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RESEARCH ARTICLE

Lifecourse Drinking Patterns, Hypertension, and Heart Problems Among U.S. Adults

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Introduction: Understanding the role of alcohol in hypertension and heart problems requires a lifecourse perspective accounting for drinking patterns before onset of health problems that distinguishes between lifetime abstinence and former drinking, prior versus current drinking, and overall alcohol consumption in conjunction with heavy episodic drinking. Using prospective data among U.S. adults aged 21−55 years, this study accounts for these lifecourse factors to investigate the effect of alcohol on hypertension and heart problems.

Methods: Data from the U.S. National Longitudinal Survey of Youth, aged 14−21 years in 1979 and followed through 2012 (n=8,289), were analyzed in 2017−18 to estimate hypertension and heart problems onset from lifecourse drinking patterns. Discrete-time survival models stratified by sex and race/ethnicity, controlling for demographics and time-varying factors of employment, smoking, and obesity.

Results: Elevated risks for hypertension were found for women drinking >14 drinks/week regardless of any heavy drinking (AOR=1.57, p=0.023) and for men engaged in risky drinking (15−28 drinks/week) together with monthly heavy drinking (AOR=1.64, p=0.016). Having a history of weekly heavy drinking elevated the risk for women but not for men. No significant relationship was evident for alcohol and heart problems onset.

Conclusions: This study confirms previous findings of increased hypertension risk from higher volume and heavier drinking patterns among women and men but did not find any support for increased heart problems risk, which may be due to the younger age profile of the sample. Further research that incorporates lifecourse drinking patterns is needed to better understand the alcohol−health relationship.

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INTRODUCTION

Hypertension and heart disease are two of the leading causes of early morbidity and mortality in the U.S., largely influenced by lifestyle behaviors of poor diet, smoking, and alcohol consumption.[1−4] Prior studies have focused on poor diet and smoking as key risk behaviors to minimize disease burden,[5,6] but alcohol-related studies have found a paradoxical role for alcohol. The well-known J-shaped curve shows alcohol consumption at low-to-moderate levels being protective from heart disease, whereas abstinence and high consumption elevate risks.[7,8] Protective effects of moderate drinking for hypertension are mixed.[9−12] Regardless, alcohol consumption at high levels or in association with heavy episodic drinking (HED) increases risks for both conditions,[9,13,14] even among light-to-moderate drinkers who engage in infrequent HED.[15,16] Though poor diet and smoking pose a clear risk, alcohol−health relationship is less clear and

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depends on the amount, frequency, and patterns. Importantly, meta-analysis studies of all-cause mortality, and specifically heart disease mortality, have suggested the reductions in mortality seen in moderate drinkers compared with abstainers might owe in large part to measurement artifacts.[17,18]

Using data from the U.S. National Longitudinal Survey of Youth 1979 Cohort (NLSY79), this study examines the risk of hypertension and heart problems in relation to life-course-defined alcohol patterns. Previous alcohol−health studies have been hampered by several major limitations, which the current study addresses. First, an appropriate reference group[19,20] is needed to distinguish between current and lifetime drinking patterns, including separating lifetime abstainers from former drinkers who may reduce or quit drinking owing to poor health.[21,22] Second, drinking patterns that use alcohol volume, without regard to HED patterns, may not reveal the extent of riskiness, given that low-to-moderate levels combined with HED have the potential for elevating health risk.[15,16,23] Using a lifecourse perspective, the accumulation of prior HED (versus current) use may escalate disease risk. Finally, given that multiple risk behaviors can affect health outcomes,[24,25] obesity and smoking should be considered as key confounders to the alcohol−health relationship. Accounting for these key limitations, it is hypothesized that an increased risk for disease onset will be found among lifetime abstainers and heavy drinkers with an expectation of finding such effects among women only (similar to prior studies[9,26,27]).

Additionally, this study aimed to investigate whether alcohol contributes to the racial/ethnic disparities in hypertension and heart disease. Non-Hispanic Black men and women disproportionately experience higher rates of both conditions compared with their non-Hispanic white counterparts.[1,2] Although Hispanic men tend to have similar rates as white men, Hispanic women have higher hypertension rates but similar heart disease rates as white women. The alcohol−health relationship may vary across racial/ethnic groups and possibly along sex lines. Though there is evidence of protective effects of moderate alcohol use among whites, this protection may not extend to blacks or Hispanics.[28−30] A negative relationship between alcohol volume and coronary heart disease was found for white men, whereas a positive relationship was found for black men.[31] Given the growing health disparities, it is important to identify whether alcohol is contributing to the disease burden.

