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# Changing Racial/Ethnic Disparities in Heavy Drinking Trajectories through Young Adulthood: A Comparative Cohort Study

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## Abstract

**Background—**There is evidence of racial/ethnic differences in the age at which young adults age-out of heavy drinking. Some studies have found Black and Hispanic drinkers engage in more frequent heavy drinking than Whites beyond adulthood. Yet, the alcohol-related disparities literature has produced contradictory findings on whether an age-crossover effect is evident among racial/ethnic groups; that is, whether racial/ethnic minorities' drinking levels or trajectories are lower than Whites' at young ages but later exceed (or crossover) those of Whites. The current study extends this scant literature by assessing whether racial/ethnic differences in heavy drinking have changed over time (possibly accounting for mixed findings from prior research); and tests for an age-crossover effect in heavy drinking using longitudinal data from two cohorts born 20 years apart.

**Methods—**Data are from the 1979 (n=10,963) and 1997 (n=8,852) cohorts of the National Longitudinal Survey of Youth. Generalized estimating equations were used to model trajectories of heavy drinking frequency from ages 17–31. Racial/ethnic differences were determined using sex-stratified models and three-way interactions of race/ethnicity with age, age-squared and cohort.

**Results—**Racial/ethnic differences in heavy drinking trajectories have changed over time in men and women. In the older NLSY cohort, Hispanic men and Black women surpassed White men's and women's heavy drinking frequency by age 31. This crossover was absent in the younger cohort, where trajectories of all racial-sex groups converged by age 31. Normative trajectories have changed in Hispanics and Whites of both sexes, with a delay in age of peak frequency, and greater levels of heavy drinking in the younger cohort of women.

**Conclusion—**Changes in heavy drinking trajectories over time suggest the need for targeted interventions during young adulthood. While disparities in young adult heavy drinking were no longer apparent in the more recent birth cohort, continued monitoring is important.

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**Keywords**

Racial/ethnic disparities; heavy drinking; gender differences; young adult

## Introduction

Heavy drinking contributes to an array of health and social problems, including injuries, violence, high blood pressure, heart disease, liver disease, cancers, mental health problems and interpersonal problems (Rehm et al., 2003). The prevalence of heavy drinking (consumption of five or more drinks on at least five occasions in the past month) is 7.0% among U.S. adults aged 18 years or older (Center for Behavioral Health Statistics and Quality, 2016). The prevalence is greater in men (9.8%) compared to women (4.5%) (Center for Behavioral Health Statistics and Quality, 2016) although, women's heavy drinking has increased over time (Dawson et al., 2015; Kerr et al., 2014; Keyes et al., 2008) and is of significant concern.

Heavy drinking is more prevalent in early adulthood than at any other time in life, and it coincides with a developmental transition period in which many young people have greater independence, yet relatively few adult responsibilities. Normative patterns of heavy drinking begin with low prevalence in adolescence, which then increases in prevalence and frequency during the early twenties, and begins to decline with age as people transition into adult roles. While young people typically "age out" of heavy drinking during their 20s (White and Jackson, 2004–2005), those whose heavy drinking escalates or persists into adulthood are at risk for social and health problems which may have long-lasting consequences in their adult lives.

Importantly, there is some evidence of racial/ethnic differences in aging out of heavy drinking. Although Blacks are less likely than Whites to drink heavily (or at all) (Center for Behavioral Health Statistics and Quality, 2016; Chen et al., 2004; Herd, 1990), an 8-year follow-up study to the 1984 National Alcohol Survey found more stable patterns of frequent heavy drinking in Black (vs. White) men across several age groups (Caetano and Kaskutas, 1995). Using longitudinal data, Chen and Jacobson (2012) found Blacks had the lowest rates of change in alcohol use and heavy drinking (5+ drinks in a row) as they transitioned into adulthood. Also, a recent analysis of retrospective data on individuals' heavy drinking during their teens, 20s, 30s, and 40s found that Black women and Hispanic men were more likely than White women and men to persist in monthly heavy drinking over four decades (Mulia et al., in press).

Relatedly, some studies find age-crossover effects in alcohol use, in which a given racial/ethnic minority group's drinking level or trajectory starts lower than, but later exceeds (crosses over), that of Whites (Caetano, 1984; Dawson et al., 2015; Herd, 1990; Vogt Yuan, 2010; Watt, 2008; Zapolski et al., 2017), but findings are mixed. Caetano (1984) found a Hispanic-White crossover in frequent, high-maximum drinking (5+ drinks/day at least once a week) among men in the 40–49 and 50–59 age groups (with Hispanics exceeding White drinking). Watt (2008) observed a Black-White female crossover in heavy drinking in the 30s, as well as consistently less heavy drinking by Black men and Hispanics (both men and

women) compared to Whites across four age groups. Keyes and Miech (2013) found no evidence of a crossover for either Blacks or Hispanics compared to Whites in their age-period-cohort analysis of heavy episodic drinking (5+ drinks/occasion in the past month). Yet, more recently Zapolski et al. (2017) reported an age-crossover effect among low-income Black men and women where the odds of binge drinking (5+ drinks/occasion in the past month) were lower in younger age groups, but then exceeded their White counterparts in the 50–64 age group.

