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Racial differences in type of alcoholic beverage consumed during adolescence in the Pittsburgh Girls Study

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Abstract

Background—White, compared to Black, adolescents have higher rates of alcohol use, and show more rapid increases in alcohol use. Racial differences in type of alcohol beverage (i.e., beer, wine, liquor) consumed by youth have received scant attention, and little is known regarding changes in type of alcohol beverage consumed during adolescence, when experimentation may transition to more regular use.

Methods—This study used repeated measures latent class analysis to identify distinct profiles that represent change in type of alcohol beverage consumed across ages 11–18, and to examine predictors (e.g., caretaker alcohol use, perceived peer alcohol use, ease in accessing alcohol, perceived neighborhood risk indicated by witnessing drug dealing), most of which were measured at ages 11–12, of alcohol use profiles in the Pittsburgh Girls Study (n=2,171; 57% Black, 43% White), a community sample with annual follow-ups.

Results—Among Black girls, 2 profiles were identified: Low Use (76%), and Alcohol Use involving primarily liquor starting around age 15 (24%). Among White girls, 4 profiles were identified: Wine sippers (11%); a Low Use profile with low probability of drinking until age 18, when use of beer and liquor increased (52%); an Increasing Use profile with increased probability of drinking beer and liquor starting at age 15 (23%); and a High Alcohol Use profile, starting with use of wine, then shifting to use primarily of beer and liquor after age 13 (14%). Separate risk factor analyses conducted by race indicated similar predictors for Black and White girls: perceived ease in accessing alcohol, witnessing neighborhood drug dealing, and perceived peer alcohol use were each associated with heavier drinking profiles.

Conclusions—Longitudinal profiles of type of alcoholic beverages, within and across racial groups, can guide the tailoring of interventions to address developmentally salient turning points in alcohol use for specific subgroups of girls.

Keywords

adolescent females; alcoholic beverage type; race/ethnicity

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Introduction

White, compared to Black, adolescents have higher rates of alcohol use (Johnson et al., 2012), tend to persist in drinking behavior following onset (Malone et al., 2012), and show more rapid increases in alcohol use (Flory et al., 2006). To complement data that highlight racial differences in youth drinking prevalence, racial differences in youth alcohol consumption need to be examined in terms of type of alcoholic beverage (i.e., beer, wine, liquor) consumed. In addition, the narrowing gender gap in adolescent alcohol use is cause for concern, justifying a focus on the development of alcohol use among girls. Specifically, the 2011 Monitoring the Future (MTF) survey indicated that the prevalence of being drunk in the past month was similar for 8th grade females and males (4.2% and 4.4%, respectively), but remained higher among 12th grade males compared to females (28% versus 22%; Johnston et al., 2012). Findings regarding beverage-specific alcohol use by youth, particularly in the understudied group of adolescent females, could inform regulatory policy (e.g., beverage-specific advertising regulations) and alcohol prevention and intervention (Cremeens et al., 2009; Naimi et al., 2007; Roeber et al., 2007; Cremeens et al., 2009; Werch et al., 2005).

Time trend data from the annual MTF surveys indicate that in the past 15 years (circa 1996–2011), the rate of liquor consumption among high school seniors has generally remained steady, while consumption of beer and wine has decreased (Johnston et al., 2012). Cross-sectional survey data on 9th through 12th graders in the 2005 and 2007 Youth Risk Behavior Surveillance System (YRBSS) also show that liquor is the alcoholic beverage consumed most often, followed by beer, with relatively low consumption of wine and wine coolers (Roeber et al., 2007; Siegel et al., 2011). Liquor and beer also were the most commonly reported alcoholic beverages reported by 6th through 12th graders in cross-sectional surveys conducted by the Parents' Resource Institute for Drug Education (Pride Surveys, 2010). These time trend and cross-sectional data indicate a shift toward greater consumption of liquor relative to beer in the past 15 years among youth, but cannot address within-person changes in type of alcohol beverage consumed during adolescence, when alcohol use may become more regular.

Characterizing longitudinal, within-person changes in type of alcohol beverage consumed during adolescence could reveal subgroups of youth who show differing patterns of development in the consumption of specific types of alcohol beverages. For example, the limited research on very early episodes of alcohol use suggests that wine, wine coolers, and beer were the alcoholic beverages consumed (usually a sip or taste) most often by children, with very few children reporting liquor (Donovan and Molina, 2008; Johnson et al., 1997). A 2-year longitudinal study of high school students followed from 9th to 11th grade observed increasing use of liquor and decreasing use of wine, with other alcoholic beverages (e.g., beer) showing little change over time (Moore and Werch, 2007). The current study provides a unique contribution to the literature by examining longitudinal patterns in type of alcoholic beverage consumed over 8 waves of annual data, covering ages 11–18, a time frame which may involve, for some youth, a shift from early exposure to wine to consumption of beverages associated with alcohol-related harm (e.g., liquor; Maldonado-Molina et al., 2010).

Little is known regarding racial/ethnic differences in type of alcoholic beverage typically consumed by youth, particularly among girls. The 2007 YRBSS survey of 9th through 12th grade students found that among Black youth, liquor was the beverage type reported most often (Siegel et al., 2011). With regard to gender differences, a longitudinal study of 9th graders followed over 2-years found that girls were more likely than boys to report consuming wine and wine coolers (Werch et al., 2006). To date, few studies have examined

race differences in type of alcohol beverage consumed by adolescent females, although such data could be used to inform policies and interventions that address the narrowing gender gap in adolescent alcohol use.