METHODS

Study Sample

The NLSY79 is an ongoing study of a nationally representative sample of individuals born between 1957 and 1964. With a stratified, clustered design, a baseline sample of 11,406 non-institutionalized, civilian youths aged 14−21 years, including oversamples of Hispanic and black youth, were surveyed in 1979 (initial response rate, 90%). Respondents were re-interviewed annually to 1994 (initial response rate, ≥90%) and every 2 years since then (initial response rate, approximately 80%). This study used 1979−2012 surveys, when respondents were aged 47−55 years. Health modules were conducted when respondents turned age 40 years and then later age 50 years. Respondents who missed either of these health modules were excluded. Respondents who reported health problems before 1982 were also excluded because alcohol was not assessed until 1982. Data were merged and analysis conducted in 2017−2018. The analytic sample included 8,289 respondents.

Measures

In the 40+/50+ Health Modules, respondents were asked: *have you ever had, or has a doctor ever told you that you have high blood pressure or hypertension?* If *yes*, then month and year of onset were collected. Age of hypertension onset was calculated based on birth month and year. The same approach was used for constructing onset of heart problems. Heart problems included doctor-diagnosed heart problems, heart attack or myocardial infarction, angina or chest pains because of heart, and doctor-diagnosed congestive heart failure.

Total volume (quantity and frequency) and frequency of HED days (defined as days in the last 30 days with 6 or more drinks in one sitting) were assessed in 1982−1985, 1988, 1989, 1994, 2002, and every other year from 2006 to 2012. Because of the intermittent years and differences in question wording across survey years, a categorical repeated measure of past-month alcohol consumption was created that combined total volume (zero, low [≤14 for men/≤7 for women drinks per week], risky [>14/7 drinks and ≤28/14 drinks per week], and high [>28/14 drinks per week]) and HED frequency (none, monthly, and weekly). Following prior studies,[32,33] current drinking patterns included no alcohol, low volume with or without any HED, risky volume and monthly HED, risky volume and weekly HED, and high volume with or without any HED. The no current alcohol group was further differentiated as lifetime abstainers or former drinkers.[22] The low volume/no HED group served as the reference group. To capture prior history, two time-varying indicators were used to indicate (1) monthly HED and (2) weekly HED in the 10 years before the current year.

The following covariates were included to account for potential confounders and demographics. Key demographics included sex (male or female), age (continuous), race/ethnicity (white; black; Hispanic; Native American; and other including Asian, Hawaiian, and Pacific Islander), nativity (foreign or U.S.-born), and education by age 25 years (less than high school, high school graduate, some college, and college degree or more). Religious participation in 1979 was categorized into none up to more than once per week (0−5). For early-life health conditions, work-related health limitation was included as a potential confounder.[34−36] Three items were summed from 1979: (1) limited in the kind of work because of health; (2) limited in the amount of work because of health; and (3) for those not working, health prevents working for pay. The following repeated measures were included as covariates: poverty (yes/no), marital status (never married, married, separated, divorced, or widowed), employment (unemployed, employed, out of the labor force, or military), and having children (yes/no).

Finally, the models accounted for risk behaviors of smoking and obesity. Given the intermittent years of smoking measures (i.e., 1992, 1994, 1998, 2008, 2010, and 2012), age of daily smoking onset was used as the starting point, and then current smoking status was updated in each year (nonsmoker, prior daily smoker, or current daily smoker). Obesity was calculated as BMI[37] from height (reported in intermittent years 1981–2012) and weight (reported in intermittent years 1981–1990 and every other year 1992–2012). Height was carried forward to calculate BMI scores for each available weight year. BMI was coded into underweight (<18.5), normal (18.5–24.9), overweight (25–29.9), and obese (≥30).