Most of these studies of racial/ethnic differences in lifecourse drinking patterns were based on national cross-sectional samples recruited at different ages in the lifecourse and in different decades. Birth cohort differences and/or period effects may therefore explain mixed findings of racial/ethnic disparities in lifecourse heavy drinking. For example, drinking patterns and alcohol-related norms among those born in the 1960s and coming of age in the 1970s could differ from those born in the 1980s and coming of age in the 1990s (e.g., demographic changes in racial/ethnic diversity including growing Hispanic populations, and laws raising the U.S. minimum legal drinking age to 21-years-old (Ennis et al., 2011; Subbaraman and Kerr, 2013)). Data from longitudinal studies allows for the separation of age and cohort effects (e.g., enabling us to compare a 25-year-old living in the 1980s versus the early 2000s), which can confound associations between age and alcohol consumption, as well as the assessment of within-subject change.

Few studies have examined racial/ethnic differences in longitudinal trajectories of heavy drinking, and to our knowledge none have considered how racial/ethnic differences in trajectories might have changed over time. Using the National Longitudinal Survey of Youth 1979 cohort Muthén and Muthén (2000) found Blacks (ages 18 – 27) had the lowest levels of heavy drinking but, by age 32 racial/ethnic differences had become indistinguishable. Chen and Jacobson (2012) examined racial/ethnic differences in early and later levels of alcohol use and heavy drinking, as well as rates of change, using Wave I through Wave IV of the National Longitudinal Study of Adolescent Health. At age 12, they found Hispanic adolescents had the highest level of heavy drinking (and alcohol use), followed by Blacks and then Whites. In regards to rates of linear and quadratic change, Blacks had the lowest levels of alcohol use and heavy drinking from adolescence to young adulthood and the lowest rates of change. Whereas Whites had the highest levels of alcohol use and heavy drinking, and significantly higher rates of change (i.e., more rapid increases and declines than Blacks and Hispanics). No significant racial/ethnic differences were found for final levels of alcohol use and heavy drinking at age 34.

The present study aims to extend this scant literature by assessing whether racial/ethnic differences in heavy drinking trajectories have changed over time among young adults. Hence, we investigate racial/ethnic disparities in heavy drinking among men and women using longitudinal data from two prospective cohorts recruited roughly two decades apart. Specifically, we aim to determine if there is a crossover effect in heavy drinking trajectories between racial/ethnic minority groups and Whites, and whether this varies by cohort in young people ages 17–31. Monitoring disparities is important; if we find that disparities have changed for better or worse over time, we can try to understand what factors prompted

these changes. This can help in forecasting future disparities and aid in the development and targeting of interventions to reduce disparities.

## Materials and Methods

### Data

Data were drawn from the 1979 and 1997 cohorts of the National Longitudinal Survey of Youth (NLSY79 and NLSY97, respectively) conducted by the Bureau of Labor Statistics. These are nationally representative samples of non-institutionalized U.S. civilian youth. NLSY79 respondents were ages 14–21 (born January 1, 1957 – December 31, 1964) when first interviewed between January and August 1979. They were selected using a multi-stage probability sampling strategy that included oversamples of Black, Hispanic, and economically-disadvantaged youth. Respondents were interviewed annually through 1994 and then biennially through 2012 (ages 47 – 56), with a retention rate of 78.7% in 2012 (n=10,963, 62.8% White, 13.5% Black, 4.5% Hispanic, and 19.2% other race/ethnicity). Follow-up interviews were conducted in the first six months of each survey year; more recently, the interviews have begun in the winter and ended the following winter. Rates of attrition were relatively low; on average, racial/ethnic groups in the analytic sample completed 90.7% to 92.1% of all eligible surveys.

Respondents in the NLSY97 were ages 12–18 (born January 1, 1980 – December 31, 1984) when first interviewed. The initial survey consisted of two separate fielding periods, February – October 1997 and March – May 1998. This cohort also was selected using probability sampling with oversamples of Black and Hispanic youth. The NLSY97 cohort was interviewed annually through 2011 (ages 26 – 31) with a retention rate of 82.6% in 2011 (n=8,852, 67.7% White, 15.5% Black, 10.7% Hispanic, and 7.1% other). All follow-up interviews were conducted in the fall through the spring for each survey year; on average, racial/ethnic groups in the analytic sample completed 85.4% to 89.5% of all eligible surveys.

### Measures

**Frequency of Heavy Drinking—**The outcome of interest was frequency of heavy drinking. The NLSY79 defined heavy drinking as “six or more drinks on one occasion during the past 30 days”, which was assessed at the following survey years: 1982 (ages 17 – 25), 1983, 1984, 1985, 1988, 1989, 1994, 2002, 2006, 2008, 2010, and 2012 (ages 47 – 56). Due to substantial changes in the interview protocol, the 1985 estimates of heavy drinking are markedly and systematically lower than all other years. Therefore, we excluded this survey year from our analyses consistent with prior NLSY studies (Mulia et al., 2017; Muthén and Muthén, 2000), resulting in six assessments (1982, 1983, 1984, 1988, 1989, and 1994) between ages 17 and 31. The NLSY97 defined heavy drinking using a lower threshold (“five or more drinks on the same occasion during the past 30 days”), which was assessed annually from 1997 (ages 12 – 18) to 2011 (ages 26 – 32), totaling 15 time-points between ages 17 and 31. This analysis was limited to respondents who had at least two data points assessing heavy drinking frequency between the ages of 17 and 31 (96.1% of the 1979 cohort and 98.5% of the 1997 cohort).

