RACE-SPECIFIC TRANSITION PATTERNS AMONG ALCOHOL USE CLASSES IN ADOLESCENT GIRLS

Sarah E. Dauber[a,*], **James F. Paulson**[b], and **Jenn A. Leiferman**[c]

[a]The National Center on Addiction and Substance Abuse (CASA) at Columbia University 633 Third Avenue New York, NY 10017 sdauber@casacolumbia.org

[b]Eastern Virginia Medical School Division of Community Health and Research EV Williams Hall 855 W. Brambleton Avenue Norfolk, VA 23510 paulsojf@evms.edu

[c]Department of Community and Behavioral Health Colorado School of Public Health 13001 E 17th Ave C245 Aurora, CO 80045 Jenn.Leiferman@ucdever.edu

Abstract

We used data from the National Longitudinal Study of Adolescent Health to examine transitions among alcohol use classes in 2225 White and African American adolescent girls, and race differences in predictors of transition into and out of problematic drinking classes. Latent class analysis confirmed four classes for White girls and three for AA girls, defined in a previous study. Latent transition analysis revealed more stable abstainers and decreasing alcohol use among AA girls, and more increasing alcohol use among White girls, though stable abstainers were the largest group among both races. Increasing use was predicted by delinquency, academic misbehavior, substance use, and peer support for White girls, and by older age and delinquency for AA girls. Decreasing use was predicted by older age and depressive symptoms for White girls, and by family relationship quality and substance use for AA girls. Study limitations and implications of findings are discussed.

Keywords

adolescent girls; race; alcohol; longitudinal; risk factors

Alcohol use is widespread among adolescent girls, with 76% reporting lifetime use, 45% past month use, and 24% past month heavy drinking (CDC, 2008). Associated negative consequences and increased risk for progression to alcohol abuse or dependence has made the prevention of adolescent alcohol use a national priority (USDHHS, 2000). Most research on adolescent drinking has focused on samples of boys, or boys and girls together; however, sex differences in the nature and correlates of adolescent alcohol use suggest the need for within-sex research (Andrews, 2005). Thus, the current study focuses only on girls.

Race differences in the prevalence of alcohol use among adolescent girls are well-established, with White girls typically using more than African American (AA) girls (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Research has also documented

several discrete classes of alcohol users, distinguished by quantity and frequency of use, and associated psychological and behavioral problems. The findings of several recent studies (Cooper et al., 2008; Flory et al., 2006), including one by the authors (Dauber, Hogue, Paulson, & Leiferman, 2009) suggest that there may be race-specific typologies of adolescent alcohol users. Specifically, we defined four classes of users for White girls and only three for AA girls (Dauber et al., 2009). The current study expands upon the findings of our previous study by examining stability and change in class membership over one year within racial groups, as well as race differences in potential predictors of transition into and out of problematic drinking classes.

Race Differences in Alcohol Use Classes

Most past research has defined alcohol use classes based on racially mixed samples and then examined race differences in class membership. Classes identified by these studies include abstainers, experimenters, heavy drinkers, and problem drinkers (Colder & Chassin, 1999; Reboussin, Song, Shrestha, Lohman, & Wolfson, 2006; Steinhausen & Metzke, 2003). Longitudinal studies based on racially mixed samples defined classes based on trajectories of alcohol use over time, including stable abstainers, increasers, decreasers, and chronic heavy drinkers (Li, Duncan, & Hops, 2001; Wieser, Wiechold, & Silbereisen, 2007; Windle, Mun, & Windle, 2005). White teens are more likely to be in classes with heavier and more frequent drinking, while AA adolescents tend to dominate the abstainer, experimenter, and decreasing use classes (Orlando, Tucker, Ellickson, & Klein, 2005; Stewart & Power, 2002; Colder & Chassin, 1999). Additionally, White adolescents are more likely to be in drinking classes with higher levels of psychological and emotional problems, including internalizing and externalizing behaviors and family distress (Colder & Chassin, 1999; Steinhausen & Metzke, 2003).

In a previous study using the same sample, the authors conducted a within-race examination of alcohol use typologies and found different classes for White and AA adolescent girls (Dauber, et al., 2009). Consistent with existing research described above, four classes of alcohol users were found for White girls: abstainers, experimenters, moderate drinkers, and heavy drinkers. However, only three classes emerged for AA girls: abstainers, experimenters, and problem drinkers. AA problem drinkers had rates of heavy drinking and negative consequences in between those of White moderate and heavy drinkers. These findings provide preliminary support for the existence of race-specific drinking classes. Two additional within-race studies examining longitudinal drinking trajectories found that AA adolescents' trajectories were characterized by lower levels of use and decreasing use over time, further supporting the need for within-race research in this area (Cooper et al., 2008; Flory et al., 2006).