In addition to characterizing longitudinal patterns in type of alcohol beverage consumed during adolescence, the identification of risk factors associated with distinct longitudinal drinking profiles can aid intervention development. A social developmental framework (Hawkins et al., 1992) proposes that individual, social, and community-level factors contribute to risk for adolescent alcohol use. Individual risk factors that were examined in the current study include early pubertal maturation, which for girls has been associated with increased risk for early substance use, possibly through greater contact with older peers who provide access to alcohol (Lanza and Collins, 2002; Storvoll et al., 2008); and perceived ease in accessing alcohol (Johnston et al., 2012). Social risk factors that were considered included the primary caretaker's level of alcohol use, given the caretaker's role in modeling drinking behavior; and the girl's perceptions of peer alcohol use, since perceived peer use robustly predicts youth alcohol involvement (e.g., Curran et al., 1997; Tobler et al., 2011). We also examined the community-level risk factor of witnessing drug dealing in the neighborhood, since some research suggests that perceptions of neighborhood drug activity (e.g., witnessing drug selling) may be important in predicting alcohol and other drug use among urban Black youth (e.g., Lambert et al., 2004).

The current study addresses gaps in knowledge regarding longitudinal changes in type of alcohol beverage consumed (i.e., beer, wine, liquor) during adolescence (ages 11–18) using data from the Pittsburgh Girls Study, a large community sample of urban girls. Latent class analyses, conducted separately for Black and White girls, identified distinct profiles representing change in type of alcoholic beverage consumed over ages 11–18, with the expectation, based on prior research, that Black girls would primarily report use of liquor (relative to beer or wine), whereas drinking profiles among White girls would be more varied, and likely to involve some combination of wine, liquor, and beer (cf. Siegel et al., 2011). We also predicted that a profile representing a shift from early use of wine to consumption of alcoholic beverages associated with greater alcohol-related harm (i.e., liquor; Maldonado-Molina et al., 2010) would be identified, as suggested by cross-sectional data (Siegel et al., 2011). Regarding risk factors, we predicted that associations of risk factors with heavier drinking profiles would be similar for Black and White girls, with the exception that neighborhood risk (witnessing drug selling) might be particularly important among Black girls (cf. Lambert et al., 2004).

Materials and Methods

Participants

The Pittsburgh Girls Study (PGS; $N=2,451$) is a community sample of four female age cohorts (ages 5–8 at wave 1), who are followed annually in an accelerated longitudinal design. PGS sample ascertainment has been detailed elsewhere (Hipwell et al., 2002; Keenan et al., 2010). Briefly, the PGS oversampled low income neighborhoods, with 85.2% of eligible families completing the first wave of data collection. Analyses excluded the small subsample of girls who were not identified as White or Black ($n=145$), and who did not provide any alcohol use data over ages 11–18 ($n=135$). Thus, the analysis sample included 2,171 girls (Black $n=1236$, 56.9%; White $n=935$, 43.1%) who provided data on alcohol use for at least one wave from ages 11–18. A minority (34.8%) of these families received public assistance at age 11. Retention was high: average of 88.5% over ages 11–18 (data collection years 2003–2010).

There were no statistically significant differences between girls included in the analyses ($n=2171$) and those who were not ($n=280$) on receipt of public assistance at Wave 1 or single parent household. Families with primary caretaker education >12 years were more likely to be excluded than those with <12 years of education (13.0% vs. 9.7% excluded, respectively, $\chi^2[1]=6.5$, $p=.01$). White girls were more likely to be excluded due to the absence of alcohol use data at ages 11–18 than Black girls (7.3% vs 4.7% excluded, respectively; $\chi^2[1]=7.1$, $p<.01$).

Procedure

Annual in-home computerized interviews were conducted separately with the girl and the girl's primary caretaker (94% mothers) by highly trained research staff (Hipwell et al., 2002; Keenan et al., 2010). The protocol was approved by the university's Institutional Review Board.

Measures

Alcohol use—The Nicotine, Alcohol, and Drug Substance Use measure (NADU; Pandina et al., 1984) collected girls' self-report of past year frequency of alcohol use (including sips and tastes) at ages 11–18 using separate items ("How often did you drink [beverage type] within the past year?") for the following beverage types: beer, wine, and liquor (cf. PRIDE, 2010). Girls were not asked specifically about malt beverages. Since a fully structured interview was used, the girl decided how "malt beverage" was categorized in terms of "beer," "wine" or "liquor". Past year use of each beverage type was coded 0=no and 1=yes. Past year rates of alcohol use in PGS are generally similar to rates in national surveys (cf. Johnston et al., 2010;). The NADU also collected information on usual quantity of alcohol consumed in the past year, on a day when drinking occurred, where one drink was defined as 1 12-ounce can of beer, 1 5-ounce glass of wine, or 1 shot [1.5 ounces] of liquor.

Individual risk factors—Girls self-reported pubertal maturation at age 11 using the Peterson Pubertal Development Scale (Petersen et al., 1988), with scores classified into pre-pubertal, early puberty, mid-pubertal, advanced puberty, and post-pubertal stages (Petersen et al., 1988). Since early pubertal maturation has been associated with risk for alcohol use among girls (Lanza and Collins, 2002; Storvoll et al., 2008), pubertal stages at age 11 were collapsed into 0=pre-pubertal, beginning pubertal, and mid-pubertal versus 1=advanced pubertal and post-pubertal. At Wave 11 (ages 15–18), an item on perceived ease/difficulty in accessing alcohol ("How difficult would it be for you to obtain alcohol?") (Johnston et al., 2012) was administered, with responses recoded to 0=probably impossible, very difficult, fairly difficult versus 1=fairly easy and very easy, due to skewed distribution.