To measure frequency of heavy drinking, the NLSY79 utilized an ordinal measure (never, once, 2–3 times, 4–5 times, 6–7 times, 8–9 times and 10 or more times, in the past month), whereas the NLSY97 utilized a continuous measure of days (0 – 30). To standardize the frequency of heavy drinking across the survey series, we transformed the NLSY97 measure to match the response categories in the NLSY79. Using the midpoint for each response category, with a midpoint of 12 for those indicating "10 or more times", the outcome variable was then treated as a continuous variable, as in other studies of the NLSY79 (Mulia et al., 2017; Muthén and Muthén, 2000).

**Demographics—**Sex, race/ethnicity and date of birth were self-reported at baseline. Race/ethnicity was initially categorized into mutually exclusive groups: non-Hispanic White, non-Hispanic Black/African American, Hispanic, Native American, Asian/Pacific Islander, and "other" (including mixed-race in the NLSY97 cohort). Of note, the NLSY79 cohort included an unexpectedly large percentage of self-identified Indian-Americans or Native Americans (approximately 5% versus census estimates of 0.5% of the population), which is attributed to a likely misinterpretation of the term "Native American" (U.S. Bureau of Labor Statistics, 2002) and which may explain the lower proportions of Whites in the NLSY79 (vs. NLSY97) cohort. Thus, in our analysis, Native Americans were included as other race/ethnicity, along with a small number of Asian/Pacific Islander and foreign-born Hispanics (who had significantly lower heavy drinking compared to U.S.-born Hispanics, consistent with prior research (Caetano et al., 2009)). In order to make comparisons between the two NLSY cohorts, race/ethnicity was thus re-categorized as White, Black, U.S.-born Hispanic, and other. Given tremendous heterogeneity within the "other" racial/ethnic group, we focus our comparison on Whites, Blacks, and U.S.-born Hispanics.

## Analysis

We used generalized estimating equations (GEE) to model trajectories of heavy drinking frequency from ages 17–31, using a quadratic form to describe change over time (Zeger et al., 1988). We verified there were no differences by birth year in the intercepts or slopes within either of the two NLSY surveys; therefore, we were able to combine data from the eight birth years (1957 – 1964) within the NLSY79 and five birth years (1980 – 1984) within the NLSY97 to fully utilize the data from the accelerated longitudinal design (Miyazaki and Raudenbush, 2000). To assess whether racial/ethnic differences in heavy drinking trajectories from adolescence through young adulthood have changed significantly over time, sex-stratified models tested three-way interactions of race/ethnicity with age, age-squared and cohort (NLSY79 versus NLSY97). These results are summarized by a 9-degree of freedom chi-square test of interactions of cohort with the effects of race/ethnicity on the intercepts and slopes; and 3-degree of freedom chi-squares were used to test cohort differences for specific racial/ethnic groups versus Whites (for example, testing changes in Black-White differences in the intercepts, linear slope, and quadratic slope for the two cohorts). When there were significant cohort differences, we used sex- and cohort-stratified models to describe racial/ethnic differences in heavy drinking frequency over time.

The main models present coefficients with age centered at 17 (youngest age in our study). We re-ran models with age centered at age 31 to test for racial/ethnic differences at the end

of the observation period (Muthén and Muthén, 2000); key coefficients are reported in the text. Ratios of the regression coefficients were used to calculate peak age ($-B_{age}$ / $2B_{age\text{-}squared}$) and peak frequency ($C_{intercept} - B^2_{age}/4B_{age\text{-}squared}$) of heavy drinking, with Taylor series approximation used to obtain the standard error of the estimated peak age and peak frequency (Sen and Singer, 1993).

Data were analyzed using sampling weights generated by the NLSY custom weighting program. These longitudinal weights used data from the multiple survey years in which heavy drinking was measured, adjusting for sampling design, and including a post-stratification adjustment so each of the two cohort samples is weighted to represent the U.S. population at their respective baselines. All statistical analyses were performed using Stata version 14 (StataCorp LP, College Station, TX) to generate robust standard errors using these weights.

## Results

### Trajectory Models for Men

Results from the GEE models are presented in Table 1 and the predicted heavy drinking trajectories for the two cohorts are depicted in Figure 1. A summary chi-square test confirmed that racial/ethnic differences have changed significantly over the study period ($\chi^2$ (df=9) =43.2, $p$<0.001). Cohort-stratified models showed significant racial/ethnic variation in men's trajectories in both the older ($\chi^2$ (df=9)= 272.2, $p$<0.05) and younger ($\chi^2$ (df=9)=473.5, $p$<0.05) cohorts. Overall cohort differences include the younger cohort's less frequent heavy drinking at ages 17 (b=−0.961, $p$<0.01) and 31(b=−0.57, $p$<0.01; model not shown). With the exception of Black men, the younger cohort also has a delayed peak in heavy drinking (Table 2), and a pronounced rise and fall in their heavy drinking trajectories that is absent in the older cohort (Figure 1).

**Black and White Differences—**As evidenced by the significant interaction of Black race/ethnicity with survey cohort for each trajectory parameter ($\chi^2$ (df=3)=20.3, $p$<0.05), Black-White differences in heavy drinking frequency have changed significantly between the two cohorts. As shown in Table 1, there were cohort changes in Black-White differences for all three trajectory parameters: the intercept (b=0.492, $p$<0.05), the linear slope (b= −0.244, $p$<0.05), and the quadratic slope (b=0.015, $p$<0.05).