Race Differences in Predictors of Adolescent Alcohol Use

Well-established risk factors for adolescent alcohol use exist. Distal risks include school, peer, and family factors, and more proximal risks include individual characteristics and behaviors, such as internalizing and externalizing behaviors (Armstrong & Costello, 2002; Hawkins, Catalano, & Miller, 1992). Several studies have found race differences in the associations among **both distal and proximal** risk variables and alcohol use (Vega, Zimmerman, Warheit, Apospori, & Gil, 1993; Wallace & Muroff, 2002; Watt & Rogers, 2007). **School** and **peer** factors are more salient for White teens, while family factors may be more influential for AA teens. School commitment and school-related conduct problems are more strongly related to substance use for White adolescents (Gottfredson & Koper, 1996; Wells et al., 1992). AA adolescents tend to be less peer-oriented than White youth in general (Giordano, Cernkovich, & Demaris, 1993), and are thus less influenced by peers'

drinking behaviors (Watt & Rogers, 2007). AA parents tend to engage in more parental monitoring and exert more control and authority (Peterson, Hawkins, Abbott, & Catalano, 1994), which has been associated with lower levels of deviance (Smetana et al., 2004) and substance use (Ludden & Eccles, 2007) compared to White youth. **In terms of proximal risks, d**elinquency and problem behavior are strongly associated with alcohol use in both racial groups (Wallace & Muroff, 2002). Depressive symptoms may be more salient for AA youth (Kandel et al., 1997; Kilpatrick, et al., 2003; Maag & Irvin, 2005) although findings are inconclusive. The current study expanded upon existing research by examining race differences in **distal and proximal** risk factors for transition into and out of problematic drinking classes.

Study Aims and Hypotheses

The current study took a within-race approach to examining change over time in alcohol use class membership, as well as potential predictors of this change, in a nationally representative sample of White and AA adolescent girls. First, we examined transitions among previously defined alcohol use classes in White and AA girls over one year. We expected to find greater movement into problematic drinking classes among White girls than AA girls. Second, we examined race differences in the extent to which **distal and proximal** risk factors predicted transition into and out of problematic drinking classes. We expected that school and peer influences would be more salient for White girls, and family factors and depressive symptoms would be more salient for AA girls.

Method

Data Source

Data came from Waves 1 (W1) and 2 (W2) of the National Longitudinal Study of Adolescent Health (AddHealth: Udry, 2003), a national study of the health and well-being of American adolescents. Adolescents in grades 7 through 12 were assessed between 1994 and 1995 (W1), and again one year later (W2). Adolescents were sampled within schools, selected with unequal probability of selection. A random sample of adolescents who completed the W1 in-school interview was included in the core in-home sample, which included an interview of the target adolescent and one parent. Adolescents from specific ethnic groups were oversampled (i.e., African Americans from well-educated families, Chinese, Cuban, and Puerto Rican). The final dataset included a total of 6504 cases (3356 female) in the core in-home sample at W1.

Sample

The current study included a subsample of 2225 female adolescents who completed both study waves[1] and reported their primary race as White ($N = 1625$) or AA ($N = 600$). Examination of other ethnic groups was beyond the scope of the current study. See Table 1 for sample demographics. White girls were more likely to come from two-parent families, to have received psychological counseling, and to have mothers with higher education, and AA girls were more likely to be on public assistance.

Attrition bias was examined by comparing the study sample (N=2225) to the 723 White or AA girls who completed the W1 interview only **on demographics and W1 predictors**. The study sample was younger than the attrition sample (B = −1.91, $p < .001$; Study Sample: M

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[1]Add Health recommends the use of Wave 2 sampling weights in longitudinal analyses (Udry, 1998). Thus, only adolescents with available data at Wave 2 were included in the study sample.

= 15.4 years, SD = .11, Attrition Sample: M = 17.3 years, SD = .10). No other significant differences were found.

Measures

Alcohol Use—Adolescents were asked 18 questions at each wave about past year alcohol use. Three items assessed <u>frequency of us</u>e: frequency of drinking, frequency of heavy drinking (i.e., 5+ drinks in a row), and frequency of getting drunk (once a month or less, more than once a month). <u>Quantity of alcohol consumption</u> was assessed by the number of drinks per drinking episode (one, 2-3, 4 or more). Nine items assessed <u>consequences of use</u>, including problems with parents, physical fights, or regretting actions (yes/no). Five items measured <u>high-risk drinking behaviors</u>, including drunk driving and drinking while using drugs (yes/no). Each item had a "never drank" option, endorsed by those who did not consume any alcohol in the past year. The 18 items were used as indicators of latent classes in the latent class analyses of W1 (Dauber et al., 2009) and W2 data and in the latent transition analysis.

School connectedness—Adolescents were asked to rate the extent to which they felt close to people at school, a part of the school, happy to be at school, safe at school, and felt that teachers treat students fairly, on a scale of 1 to 5. Items were averaged and higher scores indicate more school connectedness. This scale was derived based on factor analysis conducted in previous AddHealth studies (Anderman, 2002; Bonny, Britto, Klostermann, Hornung, & Slap, 2000; Galliher, Rostosky, & Hughes, 2004), and had Cronbach's alphas of .79 for White and .77 for AA girls.

Academic misbehavior—Five items were standardized and summed to create the academic misbehavior scale (Crosnoe & Elder, 2004): repeated the last grade in school (1 = yes), trouble completing homework past year (0 = never to 4 = every day), suspended or expelled past year (1 = yes for each), skipped school past year (1 = yes), and adolescent's reverse-coded grade point average from the past year. High scores indicate more academic misbehavior. Inter-item correlations ranged from .10 ($p < .001$) to .34 ($p < .001$) and Cronbach's alpha = .51.

Peer support—Adolescents named up to five male and five female friends, and indicated for each whether they had gone to the friend's house, hung out after school, talked on the phone, spent time together on the weekend, and discussed a problem. An index of peer support was created by summing responses for each friend and averaging across all friends, yielding one peer support score (Crosnoe & Elder, 2004; Haynie, 2002). Adolescents who did not list any friends were given a score of zero. Total scores ranged from 0 to 5 for White and AA girls, with higher scores indicating more peer support.