Statistical Analysis

Sex-stratified discrete-time survival models were used to model the onset of hypertension and heart problems, separately, in relation to both fixed and time-varying predictors with person-year weights considering both sampling and attrition. Annual history (defined as the onset of health condition or not) starting from 1982 was reconstructed for each respondent, and onsets that occurred before or in 2012 were censored after that year. All other respondents were censored when they dropped out of the study or reached 2012. Owing to small samples of Native American and other groups, racial/ethnic analyses focused on whites, blacks, and Hispanics by sex. Discrete-time survival models were implemented by a pooled logistic regression model,[38,39] treating each reconstructed person-year as an observation. Models included linear and quadratic terms for time and time-varying and -invariant covariates. Given the substantial number of dropouts over time, an inverse probability weighted estimation[38,40] was combined with the pooled logistic regression to create a time-varying censoring indicator (described elsewhere).[32] Yearly survey weights adjusted the sample to its original sampling frame and representative of U.S. youth in 1979. Survey weights and censoring weights were multiplied and used in the inverse probability estimation of analysis. All analyses were conducted in Stata, version 14.2.

RESULTS

The prevalence of hypertension was 25% for women and 28% for men (Table 1). Significant differences were found by race/ethnicity. For women, blacks had the highest prevalence (41%), followed by Native Americans (30%), Hispanics (24%), whites (21%), and others (19%). Black men reported the highest prevalence at 36%, followed by Native Americans at 29%, whites at 28%, Hispanics at 25%, and others at 24%. For heart problems, the prevalence was low at 2% for women and 3% for men, and no significant differences were found by race/ethnicity.

On average across the study period (ages 21–55 years), lifecourse drinking patterns varied by race/ethnicity (Appendix Table 1, available online). Black men and women and Hispanic women were more likely to be lifetime abstainers than their white counterparts and Hispanic men. Whites were more likely to be former drinkers. Among women, whites were more likely to drink higher volume and have riskier drinking compared with blacks and Hispanics. A similar pattern emerged for white men with higher volume and riskier drinking, except black and Hispanic men had higher prevalence of high volume.

Table 2 presents sex-stratified adjusted survival models predicting hypertension onset. Women drinking at high volume had a significantly higher hypertension risk than the reference group who reported drinking 7 or

Table 1. Sample Characteristics, National Longitudinal Survey of Youth 1979 Cohort (*n*=8,186)

Covariates	Female (*n*=4,225)	Male (*n*=3,961)
Time-invariant variables		
Age in 1982, years, mean	21.82	21.68
U.S. born	95.7 (3,926)	95.7 (3,673)
Race/ethnicity		
White	61.4 (1,702)	63.3 (1,628)
Black	14.5 (1,224)	13.7 (1,139)
Hispanic	6.5 (759)	6.2 (718)
Native American	6.2 (195)	4.8 (141)
Other	11.5 (326)	12.1 (315)
Religious attendance, 1979, mean	2.36	2.05
Work-health limitation, 1979	7.2 (297)	4.8 (190)
Education attainment by age 25 years		
Less than high school	11.4 (651)	13.9 (755)
High school	44.8 (1,856)	45.2 (1,807)
Some college	23.5 (1,025)	20.1 (774)
College or more	20.3 (684)	20.7 (617)
Hypertension	24.6 (1,200)	28.4 (1,188)
Heart problems	2.4 (113)	3.1 (123)
Time-varying variables, 1982–2012		
Children, mean		
Yes	1.43	0.9
Poverty status		
Yes	13.9	10.4
Marital status		
Never married	22.9	32.6
Married	58.5	53.7
Separated	4.2	2.9
Divorced	13.5	10.6
Widowed	0.9	0.3
Employment status		
Employed	74.8	85.9
Unemployed	2.0	2.9
Out of labor force	22.9	8.6
Active services	0.3	2.6

Note: Data presented as weighted percentage (unweighted sample size) unless otherwise specified.

Table 2. Discrete-Time Survival Models Predicting Onset of Hypertension by Sex, NLSY79