Neighborhood, family, and peer risk factors—Girls reported on risky neighborhood environment at age 12 (the first age at which this item was asked) with the question "How often have you seen others getting or buying drugs in your neighborhood?" (Loeber et al., 1998) which was coded as 0=never and 1=witnessing any drug selling activity. A family risk factor was past year receipt of public assistance at age 11, coded 0=no and 1=yes. At girl age 11, the primary caretaker completed the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001). The recommended AUDIT cutoff score of 8 used to identify problem drinking (0= <8 points, 1=8+ points; Babor et al., 2001). Girls also reported on perceived peer alcohol use at age 11 ("How many of your friends have used alcohol?"; Johnston et al., 2010), which was coded as 0=none and 1=one or more peers, due to skewed distribution.

Data analysis

We used Latent Gold version 4.0 (Vermunt and Magidson, 2005) to conduct repeated measures latent class analyses (RM LCA; Collins and Lanza, 2010) of alcoholic beverage type (i.e., beer, wine, liquor) consumed in the past year at ages 11–18 (8 time points). Preliminary multiple group analyses, which formally tested invariance of latent class structure for White and Black girls, indicated the need for separate analyses by race, which is consistent with prior PGS analyses of substance use data (Chung et al., 2008; Chung et al., in press). Sample weights, which approximate regional demographics according to the 2000 Census, were included in all RM LCA models. A dichotomous indicator (0=no, 1=yes) of past year consumption of beer, wine, and liquor at each age was used. The RM LCA model estimated the following parameters: latent class (profile) membership probabilities, and item response probabilities (IRPs) for each class (i.e., the probability of using beer, wine, and liquor at each age conditional on most likely class). For each drinking profile, usual drinking quantity for each beverage type was described by age (Appendices A, B).

In the PGS longitudinal accelerated design, data for younger cohorts at older ages are missing by design, such that all four cohorts provided data at ages 11–15, the three oldest cohorts provided data at age 16, the two oldest cohorts provided data at age 17, and the oldest cohort provided data at age 18. RM LCA in Latent Gold accommodated incomplete data using full information maximum likelihood estimation (Vermunt and Magidson, 2005). The best-fitting model was determined by the Bayesian Information Criterion (BIC; lower value indicates better fit) (Henson et al., 2007).

After identifying the optimal number of classes for the RM LCA model, separately for White and Black girls, we conducted a new analysis in each subsample. The new analysis involved simultaneous estimation of the classes and the association of classes with all covariates, in separate analyses for Black and White girls. Dummy variables representing cohort were included in the risk factor analyses. For the “access to alcohol” variable, which was assessed only at Wave 11 (when girls in the 4 cohorts were ages 15, 16, 17, and 18), preliminary analyses did not indicate a significant interaction of this variable with cohort (Black subsample: $\Delta\chi^2(3) = 7.6$, $p = .055$; White subsample: $\Delta\chi^2(9) = 11.0$, $p = .276$), thus interactions of cohort with the “access to alcohol” variable were not included. Results of analyses in which all covariates were considered simultaneously were similar to results of analyses in which each covariate was examined as a predictor of class membership one at a time, suggesting that the results of the covariate analyses presented below do not appear to be biased due to sparse data or low statistical power (each profile tested included at least 100 cases).

Results

Prevalence of alcohol use and covariates by race

Prevalence of past year alcohol use increased with age, and was higher among White, relative to Black, girls at ages 11–18 as determined by χ^2 tests (Table 1). Figure 1 shows that race differences in consumption of beer emerged at age 14 (White: 17.4%, Black: 4.8%; $\chi^2[1] = 84.6$, $p < .01$), wine at age 11 (White: 12.6%, Black: 5.6%; $\chi^2[1] = 31.5$, $p < .01$), and liquor at age 14 (White: 12.3%, Black: 7.7%; $\chi^2[1] = 11.4$, $p < .01$).

With regard to individual risk factors (see Table 1 for details), Black, compared to White, girls were more likely to report being in an advanced pubertal stage at age 11 (35.9% versus 20.8%, respectively). However, Black girls were less likely than White girls to report that it was easy to obtain alcohol (50.3% versus 67.0%, respectively). As an indicator of neighborhood risk, Black girls were more likely to report witnessing drug selling at age 11 than White girls (44.0% versus 15.5%, respectively). Black girls also were more likely than

White girls to report receiving public assistance at age 11 (49.5% versus 15.3%, respectively), and to report peer alcohol use at age 11 (14.1% versus 6.7%, respectively). There was no significant difference by race in the proportion of primary caretakers with problem drinking scores on the AUDIT (Black subsample: 5.8%, White subsample: 4.4%). In sum, Black girls were more likely to report most of the risk factors than White, girls. However, Black girls reported greater difficulty obtaining alcohol compared to White girls, which may reduce their risk for early alcohol use.