Family relationship quality—Parent-adolescent relationship quality was measured using a 12-item scale developed in previous AddHealth studies (Brookmeyer, Fanti, & Henrich, 2006; Henrich, Brookmeyer, & Shahar, 2005; Resnick et al., 1997). Adolescents rated their closeness to parents, perceived caring, warmth, communication, and general relationship satisfaction on a 1 to 5 scale, with higher scores indicating more positive relationships. Cronbach's alpha was .90 for White girls and .87 for AA girls.

Delinquency—Respondents indicated whether they committed each of 17 delinquent acts in the past year (e.g., painting graffiti, stealing a car, selling drugs, using a weapon). As in previous AddHealth studies (Haynie, 2002; Mason, Hitchings, & Spoth, 2007), the 17 items were summed to create a delinquency index, with alphas of .78 and .76 for White and AA girls.

Depressive symptoms—Using the Center for Epidemiologic Studies Depression Scale (CES-D: Radloff, 1977), adolescents self-reported their past-week level of 20 depression symptoms on a scale of never/rarely (0) to most/all of the time (3). Depressive symptoms were overall low in the study sample, with 9% of White girls and 11% of AA girls scoring above the clinical cutoff for severe symptoms (Roberts, Lewinsohn, & Seeley, 1991) at W1 and 11% White and 11% AA at W2. As in other studies using the CES-D with non-clinical samples, total scores were used as a continuous measure of depressive symptoms (Wiesner & Kim, 2006).

Other substance use—Adolescents reported the number of times they had used marijuana, cocaine, inhalants, and/or other illegal drugs in the past month. Due to very low rates of use, responses were recoded into a dichotomous variable indicating any use of one or more substance in the past 30 days, versus none.

Data Analysis

Latent class analysis (LCA) was conducted on the W2 alcohol use indicators to replicate the W1 LCA solution (Dauber et al., 2009). LCA (McCutcheon, 1987) groups similar individuals based on their patterns of responses on a set of indicators. LCA's central assumption is that correlations among observed indicators can be explained by underlying latent classes plus error (Muthen, 2004). LCA has been used in normative and clinical adolescent samples to classify individuals based on patterns of behaviors and psychiatric symptoms (e.g., Chung & Martin, 2001; Reboussin et al., 2006; Rindskopf, 2006). Two-, three-, four- and five-class solutions were tested separately for White and AA girls, and models were compared using the LL value, AIC, BIC, and LMR test (Nylund, Asparouhov, & Muthen, 2007). The W1 solution was replicated at W2, supporting the stability of the 4 classes for White girls and the 3 classes for AA girls. Latent transition analysis (LTA: Collins & Wugalter, 1992) was used to examine transitions over time among the alcohol classes within racial groups. LTA is a longitudinal extension of LCA that observes individuals' transitions into and out of latent classes, reflecting change in the latent variable of interest. Based on the results of the LCA analyses described above, we fit a four-class LTA model for White girls and a three-class model for AA girls. Because the conditional probabilities in the LCA analyses remained relatively stable across the two timepoints[2], the LTA models assumed full measurement invariance across time (i.e., the number and definitions of the classes were the same at both timepoints) (Nylund, Muthen, Nishina, Bellmore, & Graham, in press). Multiple sets of random starting values were used to prevent local solutions and maximize model stability (Muthen, 2004). LTA parameter estimates include: item probabilities (the probability that an individual in a given class will endorse each item); class probabilities (the relative size of each class); and transition probabilities (the probability of membership in a given class conditional on class membership at the previous timepoint) (Nylund et al., in press). Following LTA, individuals were assigned to transition classes based on their highest transition probabilities, and logistic regression was used to examine W1 predictors of class membership. This post-hoc method of examining predictors of class membership is limited because it does not account for the uncertainty inherent in latent class membership (Muthen, 2004). However, previous studies have used similar methods (e.g., Grant, Scherer, Neuman, Todorov, Price, & Bucholz, 2006; Reboussin et al., 2006), and given the high classification quality of the LTA model (see below), such bias is likely to be minimized. The LTA analyses were conducted using Mplus 5, and all other analyses **(group comparisons and logistic regressions)** were conducted using the survey data commands in Stata 10 (logistic for binary outcomes and multinomial

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[2]Conditional probabilities for the LCA models at Wave 1 are available from the authors upon request.

for higher order categorical outcomes), which adjust parameter estimates and standard errors to account for AddHealth's clustered, weighted sampling design (Harris et al., 2003).

Results

Comparisons of White and AA girls on Study Variables

White and AA girls were compared on study variables using chi-square tests for categorical variables and *F*-tests for continuous variables (see Table 2).[3] Significant race differences were found on all alcohol use variables, with White girls reporting more alcohol use and related problems than AA girls. White girls also reported significantly more school connectedness, and AA girls reported significantly higher levels of depressive symptoms, delinquency, academic misbehavior, and family relationship quality.

Latent Class Membership

A detailed description of the four latent classes for White girls (abstainers, experimenters, moderate drinkers, and heavy drinkers) and the three for AA girls (abstainers, experimenters, and problem drinkers) appears elsewhere (Dauber et al., 2009). In both racial groups, abstainers used no alcohol in the past year, and experimenters reported infrequent light drinking and very low rates of consequences. White moderate drinkers reported more frequent drinking and slightly more consequences and high-risk drinking behaviors than experimenters. White heavy drinkers had the highest rates of heavy drinking, consequences, and high-risk drinking behaviors. AA problem drinkers reported rates of heavy drinking, consequences, and high-risk behaviors in between the White moderate and heavy drinkers. See Tables 3 (White girls) and 4 (AA girls) for the conditional probability estimates from the Wave 2 LCA and Figure 1 for a graphic depiction of the classes for both racial groups.

