early 20s. The early-onset regular users were chronic marijuana users who used marijuana regularly from ages 15 to 24.

4. Discussion

The current study sought to enhance our understanding of developmental patterns of substance use by examining racial differences in trajectories of heavy drinking and regular marijuana use among males transitioning from adolescence into young adulthood. Our findings are consistent with other studies indicating that heavy drinking is more prevalent among Whites than African Americans at least during adolescence and the early 20s (Lee et al., 2010; O'Malley and Johnston, 2002). African Americans were more likely than Whites to be nondrinkers/nonheavy drinkers and less likely to be early-onset heavy drinkers. Within-race analyses indicated that a majority of Whites (69%) was likely to engage in heavy drinking, and both the late-onset and early-onset groups (in total 45%) had a high probability of persisting in heavy drinking as they transitioned to young adulthood. Fewer African Americans were assigned to the heavy drinking group (46%), but, within that group, there was a high probability of persisting in drinking during the transition to young adulthood.

Though there were fewer race differences in regular marijuana use compared to heavy drinking, differences in proportions within groups were observable when comparing within-race trajectories. Fewer Whites than African Americans ever used marijuana regularly, and African Americans were more likely than Whites to be in the late-onset regular marijuana group. Nonetheless, among regular marijuana users, African-Americans appeared to start later than Whites, and White regular users were almost twice as likely to mature out as African-American regular users. Thus, overall, African-American young men who eventually drink heavily and use marijuana regularly appear to start later than their White peers, and the former are less likely to mature out of either substance in their early 20s.

Future follow ups extending beyond age 24 will shed more light on racial differences in maturation.

Prior studies examining racial differences were not able to capture the full range of ages when adolescents initiate and possibly mature out of substance use. Our nonusers, late-onset, and early-onset groups were similar to groups found in previous research with adolescents (i.e., Brown et al., 2004; Flory et al., 2006). In addition, we were able to identify a sub-group of users who desisted after adolescence. Thus, the transition to adulthood appears to be a critical time period during which substance use can escalate or de-escalate. Most individuals mature out of heavy substance use by their mid 20s (Bachman et al., 1997; White et al., 2005), and this maturation has often been attributed to the adoption of adult roles, such as marriage, parenthood, and career (Karlamangla et al., 2006; Labouvie, 1996; Leonard and Rothbard, 1999). There is evidence, however, that the effects of school and work transitions may reflect role-selectivity rather than role-compatibility (Dawson et al., 2006).

It cannot be assumed, however, that maturation processes operate in the same manner for different racial/ethnic groups. African Americans are less likely to experience factors that promote maturation out of substance use (e.g., a steady job, self-efficacy) in late adolescence and young adulthood (Haynie and Payne, 2006). Also, African Americans marry at later ages than Whites and do not stay married as long (Piquero et al., 2002; Wilson, 1987), and African-American, compared to White, heavy drinkers are less likely to reduce their drinking behavior once married (Bell et al., 2006; Mudar et al., 2002; Nielsen, 1999). Our results from the combined analyses provided partial support for racial differences in maturing out of substance use. That is, in the combined model with race as a covariate, there was a significant race effect on membership in the adolescent-limited heavy drinking group. In addition, we did not identify an adolescent-limited heavy drinking group for African Americans when we tested drinking trajectories in separate race models. Further, as suggested above, a greater proportion of Whites, compared to African Americans, who became heavy drinkers or regular marijuana users, were more likely to mature out by age 24. More research is needed to understand the factors that influence maturation.

Despite the fact that the responsibilities of adulthood are incongruent with heavy drinking or regular substance use (Schulenberg et al., 1996), we found that many youth of both races did not mature out of heavy drinking and regular marijuana use by the age of 24. Both races appear to be equally at risk for heavy drinking during the transition to young adulthood since close to half of each race was characterized as heavy drinkers who had a high probability of continuing into adulthood. For regular marijuana use, African American males appear to be at high risk with 40% characterized as regular users who continued through young adulthood. These findings suggest that prevention and intervention efforts are necessary into young adulthood as these youth are not maturing out of problematic substance use behaviors.

There are limitations to this study. First, heavy drinkers were coded as individuals who consumed six or more drinks in a row, rather than the more commonly used cutoff of five or more drinks (Johnston et al., 2009a). Thus, we may have under-identified individuals who were at risk for negative health outcomes associated with heavy drinking. Second, we coded regular marijuana use to reflect individuals who reported using at least 12 times in the previous year. We could not determine, however, how often individuals smoked marijuana each month, and some individuals may have smoked several times in one month and not at all in other months. Third, the sample included only African Americans and Whites who resided in Pittsburgh, PA, and the results may not generalize to other areas (e.g., suburban or rural communities) or to other race/ethnicities. Also, the sample was limited to males, and

the findings may not generalize to females. Finally, we examined trajectories of alcohol and marijuana separately. Future research examining the co-occurrence of alcohol and marijuana may yield important results because the combination of the two behaviors may exacerbate negative outcomes (Jackson et al., 2008).