Best fitting RM LCA model in Black and White subgroups

In the Black subgroup, BIC indicated that the 2-class RM LCA model had the best fit to the data (Table 2). Classification quality was satisfactory: entropy=.74 (values closer to 1 indicate high classification quality); classification errors=.06; and probability of being assigned to the most likely class ranged from .92 [Alcohol Use class] –.95 [Low Use class]). The 2-class model (Figure 2) included a “Low Use” class (76.5%), and an “Alcohol Use” class (23.5%). Figure 2 shows that, for the Alcohol Use class, early use of alcohol was most likely to involve wine, with a shift at age 15 to increased likelihood of consuming liquor, which was more likely to be reported relative to beer and wine starting at age 15. In the Alcohol Use class, early use (ages 11–12) of wine consisted primarily of sips and tastes, whereas starting at age 13, the majority (i.e., >55%) who consumed liquor consumed at least 1 full drink (Appendix A). Even in the Low Use class, among Black girls at age 18, liquor was more likely to be consumed relative to beer and wine.

In the White subgroup, the 4-class RM LCA model had the lowest BIC (Table 2). Classification quality was satisfactory: entropy=.72; classification errors=.13; and probability of being assigned to the most likely class ranged from .82 [Wine Use class] – .91 [High Alcohol Use class]). The 4-class model (Figure 3) included a “Low Use” class (51.8%), a “Wine” using class (11.4%), a class with “Increasing Alcohol Use” starting at age 15 (22.8%), and a “High Alcohol Use” class (14.0%). The Wine using class reported primarily sips and tastes of wine at all ages (Appendix B). The Low Use class typically reported sips of wine at younger ages (11–15), with use of beer and liquor generally emerging later (ages 17–18). The other two classes (i.e., Increasing Alcohol Use, High Alcohol Use) tended to report greater likelihood of consuming beer and liquor, relative to wine, especially at older ages. In the High Alcohol Use class, starting at age 15, most girls (>55%) who consumed beer and/or liquor consumed at least 1 full drink of the beverage, whereas in the Increasing Alcohol Use class, most girls (>55%) consumed at least 1 full drink of beer and/or liquor one year later, at age 16 (Appendix B). The alcohol beverage profiles indicate differences by race in beverage consumed (Black girls: liquor, White girls: beer and liquor), and when the profiles are considered together with data quantity consumed on a drinking day, appear to be suggestive (no formal analysis was conducted) of possible race differences in age-related turning points for consumption of a full drink of alcohol.

Including covariates in the RM LCA model for each racial group

The six covariates and dummy coded cohort variables were entered simultaneously as predictors of the latent profiles, in analyses conducted separately in Black and White subsamples (see Table 3). Among the predictors, perceived ease of accessing alcohol ($p<.001$), risky neighborhood (i.e., witnessing drug selling) ($p<.001$), and peer alcohol use ($p<.01$) were each associated with the Alcohol Use class in the Black subsample, and High Use class in the White subsample.

Discussion

An important advance provided by this study involves the identification of distinct longitudinal profiles representing change in alcohol beverage type (i.e., beer, wine, liquor) during adolescence (ages 11–18), and differences by race in the profiles identified. As predicted, the majority (76%) of Black girls were classified in a “Low Use” class. However, Black girls in the Alcohol Use class, which represented a minority of the subsample, reported greater use of liquor starting at age 15, relative to beer or wine. A greater variety of drinking profiles based on alcohol beverage type was identified among White girls, with classes representing use of wine, or a combination of beer and liquor consumption. Results also provided support for certain profiles that involved a shift at ages 14–15 from early use of wine to consumption of alcoholic beverages that may be associated with greater alcohol-related harm (e.g., liquor) in both Black (i.e., Alcohol Use class) and White girls (i.e., Increasing and High alcohol use classes). Results of risk factor analyses suggested similar associations of the risk factors examined with drinking profiles for Black and White girls, despite greater prevalence of most risk factors among Black girls.

The greater prevalence of alcohol use among White, compared to Black, girls at ages 11–18 is consistent with national survey data (e.g., Johnston et al., 2012). White girls in heavier drinking profiles also tended to report use of both liquor and beer, as reported in a school-based survey (Pride Surveys, 2010). In contrast, Black girls tended to report use primarily of liquor, particularly starting at age 15. The greater use of liquor, relative to beer and wine, among Black girls is consistent with surveys reporting liquor as the alcoholic beverage used most often by adolescents (Johnston et al., 2012; Siegel et al., 2011), and with preference for liquor over beer among Black youth (Siegel et al., 2011). Although liquor and beer were the alcoholic beverage types most commonly used by youth, differences across studies may reflect regional variation in alcohol beverage consumption (e.g., Roeber et al., 2007), and differences in the range of beverage types that were coded.

Importantly, the identified profiles suggest some age-related shifts in type of alcoholic beverage consumed, which suggest specific time points for intervention. In both Black and White samples, a profile that involved early use of wine that transitioned to consumption of alcoholic beverages associated with risky drinking behavior (e.g., liquor) was identified. This shift from wine to other alcoholic beverage types (Black: at age 15; White at ages 14–15) for some girls supports cross-sectional data documenting an age-related increase in liquor use (Siegel et al., 2011), and is consistent with results from a 2-year longitudinal study of high school students, which found, on average, increasing use of liquor and decreasing use of wine over follow-up (Moore and Werch, 2007). In both Black and White girls, ages 14–15 appear to signal, for a subgroup of girls, an important turning point in alcohol use, which may be associated with starting high school and changes in peer network. Intervention to reduce the likelihood of consuming liquor and beer appears to be indicated at ages 14–15 for specific subgroups of Black and White girls.