	Women		Men	
Predictors	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Current drinking status (ref: low volume/no HED)[a,b]				
Lifetime abstainer	1.13 (0.89, 1.43)	0.311	1.20 (0.84, 1.71)	0.309
Current nondrinker	0.96 (0.81, 1.15)	0.658	1.12 (0.92, 1.35)	0.260
Low volume/HED	1.23 (0.90, 1.70)	0.193	1.01 (0.81, 1.26)	0.934
Risky volume/monthly HED	1.04 (0.67, 1.62)	0.861	**1.64 (1.10, 2.45)**	**0.016**
Risky volume/weekly HED	0.89 (0.48, 1.67)	0.719	1.20 (0.83, 1.74)	0.324
High volume	**1.57 (1.06, 2.33)**	**0.023**	1.25 (0.84, 1.87)	0.269
Prior HED (past 10 years)[a]				
Monthly HED	0.91 (0.75, 1.10)	0.324	1.11 (0.94, 1.31)	0.228
Weekly HED	1.26 (0.99, 1.59)	0.056	0.97 (0.81, 1.17)	0.785
Age	**1.09 (1.06, 1.13)**	**<0.001**	**1.12 (1.08, 1.15)**	**<0.001**
U.S. born	**1.76 (1.21, 2.54)**	**0.003**	1.19 (0.81, 1.73)	0.377
Race/ethnicity (ref: white)				
Black	**1.74 (1.46, 2.07)**	**<0.001**	**1.18 (1.01, 1.40)**	**0.043**
Hispanic	1.11 (0.89, 1.39)	0.357	**0.77 (0.61, 0.95)**	**0.017**
Native American	1.17 (0.84, 1.62)	0.357	0.90 (0.61, 1.33)	0.604
Other race	1.04 (0.78, 1.39)	0.793	0.85 (0.65, 1.10)	0.219
Frequency of religious attendance 1979	0.99 (0.95, 1.03)	0.637	0.98 (0.94, 1.03)	0.470
Work-health limitation 1979	1.00 (0.78, 1.30)	0.978	1.28 (0.97, 1.70)	0.083
In poverty[a]	1.08 (0.87, 1.34)	0.500	0.91 (0.70, 1.19)	0.490
Education attainment (ref: less than high school)				
High school graduate	1.05 (0.84, 1.30)	0.683	**0.81 (0.66, 0.99)**	**0.039**
Some college	0.96 (0.74, 1.24)	0.747	0.83 (0.65, 1.06)	0.143
College or more	0.88 (0.65, 1.19)	0.395	0.78 (0.59, 1.04)	0.089
Marital status (ref: married)[a]				
Never married	0.91 (0.73, 1.12)	0.375	1.12 (0.91, 1.39)	0.290
Separated	1.03 (0.77, 1.39)	0.831	1.27 (0.89, 1.82)	0.191
Divorced	0.91 (0.74, 1.12)	0.371	1.02 (0.81, 1.29)	0.851
Widowed	0.75 (0.41, 1.39)	0.362	0.64 (0.26, 1.57)	0.330
Has children[a]	0.94 (0.89, 1.00)	0.035	0.97 (0.90, 1.03)	0.300
Employment status (ref: employed)[a]				
Unemployed	1.12 (0.69, 1.83)	0.654	1.31 (0.85, 2.00)	0.221
Out of labor force	1.15 (0.96, 1.39)	0.132	**1.41 (1.07, 1.86)**	**0.015**
In active forces	1.81 (0.51, 6.46)	0.359	1.07 (0.56, 2.05)	0.838
Smoking status (ref: nonsmoker)[a]				
Previous daily smoker	1.00 (0.82, 1.22)	0.977	1.10 (0.90, 1.34)	0.342
Current daily smoker	1.10 (0.92, 1.31)	0.314	1.20 (0.99, 1.44)	0.057
BMI (ref: normal weight)[a]				
Underweight	0.98 (0.55, 1.76)	0.953	2.00 (0.75, 5.34)	0.166
Overweight	**1.64 (1.34, 2.00)**	**<0.001**	**1.85 (1.50, 2.28)**	**<0.001**
Obese	**3.31 (2.75, 3.97)**	**<0.001**	**3.50 (2.83, 4.34)**	**<0.001**
Time	**1.34 (1.27, 1.44)**	**<0.001**	**1.37 (1.29, 1.47)**	**<0.001**
Time^2	**0.99 (0.99, 0.99)**	**<0.001**	**0.99 (0.99, 0.99)**	**<0.001**

Note: Boldface indicates statistical significance ($p<0.05$).
[a]Indicates time-varying variable.
[b]Current drinking status is a combined total volume and frequency of HED of ≥6 drinks. Total volume is categorized into low volume (≤7/14 drinks per week for women and men, respectively), risky volume (>7/14 drinks per week and ≤14/28 drinks per week), and high volume (>14/28 drinks per week). Frequency of ≥6 HED is grouped into any in the last month, monthly, and weekly. High volume includes those with no HED and those with HED.
HED, heavy episodic drinking; NLSY79, National Longitudinal Survey of Youth 1979.