Abstainers were the largest group at both waves for both White (54% W1, 52% W2) and AA girls (69% W1, 68% W2), with AA girls having a larger percentage of abstainers than Whites at both waves. Among White girls, the experimenter class decreased significantly from Wave 1 (19%) to Wave 2 (16%) ($\chi^2(1) = 5.42$, $p < .05$). The moderate and heavy drinking classes both increased from W1 (moderate 19%, heavy 9%) to W2 (moderate 21%, heavy 12%), however only heavy drinkers increased significantly ($\chi^2(1) = 7.95$, $p < .01$). Class sizes were more stable among AA girls, with no statistically significant changes in size. Across both waves, the problematic drinking classes were larger among White girls than AA girls.

Latent Class Transitions

Table 5 contains the latent transition probabilities based on the estimated LTA models. Abstainers had the highest stability rate in both groups (74% White, 84% AA). Problematic drinkers (White moderate/heavy and AA problem) had stability rates over 50%, suggesting a significant number of chronic heavy drinkers in both racial groups.

Rates of transition into a problematic drinking class were higher among White girls than AA girls. A total of 42% of White girls transitioned into the moderate or heavy classes compared to 12% of AA girls. Rates of transition out of the problematic drinking classes were higher for AA girls (49% of W1 problem drinkers were abstainers or experimenters at W2, compared to 39% for White girls).

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[3]White and AA girls were compared on alcohol use indicators at Wave 1 in a previous study (Dauber et al., 2009). The pattern of results described here at Wave 2 are similar to those found at Wave 1.

LTA Classification Quality and Assignment of Adolescents to Transition Classes

Classification quality of the LTA models for White and AA girls was evaluated based on entropy and average posterior probabilities for each transition class. Values closest to 1.0 represent more certainty in classification. For White girls, entropy was .95, and posterior probabilities were all above .80 with one exception. For AA girls, entropy was .98, and posterior probabilities were mostly above .90, with two falling between .80 and .90. The high classification quality found for both LTA models supports the post hoc assignment of individuals to transition classes based on their highest probability value.

To facilitate interpretation of the predictor analyses, transition classes were collapsed into three categories, defined with the goal of examining the groups of greatest clinical significance (i.e., those whose alcohol use increased over time and those who decreased their use over time). *Stable Abstainers* represented a comparison category of adolescents who never used alcohol (White: *n* = 665, 41%, AA: *n* = 340). *Increasers* included adolescents who transitioned from a low-risk class (abstainer or experimenter) into one of the problematic drinking classes (moderate, heavy, or problem) (White: *n* = 183, 11%, AA: *n* = 27, 5%). *Decreasers* included adolescents who transitioned out of a problematic drinking class (moderate, heavy, or problem) into a low-risk class (either abstainers or experimenters) (White: *n* = 103, 6%, AA: *n* = 27, 5%). Collapsing the groups into these three categories (Stable Abstainers, Increasers, and Decreasers) necessitated the exclusion of 674 White girls and 206 AA girls from the following transition classes: heavy to moderate drinking, experimenting to abstaining, abstaining to experimenting, and stable experimenters, moderate, heavy, and problem drinkers. The focus on increasers and decreasers was justified by the high clinical significance of these groups compared to the excluded classes. Additionally, understanding the predictors of increasing and decreasing use appeared most relevant in terms of tailoring interventions to prevent or reduce alcohol use.

Predictors of Latent Class Transition

We conducted within-race multinomial logistic regressions to examine potential predictors of membership in the three transition groups, with stable abstainers as the reference group. Odds ratios describe the prediction of being either an increaser or decreaser relative to stable abstainers. The following potential W1 predictors were entered simultaneously into each regression: school connectedness, academic misbehavior, peer support, family relationship quality, depressive symptoms, delinquency, and other substance use. All models controlled for adolescent age, mother education, and family composition (single parent vs. two-parent). Results are presented in Table 6.

White Girls

Relative to stable abstainers, membership in the increaser class was predicted by delinquency (*d* = .09)[4], academic misbehavior (*d* = .08), and substance use (*d* = .78), as well as more peer support (*d* = .30). A similar pattern emerged for predicting decreasing use relative to stable abstainers: higher delinquency (*d* = .12), academic misbehavior (*d* = .09), substance use (*d* = 1.29), and peer support (*d* = .35) were all significant predictors. Additionally, decreasers were older (*d* = .28) and reported more depressive symptoms (*d* = .03) than stable abstainers.

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[4]Cohen's *d* is presented for each significant finding as a measure of effect size. Odds ratios, confidence intervals, and significance levels for each finding are presented in Table 6. Effect size estimates of .2 represent a small effect, .5 moderate, and .8 large (Cohen, 1992).

AA Girls

For AA girls, increasers were older (d = .21) and had more delinquency (d = .21) than stable abstainers. Decreasers had poorer family relationships (d = .56), more substance use (d = 1.13), and a trend towards higher delinquency (d = .15).