The likelihood of using wine tended to emerge early in both Black and White girls (at ages 11–13), relative to beer and liquor. The higher rate of wine use starting at age 11 among White, compared to Black girls, replicates findings regarding race/ethnic differences in early episodes of alcohol use (Donovan and Molina, 2008; Johnson et al., 1997). The early use of wine among girls in the current study typically involved sips or tastes. Donovan and Molina (2008) found that early alcohol use (typically sips or tastes) usually occurred in a family context, and appeared to reflect parental modeling of alcohol use and greater opportunity for use in the home, rather than deliberate socialization of children to drinking behavior. For some girls (i.e., for certain profiles), these opportunistic sips of alcohol transitioned to consumption of beer and/or wine at around ages 14–15 in both Black and White groups.

However, among White girls, a subgroup tended to report only sips or tastes of wine, which might reflect limited use in a religious or other supervised context.

The distinct drinking profiles identified for Black and White girls also suggest possible adolescent origins of differences between Black and White women in drinking patterns. Specifically, Black, compared to White, women are less likely to report past year alcohol use (Falk et al., 2008). However, among women drinkers, older (age 30 and older) Black women had greater risk for onset and persistence of alcohol use disorder than young adult White women (Grant et al., 2011). The two alcohol use classes identified for Black girls in this study might set the stage for patterns of relatively low or high likelihood of alcohol use into adulthood. The profiles for Black girls also suggest greater consumption of liquor starting at age 15, relative to wine or beer. Since use of liquor specifically has been associated with adverse consequences in adolescents (Maldonado-Molina et al., 2010) and adults (Bluthenthal et al., 2005), racial differences in usual alcoholic beverage consumed might be one important factor contributing to racial differences in drinking patterns and problems (Bluthenthal et al., 2005). In this regard, beverage choice may reflect availability, price, taste (e.g., preference for sweeter drinks among novice drinkers), desire for specific effects (e.g., rapid intoxication), and among youth, opportunity to use (Hughes et al., 1997).

Similar risk factors predicted heavier drinking profiles in both Black and White girls (cf. Tobler et al., 2011). Among the risk factors examined, perceived ease of accessing alcohol, witnessing drug activity, and peer alcohol use had the strongest associations with heavier drinking profiles. Greater difficulty accessing alcohol was reported by Black girls more often than White girls, which may account, in part, for their lower rates of alcohol use in adolescence. Lower perceived access to alcohol among Black girls may help to explain why, despite reporting greater likelihood of experiencing other risks (e.g., witnessing neighborhood drug dealing, greater perceived peer alcohol use), Black girls reported less alcohol use than White girls. The absence of a significant effect on class membership for risk factors of early puberty and caretaker AUDIT score may, in the case of early puberty, be due to adjusting for other covariates, or in the case of caretaker AUDIT score, the use of mainly mother (rather than report from both parents) self-report, which might underestimate effects of parental drinking on class membership. Overall, study findings highlight the importance, for both Black and White girls, of specific family and community-level influences on drinking behavior that include limiting access to alcohol among youth, improving neighborhood conditions (e.g., greater police presence to reduce drug selling), and minimizing youth contact with deviant peers in preventing early alcohol use.

Research on the types of alcohol beverages consumed by youth has implications for guiding regulatory and environmental strategies to reduce underage drinking (Creameens et al., 2009). For example, governmental regulation, which is often alcoholic beverage-specific (e.g., advertising guidelines, alcohol excise taxes), has been shown to reduce underage drinking (Carpenter et al., 2007). Furthermore, a brief pilot alcohol- beverage specific intervention (e.g., providing education about beverage-specific alcohol content) among high school student drinkers reduced risk for alcohol consumption, particularly malt liquor use (Werch et al., 2005).

Study limitations warrant consideration, and include the absence of detailed questions about alcohol beverage type beyond querying “beer,” “wine,” and “liquor,” and information on how girls might have categorized “malt beverage” in terms of “beer,” “wine” or “liquor.” Self-reported alcohol use may have limitations, however, procedures to maximize validity of self-report were used (e.g., assurance of confidentiality). The identified profiles suggest heuristic patterns of development and warrant replication. Due to differences by race in latent class structure, only within group analyses of the association between covariates and

alcohol use classes could be conducted. Information on how alcohol was obtained, context and reasons for alcohol use were not available. Selected risk factors were examined, such that analyses did not include, for example, consideration of certain individual factors (e.g., conduct problems: Loeber et al., 2010), which predict girls' alcohol use. Future work integrating other risk factors, such as alcohol expectancies, is planned. Generalizability of findings to males and other race/ethnic groups is limited.