fewer drinks per week and no HED days (AOR=1.57, p=0.023). All other drinking and nondrinking groups reported similar risks. Controlling for current drinking, women with a history of weekly HED had a heightened (marginally significant) risk for hypertension (AOR=1.26, p=0.056). After accounting for prior history, the risk from current use declined for women drinking at high volumes from 1.77 (adjusted model with no prior HED; not shown in table) to 1.57 (adjusted model with prior HED). Other risk factors included older age, being U.S.-born, black (versus white), and having no children. Neither SES, early health problems, nor smoking were related to hypertension. However, being overweight or obese placed women at higher risk (AOR=1.64, p<0.001 and AOR=3.31, p<0.001, respectively).

Though all other drinking patterns were nonsignificant, men who engaged in risky volume (15–28 drinks/week) and monthly HED had increased risk for hypertension (AOR=1.64, p=0.016) compared with the reference group of low volume/no HED. Current drinking mattered more than prior HED. However, similar to women, significant risks associated with current drinking were reduced after accounting for prior HED. Specifically, the AOR for men drinking at risky volume and monthly HED reduced from 1.70 to 1.64 after accounting for prior HED. Men at older ages and being out of the labor force were also at higher risk. Compared with whites, blacks had higher hypertension risk (AOR=1.18, p=0.043) and Hispanics had lower risk (AOR=0.77, p=0.017). Current smokers were marginally at higher risk (AOR=1.20, p=0.057), but being overweight or obese heightened risk (AOR=1.85, p<0.001 and AOR=3.50, p<0.001, respectively).

Few significant results were found in racial/ethnic-stratified models (Table 3), but AOR differences across groups offered insight into potential hypertension-related disparities. White women with the highest

Table 3. Adjusted Discrete-Time Survival Models Predicting Onset of Hypertension by Sex and Race/Ethnicity, NLSY79

	White		Black		Hispanic	
Predictors	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Women						
Current drinking status (ref: low volume/no HED)[a,b]						
Lifetime abstainer	1.32 (0.90, 1.93)	0.149	1.07 (0.81, 1.43)	0.631	1.66 (0.90, 3.08)	0.105
Current nondrinker	0.93 (0.71, 1.23)	0.611	1.01 (0.80, 1.27)	0.943	**1.91 (1.17, 3.12)**	**0.010**
Low volume/HED	1.41 (0.89, 2.24)	0.142	0.74 (0.46, 1.18)	0.202	**2.71 (1.21, 6.03)**	**0.015**
Risky volume/monthly HED	1.28 (0.72, 2.30)	0.402	0.63 (0.33, 1.22)	0.170	2.27 (0.83, 6.21)	0.111
Risky volume/weekly HED	0.86 (0.31, 2.43)	0.780	0.87 (0.36, 2.13)	0.765	1.84 (0.58, 5.87)	0.304
High volume	**2.25 (1.35, 3.75)**	**0.002**	0.64 (0.33, 1.23)	0.177	2.15 (0.67, 6.94)	0.200
Prior HED (past 10 years)[a]						
Monthly HED	0.89 (0.66, 1.19)	0.419	0.92 (0.70, 1.21)	0.564	0.84 (0.50, 1.41)	0.511
Weekly HED	1.21 (0.86, 1.69)	0.277	1.36 (0.97, 1.89)	0.073	1.00 (0.54, 1.84)	0.989
Men						
Current drinking status (ref: low volume/no HED)[a,b]						
Lifetime abstainer	1.37 (0.80, 2.35)	0.251	0.92 (0.59, 1.46)	0.736	2.12 (0.97, 4.65)	0.061
Current nondrinker	1.24 (0.95, 1.61)	0.114	0.98 (0.75, 1.27)	0.863	1.21 (0.77, 1.90)	0.400
Low volume/HED	0.96 (0.71, 1.31)	0.813	0.97 (0.69, 1.36)	0.850	1.40 (0.89, 2.20)	0.145
Risky volume/monthly HED	**1.73 (1.02, 2.92)**	**0.043**	1.34 (0.67, 2.67)	0.414	1.10 (0.33, 3.64)	0.871
Risky volume/weekly HED	1.38 (0.84, 2.26)	0.200	1.50 (0.89, 2.54)	0.126	1.44 (0.64, 3.21)	0.378
High volume	1.35 (0.78, 2.32)	0.279	0.91 (0.47, 1.76)	0.787	1.16 (0.47, 2.83)	0.748
Prior HED (past 10 years)[a]						
Monthly HED	1.11 (0.88, 1.41)	0.380	1.09 (0.86, 1.38)	0.483	0.94 (0.65, 1.36)	0.758
Weekly HED	0.96 (0.74, 1.25)	0.781	0.90 (0.69, 1.18)	0.444	1.07 (0.73, 1.56)	0.739

Note: Boldface indicates statistical significance (p<0.05). Models adjusted for age, birthplace, race/ethnicity, education, religion, early health, poverty, marital status, children, employment, smoking, BMI, and time.