In the older cohort, White men's heavy drinking was highest during the late teens, peaking at age 18.8 on average (95% CI=15.2, 22.3), after which it declined with age (b=−0.008, $p$<0.05). By contrast, Black men had the lowest predicted frequency of all three racial/ethnic groups at age 17, thus yielding the largest Black-White gap in heavy drinking during the late teens. Unlike White men, Black men's heavy drinking increased in frequency throughout young adulthood, peaking at age 28.3 on average (95% CI=24.9, 31.5) and stabilizing thereafter. By age 31, the heavy drinking frequency of the older cohort of Black and White men had converged (b=−0.004, $p$=0.97).

In the younger cohort, trajectories for Black and White men followed a similar quadratic form, with White men's heavy drinking frequency exceeding that of Blacks at nearly all

ages. The largest Black-White gap was observed during the early 20s. Peak heavy drinking occurred closer together in age (25.9 years (95% CI=24.7, 27.0) and 23.0 years (95% CI=22.8, 23.3)) for Black and White men, respectively, with both trajectories declining thereafter. Similar to the older cohort, heavy drinking of the younger cohort of Black and White men had converged by age 31 (b=−0.04, $p$=0.81).

**Hispanic and White Differences—**Hispanic-White differences in young men's heavy drinking have changed marginally between the 1979 and 1997 cohorts ($\chi^2$ (df=3)=7.3, $p$=0.06). In the older cohort, Hispanic men had an inverse trajectory unlike that of their White or Black peers. Their predicted heavy drinking was highest at age 17 and declined to a low of 2.3 times per month at age 27.3 (95% CI=17.8, 36.4), then slowly increased in frequency with age (see Table 2 and Figure 1). Importantly, there was a crossover in the trajectories of Hispanic and White men toward the end of young adulthood, with Hispanics surpassing Whites' heavy drinking frequency by age 31 (b=0.73, $p$<0.05).

By contrast, the younger cohort of Hispanic and White men showed roughly parallel trajectories, with Hispanics maintaining a lower frequency and decreasing more slowly than Whites until both groups' trajectories converged at age 31 (b=−0.01, $p$=0.96). Thus, the Hispanic-White crossover and disparity seen in the older male cohort is no longer apparent in the younger cohort born approximately 20 years later.

## Trajectory Models for Women

Figure 2 shows how the heavy drinking trajectories of women, like those of men, have changed over time across cohorts (summary chi-square test, $\chi^2$ (df=9)=62.3, $p$<0.05). Cohort-stratified models for women revealed significant racial/ethnic differences in both the older ($\chi^2$ (df=9)=213.3, $p$<0.05) and younger ($\chi^2$ (df=9)=360.9, $p$<0.05) cohorts. Across cohorts, heavy drinking frequency was similar at ages 17 and 31, but the younger cohort of Hispanic and White women engaged in more frequent heavy drinking during their 20s than their 1979 counterparts. Similar to the younger male cohort, heavy drinking peaked at a later age for White and Hispanic women, but not Black women, in the younger cohort, and women's heavy drinking trajectories for all racial/ethnic groups converged by age 31.

**Black and White Differences—**As evidenced by the significant interactions of Black race/ethnicity with survey cohort for two of the trajectory parameters shown in Table 1 ($\chi^2$ (df=3)=27.3, $p$<0.05). Black-White differences in young women's heavy drinking trajectories have changed over time between cohorts. Specifically, there were cohort changes in Black-White differences for both the linear (b=−0.244, $p$<0.05) and the quadratic slope (b=0.015, $p$<0.05).

The largest Black-White differences in the older female cohort's heavy drinking occurred during the late teens. Unlike the heavy drinking trajectories of White women, which began at the peak frequency (calculated as age 16.0, 95% CI=9.1, 22.7) and declined with age, Black women's heavy drinking frequency increased with age and exceeded White women's by age 31 (b=0.17, $p$<0.05).

Black women's heavy drinking trajectories showed a similar form in both cohorts, with the exception of an earlier peak age in the younger cohort (at age 25.9 vs. 28.5, see Table 2). Also notable was the absence of a Black-White crossover in heavy drinking in the younger cohort, which instead showed a convergence by age 31 (b=−0.04, $p$=0.67).

**Hispanic and White Differences—**Hispanic-White differences in heavy drinking trajectories among women have not changed significantly over time ($\chi^2$ (df=3)=0.58, $p$=0.90). In both cohorts, Hispanic women had less-frequent heavy drinking at age 17 than White women, although by age 31 their levels were similar (b=−0.001, $p$=0.99). The greatest Hispanic-White difference in both female cohorts occurred during the late teens to early 20s. However, in the younger cohort, heavy drinking peaked closer in age (at 24.0 (95% CI=23.3, 24.7) for Hispanics and 21.9 (95% CI=21.4, 22.5) for Whites), reflecting a marked shift in White women's peak heavy drinking toward a later age.