This longitudinal study identified distinct profiles, separately for Black and White girls, representing change in type of alcoholic beverage consumed over ages 11–18. The female-specific profiles indicate racial differences in type of beverage consumed, and age-related turning points that signal increased risk for alcohol consumption among certain subgroups. The profiles provide novel information that can guide the development of beverage-specific interventions to address drinking behaviors which are specific to certain subgroups of girls.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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References

- Babor, TF.; Higgins-Biddle, JC.; Saunders, JB.; Monteiro, MG. Guidelines for Use in Primary Care. Geneva: World Health Organization; 2001. The Alcohol Use Disorders Identification Test.
- Bluthenthal RN, Browntaylor D, Guzman-Becerra N, Robinson PL. Characteristics of malt liquor beer drinkers in a low-income, racial minority community sample. *Alcohol Clin Exp Res*. 2005; 29:402–9. [PubMed: 15770116]
- Carpenter CS, Kloska DD, O'Malley PM, Johnston LD. Alcohol control policies and youth alcohol consumption: Evidence from 28 years of Monitoring the Future. *B E J Econom Anal Policy*. 2007; 7:Article 25.
- Chung T, Hipwell A, Loeber R, White HR, Stouthamer-Loeber M. Ethnic differences in positive alcohol expectancies during childhood: the Pittsburgh Girls Study. *Alcohol Clin Exp Res*. 2008; 32:966–74. [PubMed: 18445108]
- Chung T, Kim K, Hipwell A, Stepp S. White and Black adolescent females differ in profiles and longitudinal patterns of alcohol, cigarette, and marijuana use. *Psychol Addict Behav*. in press.
- Collins, LM.; Lanza, ST. Latent class and latent transition analysis with applications in the social, behavioral, and health sciences. Hoboken, NJ: John Wiley & Sons; 2010.
- Cremeens JL, Miller JW, Nelson DE, Brewer RD. Assessment of source and type of alcohol consumed by high school students. *J Addict Med*. 2009; 3:204–210. [PubMed: 21769017]
- Curran PJ, Stice E, Chassin L. The relation between adolescent alcohol use and peer alcohol use: a longitudinal random coefficients model. *J Consult Clin Psychol*. 1997; 65:130–40. [PubMed: 9103742]
- Donovan JE, Molina BSG. Children's introduction to alcohol use: Sips and tastes. *Alcohol Clin Exp Res*. 2008; 32:108–119. [PubMed: 18070249]
- Falk D, Yi HY, Hiller-Sturmhofel S. An epidemiologic analysis of co-occurring alcohol and drug use and disorders: Findings from the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC). *Alc Res Health*. 2008; 31:100–110.
- Flory K, Brown TL, Lynam DR, Miller JD, Leukefeld C, Clayton RR. Developmental patterns of African American and Caucasian adolescents' alcohol use. *Cultur Divers Ethnic Minor Psychol*. 2006; 12:740–6. [PubMed: 17087533]

- Grant JD, Verges A, Jackson KM, Trull TJ, Sher KJ, Bucholz KK. Age and ethnic differences in the onset, persistence and recurrence of alcohol use disorder. *Addiction*. 2011; 107:756–765. [PubMed: 22085024]
- Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. *Psychol Bull*. 1992; 112:64–105. [PubMed: 1529040]
- Henson JM, Reise SP, Kim KH. Detecting mixtures from structural model differences using latent variable mixture modeling: A comparison of relative model fit statistics. *Struct Equ Modeling*. 2007; 14:202–226.
- Hipwell AE, Loeber R, Stouthamer-Loeber M, Keenan K, White HR, Kroneman L. Characteristics of girls with early onset disruptive and antisocial behaviour. *Crim Behav Ment Health*. 2002; 12:99–118. [PubMed: 12357260]
- Hughes K, MacKintosh AM, Hastings G, Wheeler C, Watson J, Inglis J. Young people, alcohol, and designer drinks: Quantitative and qualitative study. *Br Med J*. 1997; 314:414–418. [PubMed: 9040387]
- Johnson CC, Greenlund KJ, Webber LS, Berenson GS. Alcohol first use and attitudes among young children. *J Child Fam Stud*. 1997; 6:359–372.
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, J. Monitoring the Future national survey results on drug use, 1975–2009. Bethesda, MD: National Institute on Drug Abuse; 2010.
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the Future national results on adolescent drug use: Overview of key findings, 2011. Ann Arbor: Institute for Social Research, The University of Michigan; 2012.
- Keenan K, Hipwell A, Chung T, Stepp S, Stouthamer-Loeber M, Loeber R, McTigue K. The Pittsburgh Girls Study: overview and initial findings. *J Clin Child Adolesc Psychol*. 2010; 39:506–21. [PubMed: 20589562]
- Lambert SF, Brown TL, Phillips CM, Ialongo NS. The relationship between perceptions of neighborhood characteristics and substance use among urban African American adolescents. *Am J Comm Psychol*. 2004; 34:205–218.
- Lanza ST, Collins LM. Pubertal timing and the onset of substance use in females during early adolescence. *Prev Sci*. 2002; 3:69–82. [PubMed: 12002560]
- Loeber, R.; Farrington, D.; Stouthamer-Loeber, M.; Van Kammen, W. *Antisocial Behavior and Mental Health Problems: Risk Factors in Childhood and Adolescence*. Hillsdale, NJ: Lawrence Erlbaum; 1998.
- Loeber R, Stepp SD, Chung T, Hipwell AE, White HR. Time-varying associations between conduct problems and alcohol use in adolescent girls: the moderating role of race. *J Stud Alcohol Drugs*. 2010; 71:544–53. [PubMed: 20553663]
- Maldonado-Molina MM, Reingle JM, Tobler AL, Komro KA. Effects of beverage-specific alcohol consumption on drinking behaviors among urban youth. *J Drug Educ*. 2010; 40:265–80. [PubMed: 21313986]
- Malone PS, Northrup TF, Masyn KE, Lamis DA, Lamont AE. Initiation and persistence of alcohol use in United States Black, Hispanic, and White male and female youth. *Addict Behav*. 2012; 37:299–305. [PubMed: 22136874]
- Moore MJ, Werch C. Results of a Two-Year Longitudinal Study of Beverage-Specific Alcohol Use among Adolescents. *J Drug Educ*. 2007; 37:107–122. [PubMed: 17977236]
- Naimi TS, Brewer RD, Miller JW, Okoro C, Mehrotra C. What do binge drinkers drink? Implications for alcohol control policy. *Am J Prev Med*. 2007; 33:188–193. [PubMed: 17826577]
- Pandina R, Labouvie E, White HR. Potential contributions of the life span developmental approach to the study of adolescent alcohol and drug use: The Rutgers Health and Human Development Project, a working model. *J Drug Issues*. 1984; 14:253–268.
- Petersen AC, Crockett L, Richards M, Boxer A. A self-report measure of pubertal status: Reliability, validity and initial norms. *J Youth Adolesc*. 1988; 17:117–133. [PubMed: 24277579]
- Pride Surveys. [Accessed 2-6-13] Questionnaire report for grades 6 to 12: National summary statistics for 2009–2010 [Online]. 2010. Available: <http://www.pridesurveys.com/customercenter/us09ns.pdf>