Examination of Change Over Time in Predictors

To attempt to understand several counterintuitive findings, particularly for the decreasers, we examined change from W1 to W2 in the predictor variables that significantly distinguished among the classes for the decreasers and increasers. White increasers significantly increased in delinquency (t (181) = −3.73, p < .001), academic misbehavior (t (182) = −5.002, p < .001), depressive symptoms (t (182) = −2.912, p < .01), substance use ($\chi^2(1)$ = 6.38, p < .05), and peer support (t (182) = −4.703, p < .001). White decreasers showed significant declines in delinquency (t (102) = 7.52, p < .001) and depressive symptoms (t (102) = 2.50, p < .05), and a trend-level decline in academic misbehavior (t (102) = 1.81, p < .10). Substance use also declined among White decreasers, but not significantly. AA increasers did not change significantly in delinquency or substance use, but did show trend-level decline in family relationship quality (t (25) = 1.97, p <.10). AA decreasers significantly decreased in delinquency (t (26) = 3.56, p < .01) and improved in family relationship quality (t (25) = −2.26, p < .03). AA decreasers also decreased their other substance use, but not significantly.

Discussion

This study examined transitions among alcohol use classes over one year in a nationally representative sample of White and AA adolescent girls. Results of this study suggest the need for race-specific typologies of alcohol users, and provide race-specific information on psychological and developmental characteristics that may predict transition into or out of problematic drinking.

The alcohol use typologies previously defined at W1 (Dauber et al., 2009) were replicated at W2, further supporting their validity. At both waves, AA girls had more abstainers and White girls more problematic drinkers, consistent with documented higher rates of alcohol use among White adolescents compared to AA (CDC, 2008). AA abstainers also had higher stability rates over time than White abstainers, although stability was high for White abstainers as well. High stability rates for problematic drinkers in both racial groups suggest that more than half of problematic drinkers did not significantly reduce their drinking over time. While transitions into lower severity classes were more common in both racial groups, a significant number of girls transitioned into a problematic drinking class by W2. More White than AA girls transitioned into a problematic drinking class, consistent with research showing that White adolescents are more likely than AA adolescents to be problem drinkers (Orlando et al., 2005; Schulenberg, O'Malley, Bachman, Wadsworth, & Johnston, 1996; Stewart & Power, 2002). This may reflect the general trend for AA teens to use less alcohol than Whites, or it may be that AA girls take longer than one year to progress from abstaining or experimenting to heavy drinking (Flory et al., 2006).

Among White girls, both the increasers and decreasers were distinguished from the stable abstainers by higher levels of delinquency, academic misbehavior, and other drug use. Alcohol use often co-occurs with delinquency, poor school performance, and use of other drugs (Armstrong & Costello, 2002). There may be a common set of characteristics that distinguish girls who drink from girls who abstain. Thus, the stable abstainers may represent a general "low problem" group of girls who do not use alcohol or engage in other problem behaviors, while both increasers and decreasers drink in conjunction with other problem

behaviors. It is notable, however, that delinquency, academic misbehavior, and drug use all declined over time for the decreasers and increased over time for the increasers. Thus, among White girls, transition into a problematic drinking class was associated with increases in other problematic behaviors, and transition out of problem drinking was associated with improvements in other problem areas as well.

Peer support also distinguished the White increasers and decreasers from stable abstainers. Supportive peer relationships can protect adolescents from engaging in substance use and other risky behavior (Hawkins, et al., 1992). Alternatively, involvement with deviant peers may encourage substance use and problem behaviors in adolescents (Dishion & Owen, 2009; Hussong, 2002). The high peer support of White decreasers may represent supportive relationships with positive peer influences that contributed to their reduction in alcohol use over time. However, for White increasers, high peer support may reflect involvement with deviant peers engaged in similar levels of alcohol use and other risky behavior. More detailed data on the nature of peer involvement in alcohol use and problem behaviors in this sample is needed to confirm these explanations.

White decreasers were further distinguished from stable abstainers by older age and more depressive symptoms. Older adolescents may age out of problematic drinking as they enter the young adult years and become involved in the developmental tasks of adulthood. The finding of higher depressive symptoms among the decreasers is somewhat counterintuitive, however post-hoc analyses revealed that depressive symptoms declined from W1 to W2, suggesting an overall improvement in symptoms for this group.

AA increasers were distinguished from stable abstainers by older age and more delinquency. Interestingly, among White girls, the decreasers were older, while among AA girls, increasers were older. This may reflect the tendency for AA teens to have a later age of onset of alcohol use compared to White adolescents (Ellickson, Hays, & Bell, 1992). Unlike White girls, academic misbehavior, other substance use, and peer support did not predict membership in the increaser group for AA girls. This is consistent with research showing that school and peer factors are less influential among AA adolescents (Gottfredson & Koper, 1996). While peers have greater influence on risk behaviors for White adolescents, family influences may be more salient for AA teens (Smetana et al., 2004; Watt & Rogers, 2007). In line with this, transition out of problematic drinking was predicted by family relationship quality for AA girls, however the prediction was not in the expected direction (i.e., poorer family relationships predicted transition out of problematic drinking). Post hoc analysis revealed improvements in family relationship quality over time suggesting that for AA girls, decreases in alcohol use may have occurred in conjunction with improvements in their relationships with parents. Unlike White girls, depressive symptoms did not differentiate among the groups for AA girls. This finding is surprising given that some research has found depressive symptoms to be more strongly associated with substance use among AA adolescents (Kandel et al., 1997; Maag & Irvin, 2005), however it is consistent with previous results on the same sample (Dauber et al., 2009). Given the overall low levels of depressive symptoms in the study sample, the above findings must be interpreted with caution.