## Discussion

To our knowledge, this is the first U.S. study to assess whether racial/ethnic disparities in heavy drinking trajectories of young men and women have changed over time. This is an important question, as heavy drinking that persists through and beyond early adulthood can pose significant risks to adult social, economic and physical well-being and vary by racial/ethnic groups. This study of two nationally-representative samples reveals several important findings. First, heavy drinking trajectories appear to have changed shape for Whites and Hispanics of both sexes, but especially in men. This was seen in the younger cohort's pronounced rise and fall in heavy drinking frequency and shift in peak heavy drinking to older ages. U.S. state policies raising the minimum drinking age during the 1970s and 1980s have likely played an important role in this delay in peak heavy drinking (Subbaraman and Kerr, 2013). It bears mentioning, however, that young people's peak *frequency* of heavy drinking remains similar 20 years later, and has actually increased among White women.

A second key finding concerns the changing nature of racial/ethnic disparities; namely, that the age-crossover effect in heavy drinking trajectories seen in the older cohort by age 31, whereby Hispanic men and Black women exceeded the heavy drinking of their White counterparts, is absent in the younger cohort. Future research is needed to understand what might account for the racial/ethnic convergence in heavy drinking observed in the younger cohort at age 31. In this study, we have not controlled for indicators of socioeconomic status (SES) because doing so is problematic when the study's purpose is to estimate racial/ethnic disparities and SES is likely to be a partial mediator of the effects of race/ethnicity. Thus, an important next step for future research is to investigate the extent to which differences in SES might explain the observed changes in the racial/ethnic patterning of heavy drinking. One possibility is that the Great Recession constrained young people's heavy drinking, possibly leading to a more rapid and steep decline in heavy drinking frequency in this younger cohort of White and Hispanic men and women starting in the mid-20s (coinciding with the official start of the U.S. Recession in December 2007). National data indicate a decline in U.S. rates of young adult heavy drinking beginning in the mid-2000s (Burgard, 2012; Substance Abuse and Mental Health Services Administration, 2014), which contrasts with the increased heavy drinking of older Americans (Dawson et al., 2015), particularly in

response to severe recessionary loss (Mulia et al., 2014). To test this explanation in a future study, one could use splines to test for inflection points in the trajectories of the younger cohort for the years during the U.S. Recession.

Our finding of more frequent heavy drinking in the younger cohort of White and especially Hispanic women in their 20s is cause for concern. This increase was not found in the younger male cohort, who generally had *lower* levels of heavy drinking than the older cohort, except during the mid-20s when levels were similar. The shift in women's drinking likely reflects changes in women's social roles and norms (Keyes et al., 2011). For example, women's transition into formal employment (versus homemaking) has been associated with increased drinking frequency, and with delays in marriage single women may be more likely to persist in heavy drinking (Christie-Mizell and Peralta, 2009; Wilsnack and Wilsnack, 1995). Relatedly, young women's greater educational attainment (i.e. college degrees) and delay in childbearing might also contribute to heavier drinking in the younger cohort during their early to mid-20s (Christie-Mizell and Peralta, 2009; Inglehart and Baker, 2000). Notably, the proportion of young NLSY women who earned a college degree was 10 to 22 percentage points higher in the 1997 versus 1979 cohort, and national data indicate that binge drinking in young adulthood is greater among full-time college goers than part-time and non-college goers (Substance Abuse and Mental Health Services Administration, 2014). Importantly, these cohort differences in the heavy drinking trajectories of both genders are further evidence of a narrowing gap between men and women's drinking (Kerr et al., 2009; Kerr et al., 2013; Keyes et al., 2008).

The pronounced cohort differences in Hispanic heavy drinking trajectories were unexpected, and may be due to a variety of factors. First, the U-shaped trajectory for the older cohort of Hispanic men may be a reflection of Latin American cultures. Although heavy drinking does decrease with age (often later in adulthood), studies show older Hispanic men (ages 30–39 and 40–49) continue to drink because it is considered an earned right (Caetano, 1991; Ramisetty-Mikler et al., 2010). Second, there have been demographic changes among young, U.S.-born Hispanics. More than 50% of Hispanics in the NLSY79 cohort identified as Mexican or Puerto Rican, which are Hispanic ethnic subgroups with generally higher drinking rates, weekly consumption, and binge drinking (Ramisetty-Mikler et al., 2010). While Hispanic ethnic origin was not readily available for the NLSY97 cohort, U.S. Census data from 2000 and 2010 indicate growth in the proportion of Hispanics with origins in Central and South America (excluding Mexico), Cuba and the Dominican Republic (Ennis et al., 2011). Thus, the younger Hispanic cohort may include a larger proportion of Hispanic ethnic subgroups with traditionally lower levels of heavy drinking.

Unlike other groups, Black men's and women's heavy drinking trajectories showed little change between birth cohorts. In keeping with prior studies, both cohorts generally maintained less frequent heavy drinking than Whites and Hispanics (Hasin et al., 2007; Muthén and Muthén, 2000; O'Malley and Johnston, 2002). Historical studies suggest Blacks have more conservative social norms and attitudes towards drinking, as well as strong norms for maintaining social control while drinking, possibly reflecting greater religiosity and concerns about social status that have endured over time and continue to influence Black heavy drinking (Godette et al., 2009; Zapolski et al., 2014). Despite their consistently higher

rates of abstention and lower levels of drinking frequency and overall consumption, Black drinkers experience more alcohol-related problems (Mulia et al., 2009) and higher rates of liver disease than White drinkers (Chartier and Caetano, 2010). This inconsistency between frequency and level of consumption with alcohol-related problems suggest there are other factors at play—perhaps social, behavioral, institutional and biological—which continue to contribute to health disparities, and which have yet to be identified. Further research is needed to understand the various mechanisms that contribute to higher alcohol-related morbidity and mortality for Blacks in the U.S.