- Roeber J, Green DL, Meurer KM, Armitage JJ, Maas GM, McClinton RC, Courtney K, Cremeens JL, Miller JW, Eaton D. Types of alcoholic beverages usually consumed by students in 9th – 12th grades---Four states, 2005. *MMWR*. 2007; 56:737–740. [PubMed: 17657207]
- Siegel MB, Naimi TS, Cremeens JL, Nelson DE. Alcoholic beverage preferences and associated drinking patterns and risk behaviors among high school youth. *Am J Prev Med*. 2011; 40:419–426. [PubMed: 21406275]
- Storvoll EE, Pape H, Rossow I. Use of commercial and social sources of alcohol by underage drinkers: The role of pubertal timing. *Addict Behav*. 2008; 33:161–166. [PubMed: 17553624]
- Tobler AL, Livingston MD, Komro KA. Racial/Ethnic differences in the etiology of alcohol use among urban adolescents. *J Stud Alcohol Drug*. 2011; 72:799–810.
- Vermunt, JK.; Magidson, J. *Latent GOLD® 4.0 User's Guide*. Belmont, MA: Statistical Innovations Inc; 2005.
- Werch C, Jobli E, Moore MJ, DiClemente CC, Dore H, Brown CH. A brief experimental alcohol beverage-tailored program for adolescents. *J Stud Alcohol*. 2005; 66:284–90. [PubMed: 15957680]
- Werch C, Jobli E, Moore MJ, DiClemente CC, Dore HS, Brown CH. Do Alcohol Consumption Patterns of Adolescents Differ by Beverage Type? *J Child Adolesc Subst Abuse*. 2006; 15:45–62.

Figure 1.
Alcohol beverage type preference at ages 11–18 by race

Figure 2.
Black subsample: 2-class Repeated Measures Latent Class Analysis of Alcohol Beverage Type across ages 11–18 (N=1236)

Panel A: Low Use and Wine using classes

Panel B: Increasing Alcohol Use and High Alcohol Use classes

Figure 3.

White subsample: 4-class Repeated Measures Latent Class Analysis of Alcohol Beverage Type across ages 11–18 (N=935). Panel A: Low Use and Wine Use classes. Panel B: Increasing Alcohol Use and High Alcohol Use classes

Table 1

Sample descriptive statistics

Past Year Use	Total Sample		Black Girls		White Girls		Black vs White Girls	
	n	%	n	%	n	%	$\chi^2(1)$	
Any Alcohol	215	10.1	93	7.7	122	13.4	19.0**	
Age 11 (N=2121)	244	11.7	107	9.0	137	15.4	20.3**	
Age 12 (N=2085)	329	16.0	146	12.3	183	21.0	28.3**	
Age 13 (N=2057)	446	22.1	179	15.3	267	31.4	73.9**	
Age 14 (N=2018)	559	28.0	245	21.2	314	37.4	63.2**	
Age 15 (N=1996)	494	33.2	219	25.3	275	44.2	58.7**	
Age 16 (N=1489) ¹	407	41.4	177	30.9	230	56.0	62.0**	
Age 17 (N= 984) ²	296	58.7	136	46.1	160	76.6	46.8**	
Age 18 (N= 504) ³								
Individual risk factors	Total		Black Girls		White Girls		Black vs White Girls	
	n	%	n	%	n	%	$\chi^2(1)$	
Age 11: Adv puberty	600	29.5	422	35.9	178	20.8	53.55**	
Easy to get alcohol ⁴	1118	57.2	571	50.3	547	67.0	53.48**	
Neighborhood, family, and peer risk factors								
Age 12: Risky neigh	664	31.9	526	44.0	138	15.5	189.47**	
Age 11: Public Assist	739	34.8	600	49.5	139	15.3	266.24**	
Age 11: Caretaker AUDIT	110	5.2	70	5.8	40	4.4	1.79	
Age 11: Peer alc use	220	10.9	162	14.1	58	6.7	27.18**	

Total sample N =2171 with any alcohol data ages 11–18, unweighted data

¹ includes the 3 oldest cohorts;
² includes the 2 oldest cohorts;
³ includes only the oldest cohort
* p<.05,

** p<.01
* p<.05,
** p<.01

Notes: Total sample size ranges from 1953–2163 due to missing data; Black sample size ranges from 1136–1231; White sample size ranges from 817–910.