Taken together, study findings provide further justification for examining alcohol use typologies within race, as well as support for race differences in developmental and psychological characteristics associated with changes over time in alcohol use. Specifically, academic misbehavior, peer relationships and depressive symptoms were unique predictors of transition class membership for White girls, and family relationship quality for AA girls. It is important to note that while different transition patterns were observed for White and AA girls, overall prevalence rates of alcohol use were significantly lower among AA girls

than White girls. Thus, it is possible that the race differences in transition classes that were found could be attributed to the overall prevalence differences.

The results of this study must be considered in light of several limitations. First, the LTA spanned only one year; a more detailed understanding of change over time in drinking behaviors would require a longer time period. While this study provides some important information regarding the influence of developmental and psychological predictors on changes in alcohol use over time, it does not allow for a more fine-grained examination of the changing impact of developmental predictors on change in alcohol use over time. The analysis of within-race joint trajectories of alcohol use and risk factors over a longer time span is an important next step. Second, the assignment of individuals to transition classes based on the conditional probability values is a limitation because it does not account for error in classification. However, this method has been used in previous studies and is further justified by the very high classification quality obtained for the LTA models. Third, the research questions under investigation necessitated the exclusion of a large number of adolescents from the predictor analyses. This may have impacted generalizability and thus findings should be interpreted with caution and should be replicated in future studies. Relatedly, due to the nature of the sample, the vast majority of adolescents in both racial groups were stable abstainers, and there were only a small number of adolescents in the increaser and decreaser groups, particularly among AA girls, which may have limited the power to detect significant effects. An additional limitation was the low reliability of the academic misbehavior scale. Finally, the AddHealth data were collected in 1994-1996, and rates of lifetime and current alcohol use in adolescent girls declined by approximately 5% from 1995 to 2007 (CDC, 2008). However, race differences in these rates have not changed over time, with 53% of White girls and 39% of AA girls reporting current alcohol use in 1995 (CDC, 1996). Despite its age, AddHealth is currently the most comprehensive national dataset of adolescents, with the broadest assessment of alcohol use and developmental predictors. The study findings will need to be replicated using more updated data as it becomes available.

Despite these limitations, this study makes an important contribution to the growing body of knowledge on race differences in adolescent alcohol use. Our findings reinforce the need for further within-race investigations of patterns of change over time in alcohol use and their developmental and behavioral correlates among adolescent girls. Future research should examine transitions among drinking classes over a longer time period within racial groups, as well as association of these transitions with young adult outcomes. Research of this nature will increase our limited understanding of race differences in alcohol use and co-occurring problems, and inform the development of targeted alcohol prevention programs.

Acknowledgments

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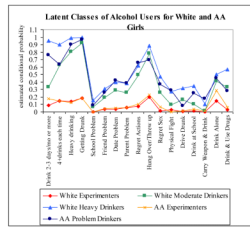
Figure 1. Graphic representation of latent classes for White and AA girls at Wave 1
Note. This graph represents the LCA solution from Wave 1. The number and structure of the latent classes at Wave 2 were identical, so a graph for Wave 2 is not presented. Indicators were dichotomized in this figure for ease of interpretation. However, the LCA and LTA models were conducted using the indicators with multiple categories (shown in Table 2). Note also, that the Stable Abstainer classes for White and AA girls are not depicted in the graph, as these groups scored zero on all indicators.

Table 1

Sample Demographics for White **(N = 1625)** and AA **(N = 600)** Girls at Wave 1

	White	AA	Total
Age			
Age 13-15 years	54%	48%	53%
Age 16-19 years	46%	52%	47%
Mean Age (SD)	15.4 (.12)	15.6 (.18)	15.4 (.11)
Family composition[**]			
Single-parent	21%	52%	26%
Two-parent	79%	48%	74%
Currently attending school	98%	98%	98%
Received psychological counseling[*]	15%	10%	14%
Attended substance abuse treatment	2%	1%	2%
Mother education[ψ]			
Less than HS	13%	17%	14%
HS graduate or equivalent	38%	43%	39%
Some college	21%	20%	21%
College graduate or more	28%	20%	27%
Receiving public assistance[**]	8%	19%	10%

[**] $p < .01$,

[*] $p < .05$,

[ψ] $p < .10$

Note. Column percents provided for each group. Group differences were tested using the chi-square statistic. All reported results were adjusted for the weighted sampling design of Add Health.

Table 2

Comparisons of White **(N = 1625)** and AA **(N = 600)** Girls on Wave 2 Alcohol Use Indicators and Wave 1 Predictors of Class Transitions

	White	**AA**	**Total Sample**
Drink alcohol past year[**]			
Never	52%	68%	55%
Once a month	31%	20%	29%
2-3 times a month	9%	4%	8%
Once a week or more	9%	8%	9%
Number of drinks[**]			
One drink	7%	9%	8%
Two or three	15%	14%	15%
Four or more	26%	8%	22%
Heavy drinking past year[**]			
Never	70%	89%	73%
Once a month	20%	6%	18%
More often	10%	5%	9%
Got drunk past year[**]			
Never	68%	86%	71%
Once a month	22%	10%	20%
More often	10%	4%	9%
Hung over/threw up[**]	28%	10%	25%
School problem[**]	3%	1%	2%
Friend problem[**]	9%	4%	8%
Date problem[**]	10%	5%	9%
Parent problem[**]	9%	4%	8%
Regret actions[**]	14%	6%	13%
Regret sex[**]	8%	4%	7%
Serious physical fight[**]	5%	4%	5%
Drive while drunk[**]	4%	1%	4%
Drink at school[**]	3%	2%	3%
Carry weapon & drink[**]	1%	2%	1%
Drink alone[**]	10%	8%	10%
Drink and use drugs[**]	11%	3%	9%
Depressive symptoms (M/SE)[*]	11.8 (.27)	13.5 (.49)	--
Delinquency (M/SE)[ψ]	2.3 (.08)	2.6 (.15)	--
Academic misbehavior (M/SE)[**]	−.84 (.09)	−.03 (.15)	--
School Connectedness (M/SE)[*]	3.7 (.03)	3.6 (.05)	--
Family Relationship Quality	4.3 (.02)	4.4 (.04)	--