The current study is not without limitations. As previously mentioned, the threshold for heavy drinking was not the same between the cohorts (6+/day in the NLSY79 and 5+/day in the NLSY97). It is conceivable that this difference could bias the study results towards a higher frequency trajectory in the younger (vs. older) cohort, which is indeed what we found for White and U.S.-born Hispanic women. Nonetheless, our results are consistent with other studies that find women (particularly Whites and Hispanics) are consuming more alcohol in young adulthood than they did decades ago (Kerr et al., 2009; Kerr et al., 2013; Keyes et al., 2008), which suggests that this change in measurement was not the sole driving factor behind the current results. The fact that we found lower trajectories for the younger male cohort and similar trajectories for Black women across cohorts also is notable.

Another limitation concerns the use of the same heavy drinking measure for men and women. As NIAAA drinking guidelines specify a lower heavy drinking threshold for women (4+/day) than men (5+/day) (National Institute on Alcohol Abuse and Alcoholism, 2005), our findings based on the use of the same threshold for men and women could, conceivably, underestimate women's heavy drinking. This would result in the observation of a lower trajectory level and suggest a larger gender difference in the frequency of heavy drinking than if a lower threshold had been used for women.

Other study limitations concern the use of self-reported data and 30-day measurements. Although surveys are highly utilized in epidemiological research on alcohol consumption, there is potential bias in the self-reporting of consumption over time, particularly in cases of changing social norms or community views on drinking. The use of a singular period (past 30 days) may also limit the results; for example, respondents who drink heavily throughout the year, but who did not engage in this behavior at the time of assessment would be missed, and seasonal changes are not captured either. This is expected to be less problematic for a longitudinal series consistently employing a 30-day timeframe in many interviews, however. Finally, it should be noted that while the current study findings represent the most recent longitudinal trajectories from a nationally representative, non-school based sample, it is possible that a similar aged sample followed from 2002 – 2017 might yield somewhat different trajectories and racial/ethnic- gender patterns due to additional changes in drinking by this younger cohort.

Our findings have several implications. First, heavy drinking trajectories have changed over two decades across racial/ethnic groups, with diverging results for men and women. Young women are engaging in more frequent heavy drinking than previously, while men maintained similar frequencies as their older counterparts. Targeted interventions are

warranted, because women are more susceptible to the physiological effects of alcohol, and women who drink heavily are at increased risk of breast cancer (Bradley et al., 1998). Second, the shift in peak age of heavy drinking from late adolescence to the mid-20s may be beneficial to the extent that this reduces adverse impacts on the developing brain, and alcohol-related morbidity and mortality in adolescents. However, because peak heavy drinking levels remain largely unchanged across time, interventions during the transition to adulthood are needed. Finally, while the younger cohort showed convergent heavy drinking trajectories by age 31 in both genders, White and Hispanic heavy drinking was declining more steeply than that of Black drinkers. Extending the observation period beyond young adulthood might reveal a crossover and emergent Black-White disparity in this younger cohort. Monitoring heavy drinking remains important to the goal of reducing the differential negative impacts of alcohol.

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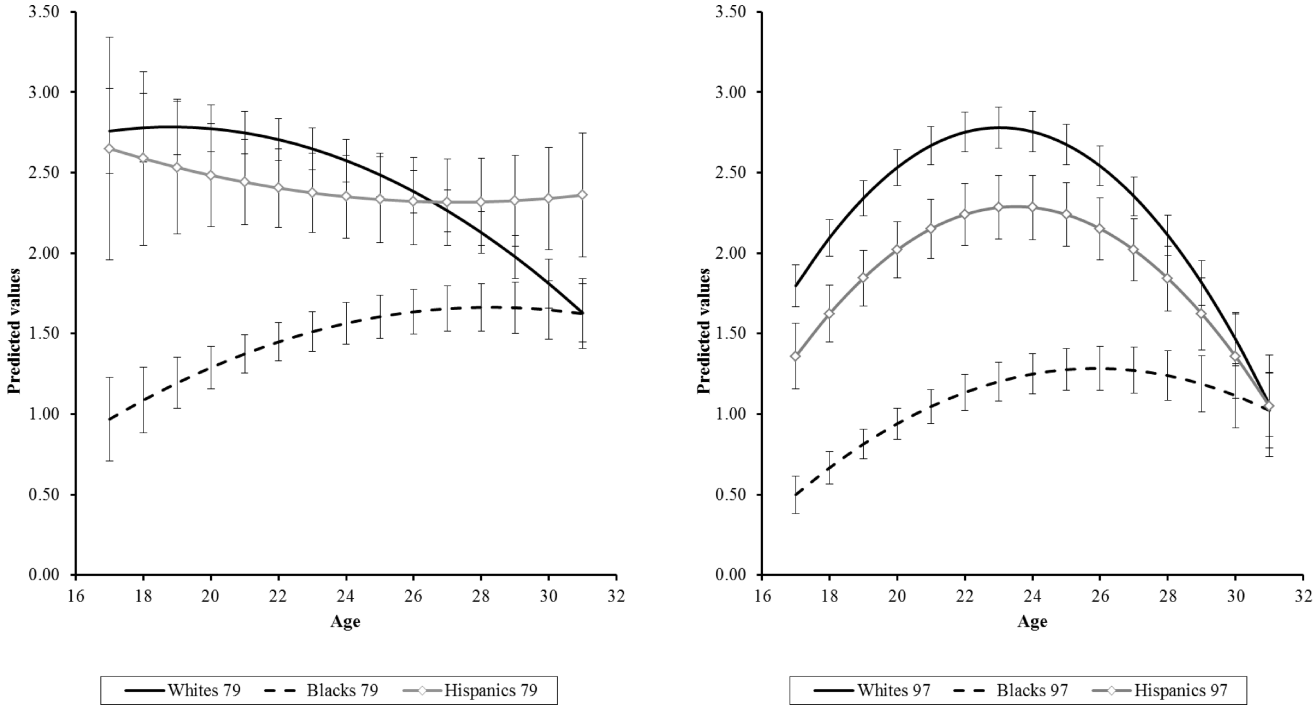