Despite these limitations, the current study extends previous results by showing that, by age 24, many African American and White youth do not mature out of the high-risk patterns of substance use that they exhibit in adolescence. In addition, the current study confirms prior research indicating that there are important differences in African-American and White substance use trajectories and that these two racial groups should be examined separately. Future research that further delves into these racial differences and the potential mechanisms that explain the maturating out process, or lack thereof, will help provide more information on youth most at risk for negative health outcomes.

Acknowledgments

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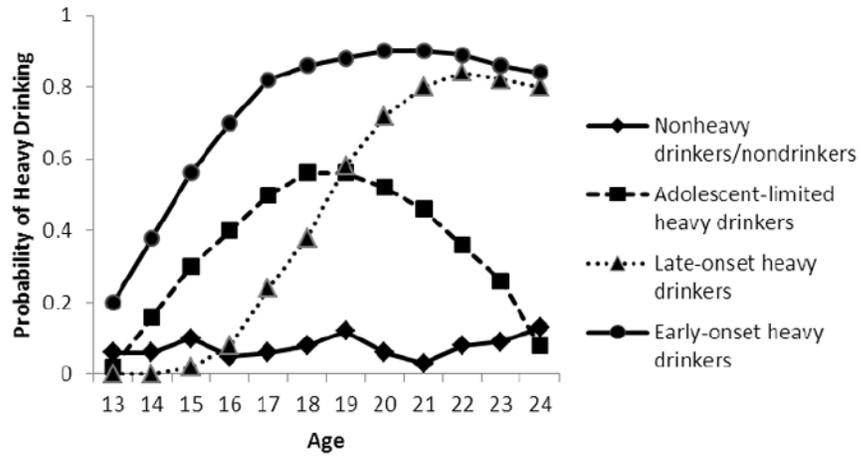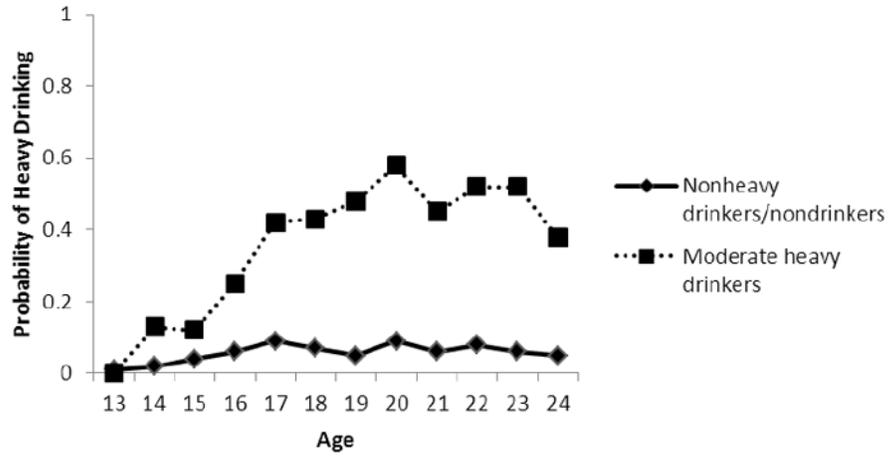
a and b