Adv puberty= advanced or post-puberty at age 11; Easy to get alcohol= Perceived ease in obtaining alcohol; Risky neigh= Witness any drug selling or dealing in the neighborhood in the past year; Public Assist=Received public assistance in the past year; Caretaker AUDIT score = 8, indicating problem drinking; Peer alc use= proportion reporting no perceived peer alcohol use vs any perceived peer alcohol use in the past year

⁴This item was assessed at Wave 11, when girls were ages 15–18.

Table 2

Comparison of Repeated Measures Latent Class Analysis Models: Ages 11–18 (8 time points)

Black Girls (n=1236)			
Number of classes	BIC	Degrees of Freedom	Classification Errors
1	12193.65	4328922	0.00
2	11033.90	4328920	0.06
3	11058.39	4328917	0.12

White Girls (n=935)			
Number of classes	BIC	Degrees of Freedom	Classification Errors
1	13480.53	5253915	0.00
2	11667.95	5253912	0.05
3	11514.52	5253910	0.11
4	11465.94	5253907	0.13
5	11489.04	5253905	0.14

Notes: BIC=Bayesian Information Criterion, where lower value indicates better fit. Best fitting model is indicated in **bold**. Although 1–6 classes were tested in both groups, class fit declined with each additional class after the model indicated in bold, and is not reported.

Table 3

Repeated Measures Latent Class Analysis model with covariates

Black girls: test for covariates (simultaneous entry) as predictors of alcohol use profile					
	Low Use class Unstd beta (SE)	Alcohol Use class Unstd beta (SE)	Wald	p-value	
Intercept	1.00 (0.15)	-1.00 (0.15)	44.34	<.001	
Individual risk factors					
Age 11: Adv puberty	-0.05 (0.09)	0.05 (0.09)	0.36	0.55	
Easy to get alcohol ¹	-0.55 (0.09)	0.55 (0.09)	36.09	<.001	
Neighborhood, family, and peer risk factors					
Age 12: Witness drug deal	-0.27 (0.08)	0.27 (0.08)	10.10	0.001	
Age 11: Public Assist	0.03 (0.08)	-0.03 (0.08)	0.09	0.76	
Age 11: Caretaker AUDIT	0.11 (0.19)	-0.11 (0.19)	0.33	0.56	
Age 11: Peer alc use	-0.53 (0.11)	0.53 (0.11)	21.99	<.001	
Cohort 5 dummy variable	0.24 (0.14)	-0.24 (0.14)	2.88	0.09	
Cohort 6 dummy variable	0.04 (0.12)	-0.04 (0.12)	0.14	0.71	
Cohort 7 dummy variable	-0.05 (0.11)	0.05 (0.11)	0.23	0.63	

White girls: test for covariates (simultaneous entry) as predictors of alcohol use profile					
	Low Use class Unstd beta (SE)	Increasing Use class Unstd beta (SE)	High Use class Unstd beta (SE)	Wald	p-value
Intercept	1.15 (0.22)	-0.12 (0.26)	-1.18 (0.30)	34.72	<.001
Individual risk factors					
Age 11: Adv puberty	-0.08 (0.20)	-0.02 (0.27)	0.53 (0.20)	7.48	0.06
Easy to get alcohol ¹	-0.94 (0.16)	0.42 (0.25)	0.91 (0.30)	46.46	<.001
Neighborhood, family, and peer risk factors					
Age 12: Witness drug deal	-0.65 (0.23)	-0.52 (0.28)	0.57 (0.24)	15.90	0.001
Age 11: Public Assist	0.31 (0.23)	0.40 (0.29)	0.10 (0.28)	3.36	0.34
Age 11: Caretaker AUDIT	1.03 (0.51)	1.29 (0.56)	1.06 (0.54)	7.45	0.06
Age 11: Peer alc use	-0.37 (0.33)	-0.08 (0.36)	0.90 (0.30)	11.85	0.008
Cohort 5 dummy variable	0.51 (0.21)	0.14 (0.28)	-0.36 (0.24)	7.69	0.05
Cohort 6 dummy variable	0.48 (0.20)	-0.28 (0.26)	0.19 (0.22)	6.82	0.08

White girls: test for covariates (simultaneous entry) as predictors of alcohol use profile					
	Low Use class Unstd beta (SE)	Increasing Use class beta (SE)	High Use class Unstd beta (SE)	Wine class Unstd beta (SE)	Wald
Cohort 7 dummy variable	0.26 (0.22)	0.05 (0.21)	-0.37 (0.22)	0.06 (0.28)	3.63
					0.30

Note: n=1236; Wald chi-square test degrees of freedom = 1
Note: n=935; Wald chi-square test degrees of freedom = 3

Table 3 notes: The Wald statistic tests whether the effect of the covariate is significantly different from all 0 for each class in the model simultaneously. Unstd beta= Unstandardized beta weight; SE= standard error; Adv puberty= advanced or post-puberty at age 11; Easy to get alcohol= Perceived ease in obtaining alcohol; Witness drug deal= Witness any drug selling or dealing in the neighborhood in the past year as an indicator of risky neighborhood environment; Public Assist=Received public assistance in the past year; Caretaker AUDIT= Caretaker AUDIT score 8, indicating problem drinking; Peer alc use= proportion reporting no perceived peer alcohol use vs any perceived peer alcohol use in the past year

J This item was assessed at Wave 11, when girls were ages 15–18