**Figure 1.**

Predicted Trajectories of Heavy Drinking Frequency with 95% Confidence Intervals for Men in the 1979 (left panel) and 1997 (right panel) NLSY Cohorts

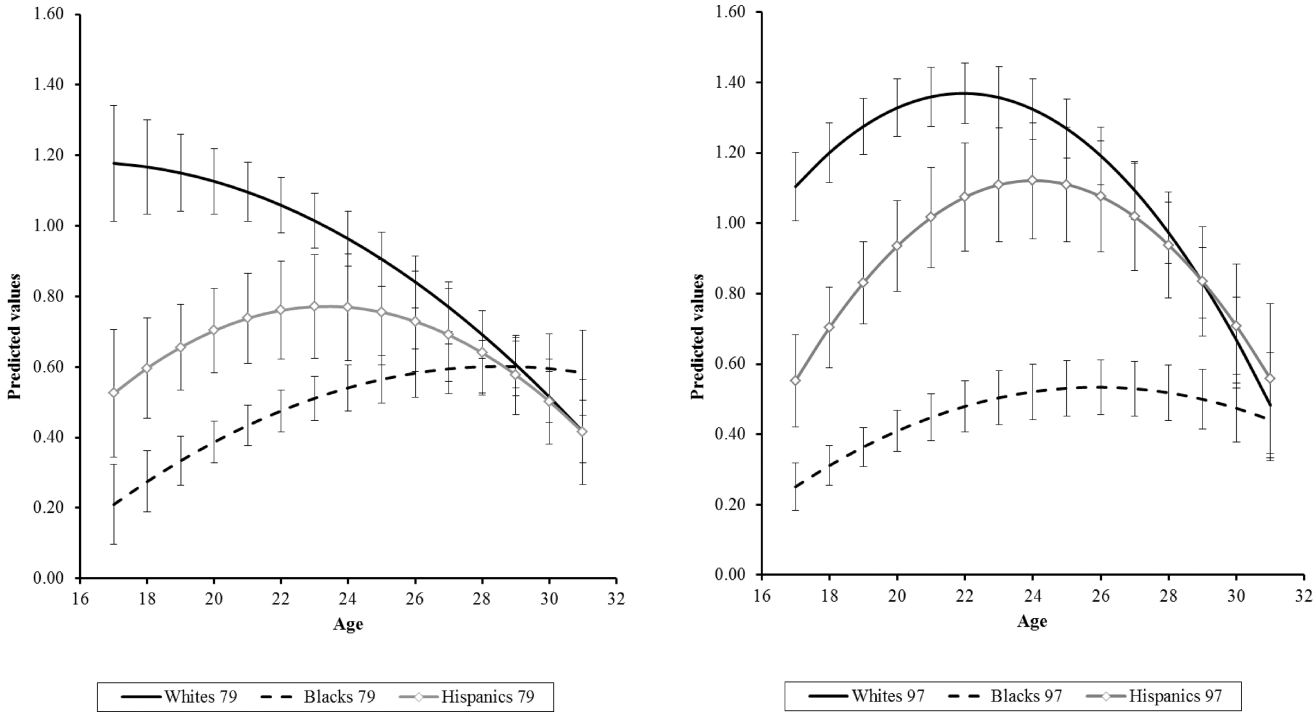


**Figure 2.**

Predicted Trajectories of Heavy Drinking Frequency with 95% Confidence Intervals for Women in the 1979 (left panel) and 1997 (right panel) NLSY Cohorts

**Table 1**

Trajectory Models of Heavy Drinking Frequency in the NLSY79 and NLSY97 Cohorts by Sex