	White	AA	Total Sample
(M/SE) $^\psi$			
Peer Support (M/SE)	2.7 (.05)	2.6 (.06)	--
Other substance use	14%	10%	13%

[*] $p < .05$,

[**] $p < .001$,

ψ $p < .10$

Note. Column percents provided for each group. Group differences were tested using the chi-square statistic for categorical variables and the F-test for continuous variables. All reported results were adjusted for the weighted sampling design of Add Health.

Table 3

Estimated Conditional Probabilities by Class for Alcohol Use Indicators at Wave 2: White Girls (Total N =1625)

	Class 4: Stable Abstainers N = 840	Class 2: Experimenters N = 247	Class 3: Moderate Drinkers N = 351	Class 1: Heavy Drinkers N = 187
Past Year Drinking				
Never	1.00	.00	.00	.00
Once a month or less	.00	.91	.78	.03
2-3 days a month	.00	.07	.15	.38
Once a week or more	.00	.02	.07	.59
Quantity				
Never drank	1.00	.00	.00	.00
One drink	.00	.43	.03	.00
2-3 drinks	.00	.43	.35	.08
4 or more drinks	.00	.15	.62	.92
Past Year Heavy Drinking				
Never	1.00	.83	.20	.03
Once a month or less	.00	.16	.76	.16
More than once a month	.00	.01	.05	.81
Past Year Got Drunk				
Never	1.00	.86	.10	.03
Once a month or less	.00	.14	.87	.16
More than once a month	.00	.01	.03	.81
School Problem				
Never drank	1.00	.00	.00	.00
No	.00	1.00	.96	.86
Yes	.00	.00	.04	.14
Friend Problem				
Never drank	1.00	.00	.00	.00
No	.00	.98	.80	.63
Yes	.00	.02	.20	.38
Date Problem				
Never drank	1.00	.00	.00	.00
No	.00	.92	.79	.64
Yes	.00	.08	.21	.36
Parent Problem				
Never drank	1.00	.00	.00	.00
No	.00	.97	.77	.68
Yes	.00	.03	.23	.32
Regret Actions				
Never drank	1.00	.00	.00	.00
No	.00	.95	.64	.49

	Class 4: Stable Abstainers N = 840	Class 2: Experimenters N = 247	Class 3: Moderate Drinkers N = 351	Class 1: Heavy Drinkers N = 187
Yes	.00	.05	.37	.51
Hung over/Threw up				
Never drank	1.00	.00	.00	.00
No to both	.00	.82	.26	.14
Yes to either or both	.00	.18	.74	.86
Regret Sex				
Never drank	1.00	.00	.00	.00
No	.00	.99	.83	.62
Yes	.00	.01	.17	.39
Physical Fight				
Never drank	1.00	.00	.00	.00
No	.00	.98	.93	.72
Yes	.00	.02	.07	.28
Drive while Drunk				
Never drank	1.00	.00	.00	.00
No	.00	.99	.93	.77
Yes	.00	.01	.07	.23
Drink at School				
Never drank	1.00	.00	.00	.00
No	.00	.99	.96	.81
Yes	.00	.01	.04	.19
Carry Weapon and Drink				
Never drank	1.00	.00	.00	.00
No	.00	1.00	1.00	.94
Yes	.00	.00	.00	.06
Drink Alcohol Alone				
Never drank	1.00	.00	.00	.00
No	.00	.83	.82	.67
Yes	.00	.17	.18	.33
Drink and Use Drugs				
Never drank	1.00	.00	.00	.00
No	.00	.97	.79	.49
Yes	.00	.03	.21	.51

Note. Fit statistics for the 4-class model were: Loglikelihood = −7322.530; AIC = 14939.059; BIC = 15731.869; Entropy = .94. The 4-class model showed better fit than the 3-class model (LL = −7591.489; AIC = 15402.978; BIC = 15996.237; Entropy = .95) and the 5-class model (LL = −7232.235; AIC = 14832.469; BIC = 15824.830; Entropy = .93).

Table 4

Estimated Conditional Probabilities by Class for Alcohol Use Indicators at Wave 2: AA Girls (Total N =600)

	Class 1: Abstainers N = 408	Class 2: Experimenters N = 129	Class3: Problem Drinkers N = 64
Past Year Drinking			
Never	1.00	.00	.00
Once a month or less	.00	.84	.24
2-3 days a month	.00	.01	.34
Once a week or more	.00	.16	.42
Quantity			
Never drank	1.00	.00	.00
One drink	.00	.38	.05
2-3 drinks	.00	.46	.49
4 or more drinks	.00	.16	.47
Past Year Heavy Drinking			
Never	1.00	.83	.29
Once a month or less	.00	.15	.31
More than once a month	.00	.03	.40
Past Year Got Drunk			
Never	1.00	.74	.16
Once a month or less	.00	.26	.42
More than once a month	.00	.00	.42
School Problem			
Never drank	1.00	.00	.00
No	.00	1.00	.95
Yes	.00	.00	.05
Friend Problem			
Never drank	1.00	.00	.00
No	.00	.95	.73
Yes	.00	.05	.27
Date Problem			
Never drank	1.00	.00	.00
No	.00	.92	.66
Yes	.00	.08	.34
Parent Problem			
Never drank	1.00	.00	.00
No	.00	.96	.74
Yes	.00	.04	.26
Regret Actions			
Never drank	1.00	.00	.00
No	.00	.98	.46
Yes	.00	.03	.54