Figure 1.
a and b. Observed trajectories of the probability of heavy drinking for African-American (top) and White (bottom) young men.
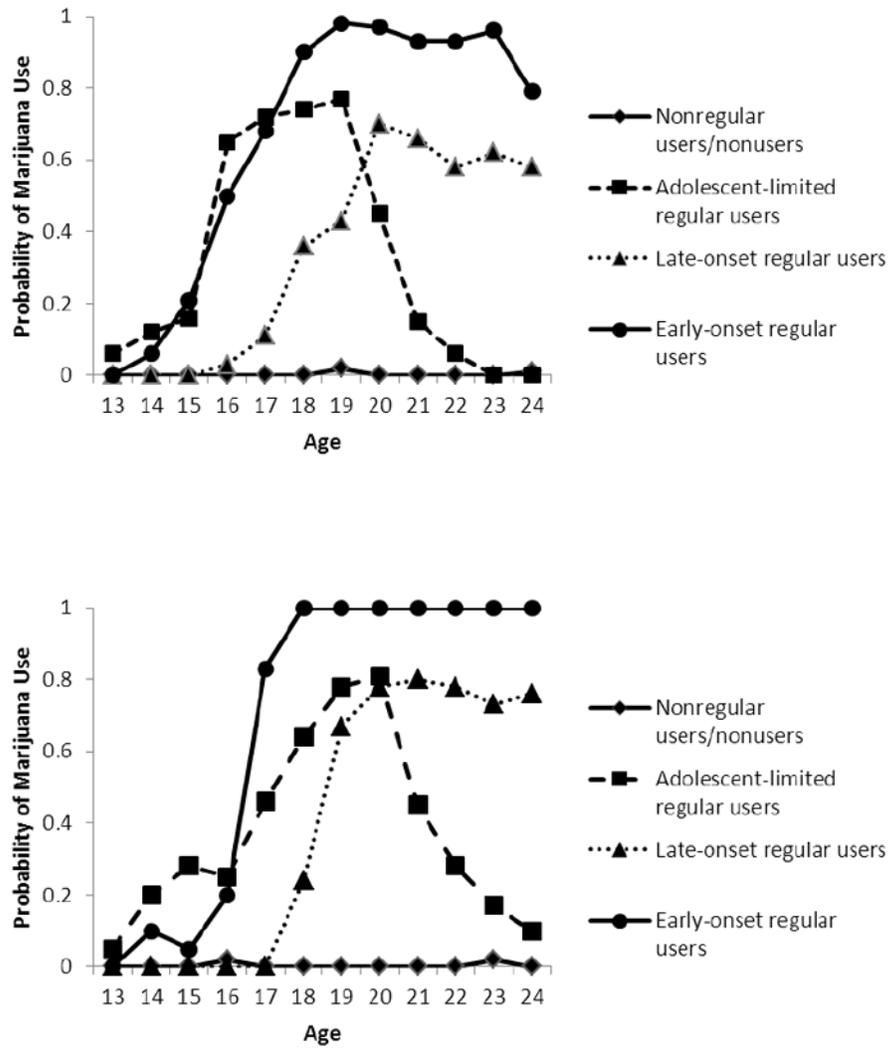
a and b

Figure 2.
a and b. Observed trajectories of probabilities of regular marijuana use for African-American (top) and White (bottom) young men.

Table 1

Racial Differences in Heavy Drinking and Regular Marijuana Use (in percents)

	Heavy Drinking			Regular Marijuana Use		
	AA[a]	White	χ^2	AA	White	χ^2
Age 13	1.5	5.5	4.85*	0.6	1.0	1.71
Age 14	7.1	13.9	5.01*	2.0	4.4	1.30
Age 15	7.0	21.6	15.89***	3.9	5.2	0.19
Age 16	14.3	28.1	11.50***	11.7	6.9	1.95
Age 17	24.2	43.1	15.80***	16.4	13.6	0.52
Age 18	23.6	48.0	26.93***	26.5	19.9	2.20
Age 19	24.7	50.6	29.27***	31.0	27.7	0.39
Age 20	31.6	54.1	20.08***	33.7	27.3	1.71
Age 21	23.3	48.8	28.86***	30.0	23.6	2.04
Age 22	27.8	47.8	17.12***	27.8	20.4	2.99
Age 23	28.3	44.7	11.53**	28.9	19.4	4.63*
Age 24	20.4	38.3	15.59***	26.0	17.2	4.31*

[a] AA=African American

*
p < .05,

**
p < .01,

***
p < .001.

Table 2

Chi-squared Tests of Heavy Drinking and Regular Marijuana Use Trajectory Group Membership (Percent in Each Race)

	Group 1[a]	Group 2[b]	Group 3[c]	Group 4[d]	χ^2
Heavy Drinking					53.83***
African American	51.1*	25.7	14.5	8.7*	
White	24.6	29.9	14.7	30.8	
Regular Marijuana Use					10.01*
African American	50.0	9.8	30.8*	9.4	
White	62.1	8.5	19.0	10.4	

[a] Group 1 = *nonheavy drinkers/nondrinkers or nonregular users/nonusers.*

[b] Group 2 = *Adolescent-limited heavy drinkers or Adolescent-limited regular users.*

[c] Group 3 = *Late-onset heavy drinkers or Late-onset regular users.*

[d] Group 4 = *Early-onset heavy drinkers or Early-onset regular users.*

*
$p < .05$,

***
$p < .001$ for overall chi-squared analysis as well as for the examination of standardized residuals within trajectory groups.