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | **Coef.** | **(95% CI)** | **p-value[a]** | **Coef.** | **(95% CI)** | **p-value[a]** |
| Intercept | **2.759** | **(2.494, 3.024)** | **<0.01** | **1.177** | **(1.013, 1.342)** | **<0.01** |
| Age | 0.028 | (−0.041, 0.098) | 0.43 | −0.007 | (−0.048, 0.034) | 0.74 |
| $Age^2$ | **−0.008** | **(−0.012, −0.004)** | **<0.01** | **−0.003** | **(−0.006, −0.001)** | **0.01** |
| 1997 cohort (ref. 1979 cohort) | **−0.961** | **(−1.257, −0.666)** | **<0.01** | −0.073 | (−0.264, 0.118) | 0.45 |
| Age*Cohort | **0.298** | **(0.216, 0.380)** | **<0.01** | **0.114** | **(0.063, 0.165)** | **<0.01** |
| $Age^2$*Cohort | **−0.019** | **(−0.025, −0.014)** | **<0.01** | **−0.007** | **(−0.011, −0.004)** | **<0.01** |
| Black-White Differences | | | | | | |
| Black | **−1.790** | **(−2.162, −1.418)** | **<0.01** | **−0.967** | **(−1.167, −0.768)** | **<0.01** |
| Black*Age | 0.095 | (−0.006, 0.196) | 0.07 | **0.075** | **(0.021, 0.128)** | **0.01** |
| Black*$Age^2$ | 0.002 | (−0.004, 0.009) | 0.46 | 0.005 | (−0.003, 0.004) | 0.79 |
| Black * Cohort | **0.492** | **(0.081, 0.903)** | **0.02** | 0.114 | (−0.118, 0.346) | 0.34 |
| Black*Age*Cohort | **−0.244** | **(−0.362, −0.127)** | **<0.01** | **−0.118** | **(−0.186, −0.050)** | **<0.01** |
| Black*$Age^2$*Cohort | **0.015** | **(0.007, 0.022)** | **<0.01** | **0.007** | **(0.002, 0.011)** | **<0.01** |
| Hispanic-White Differences | | | | | | |
| Hispanic | −0.109 | (−0.850, 0.631) | 0.77 | **−0.652** | **(−0.897, −0.408)** | **<0.01** |
| Hispanic*Age | −0.093 | (−0.287, 0.100) | 0.35 | **0.084** | **(0.008, 0.161)** | **0.03** |
| Hispanic*$Age^2$ | 0.011 | (0.000, 0.022) | 0.06 | −0.003 | (−0.008, 0.002) | 0.29 |
| Hispanic*Cohort | −0.328 | (−1.107, 0.450) | 0.41 | 0.101 | (−0.193, 0.395) | 0.50 |
| Hispanic*Age*Cohort | 0.053 | (−0.156, 0.263) | 0.62 | −0.030 | (−0.129, 0.070) | 0.56 |
| Hispanic*$Age^2$*Cohort | −0.006 | (−0.019, 0.007) | 0.37 | 0.002 | (−0.005, 0.009) | 0.57 |
| Other-White Differences | | | | | | |
| Other | −0.302 | (−0.810, 0.206) | 0.24 | 0.098 | (−0.255, 0.451) | 0.59 |
| Other*Age | −0.022 | (−0.149, 0.105) | 0.74 | −0.066 | (−0.151, 0.019) | 0.13 |
| Other*$Age^2$ | 0.002 | (−0.005, 0.010) | 0.55 | 0.004 | (−0.006, 0.009) | 0.09 |
| Other*Cohort | **−0.689** | **(−1.277, −0.101)** | **0.02** | **−0.912** | **(−1.297, −0.527)** | **<0.01** |
| Other*Age*Cohort | −0.056 | (−0.219, 0.107) | 0.50 | **0.119** | **(0.009, 0.228)** | **0.03** |

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | Coef. | (95% CI) | p-value[a] | Coef. | (95% CI) | p-value[a] |
| Other*Age$^2$*Cohort | 0.008 | (−0.004, 0.019) | 0.19 | −0.005 | (−0.013, 0.002) | 0.16 |

[a]Significant effects are highlighted in bold

**Table 2**

Peak Age and Frequency of Heavy Drinking by Sex and NLSY Cohorts

| | 1979 Cohort | | | | 1997 Cohort | | | |
|---|---|---|---|---|---|---|---|---|
| | **Age** | **(95% CI)** | **Freq[a]** | **(95% CI)** | **Age** | **(95% CI)** | **Freq[a]** | **(95% CI)** |
| Men | | | | | | | | |
| White | 18.8 | (15.2, 22.3) | 2.78 | (2.67, 2.90) | 23.0 | (22.8, 23.3) | 2.78 | (2.63, 2.93) |
| Black | 28.3 | (24.9, 31.5) | 1.66 | (1.35, 1.98) | 25.9 | (24.7, 27.0) | 1.28 | (1.11, 1.45) |
| Hispanic | 27.3[b] | (17.8, 36.4) | 2.32[b] | (1.52, 3.12) | 23.5 | (23.0, 24.0) | 2.29 | (2.05, 2.53) |
| Women | | | | | | | | |
| White | 16.0 | (9.1, 22.7) | 1.18 | (1.14, 1.23) | 21.9 | (21.4, 22.5) | 1.37 | (1.27, 1.47) |
| Black | 28.5 | (25.0, 32.0) | 0.60 | (0.47, 0.74) | 25.9 | (24.1, 27.7) | 0.53 | (0.43, 0.64) |
| Hispanic | 23.4 | (22.0, 24.6) | 0.77 | (0.53, 1.01) | 24.0 | (23.3, 24.7) | 1.12 | (0.92, 1.32) |

[a] Freq = Mean Frequency of Heavy Drinking in the past 30 days

[b] For Hispanic men in the 1979 cohort, age and frequency of heavy drinking correspond to the lowest point in the trajectory, reflecting the convex nature of the curve.