	Class 1: Abstainers N = 408	Class 2: Experimenters N = 129	Class3: Problem Drinkers N = 64
Hung Over/Threw Up			
Never drank	1.00	.00	.00
No to both	.00	.84	.37
Yes to either or both	.00	.17	.63
Regret Sex			
Never drank	1.00	.00	.00
No	.00	.95	.74
Yes	.00	.05	.26
Physical Fight			
Never drank	1.00	.00	.00
No	.00	1.00	.62
Yes	.00	.00	.38
Drive while Drunk			
Never drank	1.00	.00	.00
No	.00	.98	.93
Yes	.00	.02	.07
Drink at School			
Never drank	1.00	.00	.00
No	.00	.97	.90
Yes	.00	.03	.10
Carry Weapon and Drink			
Never drank	1.00	.00	.00
No	.00	.99	.85
Yes	.00	.01	.15
Drink Alcohol Alone			
Never drank	1.00	.00	.00
No	.00	.83	.58
Yes	.00	.17	.42
Drink and Use Drugs			
Never drank	1.00	.00	.00
No	.00	.96	.77
Yes	.00	.04	.23

Note. Fit statistics for the 3-class model were: Loglikelihood = −1801.186; AIC = 3822.371; BIC = 4306.034; Entropy = .98. The 3-class model showed better fit than the 2-class model (LL =−1986.134; AIC = 4118.268; BIC = 4439.243; Entropy = 1.00) and the 4-class model (LL = −1754.619; AIC = 3803.239; BIC = 4449.588; Entropy = .97).

Table 5

Latent Transition Probabilities Based on the Estimated Models for White (N = **1625**) and AA (N = **600**) Girls

	WAVE 2				
	Abstainers	**Experimenters**	**Moderate Drinkers**	**Heavy Drinkers**	**Problem Drinkers**
WAVE 1					
White Girls					
Abstainers	**.744**	.146	.075	.035	--
Experimenters	.360	**.345**	.247	.049	--
Moderate Drinkers	.198	.094	**.540**	.167	--
Heavy Drinkers	.093	.005	.263	**.639**	--
AA Girls					
Abstainers	**.840**	.122	--	--	.038
Experimenters	.441	**.482**	--	--	.077
Problem Drinkers	.169	.322	--	--	**.510**

Note. Numbers in the table represent the estimated conditional probability of membership in the latent classes at Wave 2 given class membership at Wave 1. Bolded numbers on the diagonal represent stability in class membership across time, and the off-diagonals represent movement among the classes. All reported results were adjusted for the weighted sampling design of Add Health.

Table 6

Estimated Odds Ratios (95% Confidence Intervals) for Predictors of Latent Class Transition Groups for White (**N = 1625**) and AA (**N = 600**) Girls

	Age	Mother education	Family composition	School connection	Academic misbehavior	Peer support	Family relationship	Delinquency	Depressive symptoms	Substance use
White										
SA (R)										
INC	.98 (.87, 1.11)	1.06 (.86, 1.31)	.88 (.51, 1.51)	.93 (.68, 1.26)	1.16* (1.04, 1.30)	1.71*** (1.45, 2.02)	.89 (.62, 1.28)	1.17* (1.00, 1.36)	1.02 (.99, 1.04)	4.12* (1.42, 12.01)
DEC	1.65*** (1.34, 2.04)	.90 (.65, 1.26)	.72 (.35, 1.45)	.97 (.58, 1.61)	1.17* (1.03, 1.34)	1.90*** (1.48, 2.43)	.99 (.58, 1.68)	1.25* (1.04, 1.50)	1.06** (1.02, 1.11)	10.39*** (3.23, 33.41)
AA										
SA (R)										
INC	1.46* (1.04, 2.04)	1.30 (.82, 2.06)	.36 (.12, 1.10)	1.09 (.61, 1.96)	.93 (.75, 1.16)	1.11 (.78, 1.60)	1.01 (.36, 2.86)	1.47* (1.07, 2.02)	1.03 (.98, 1.08)	1.37 (.28, 6.77)
DEC	1.43 (.91, 2.24)	1.41 (.75, 2.64)	1.03 (.28, 3.86)	.67 (.29, 1.53)	1.07 (.85, 1.35)	1.16 (.72, 1.88)	.36** (.19, .70)	1.32$^{\psi}$ (.99, 1.75)	.99 (.92, 1.07)	7.72* (1.21, 49.36)

*
$p < .05$,

**
$p < .01$,

***
$p < .001$,

$^{\psi} p < .10$

Note. SA = Stable Abstainers; R = Reference Group; INC = Increasers; DEC = Decliners.

All reported results were adjusted for the weighted sampling design of Add Health.

The dependent variable was coded in the following way: 0=stable abstainers, 1=increasers, 2=decreasers. Thus, odds ratios less than 1 indicate a higher probability of belonging to the reference class (stable abstainers).