[a]Indicates time-varying variable.

[b]Current drinking status is a combined total volume and frequency of HED of ≥6 drinks. Total volume is categorized into low volume (≤7/14 drinks per week for women and men, respectively), risky volume (>7/14 drinks per week and ≤14/28 drinks per week), and high volume (>14/28 drinks per week). Frequency of ≥6 HED is grouped into any in the last month, monthly, and weekly. High volume includes those with no HED and those with HED.

HED, heavy episodic drinking; NLSY79, National Longitudinal Survey of Youth 1979.

volume had significantly greater risk (AOR=2.25, p=0.002), and though not significant, low volume/any HED and risky volume/monthly HED had escalated risk. In comparison, none of the current drinking patterns for black women showed higher risks; however, black women who had a history of weekly HED did report higher hypertension risk, although it was near significance (AOR=1.36, p=0.073). Hispanic women exhibited significantly higher hypertension risks among lower drinking patterns and current abstinence/former drinkers. Among men, elevated risks for lifetime abstinence were found for white and Hispanic men with Hispanics at marginal significance, but lifetime abstinence for black men showed reduced risks. Increased risks from current HED patterns were generally seen for all racial/ethnic groups. Having a history of weekly HED elevated hypertension risk for Hispanic men, whereas history of monthly HED elevated hypertension risks for white and black men.

Although the general trend showed lower risks for onset of heart problems among lifetime abstinence and low-risk drinking groups, there were no significant differences for any of the drinking groups compared with the reference group (Table 4). Prior HED was also not significantly associated. However, for both women and men, older ages (AOR=1.15, p=0.012 and AOR=1.19, p=0.001, respectively) and current daily smoking (AOR=2.55, p=0.009 and AOR=2.54, p=0.005, respectively) were significant risk factors. For women only, U.S.-born, not working, and obesity heightened the risk. For men, higher education served as a protective factor. Racial/ethnic-stratified models were also conducted, but no significant findings were found for current or prior drinking (results not shown).

DISCUSSION

This study investigated the effects of alcohol on risks for hypertension and heart problems using a cohort of U.S. adults born between 1957 and 1963 followed prospectively to their early 50s. Capitalizing on the data available and applying a lifecourse framework, this study distinguished between lifetime abstainers and former drinkers and provided a more nuanced construction of drinking patterns, including a combined HED and total volume measure (in an effort to capture those with nonrisky volume who still engage in HED) and going beyond current drinking patterns to examine lifetime history of HED.

For hypertension, results were similar to prior studies with evidence of elevated risks for high volume (regardless of HED) compared with the low volume/non-HED group for both men and women.[9,41] For women, high volume drinking that involved more than 14 drinks per week revealed the highest risk for hypertension. Prior history of weekly HED elevated the risk for women. For men, current drinking mattered more than prior HED, which had no effect on hypertension risk. Although the riskiest and highest volume drinking groups were not significantly different for men, those who engaged in risky drinking (15−28 drinks/week) with monthly HED had a significantly larger risk. This aligns with a meta-analysis study that found men's risk of hypertension is linear up to 40 grams/day (equivalent to 21 drinks/week) and plateaus at higher volumes.[9]

Although blacks reported higher hypertension rates than whites,[2] in this study, there was no clear evidence that alcohol contributed to heightened hypertension risk for blacks over and above factors such as physical inactivity, obesity, and socioeconomic indicators.[42,43] Although black women with a history of weekly HED reported a 36% greater odds of hypertension than those without weekly HED, results were only marginally significant. For Hispanics, noncurrent drinking groups escalated hypertension risks (i.e., former drinking for Hispanic women and lifetime abstinence for Hispanic men), and furthermore, low-volume HED pattern had a higher risk for Hispanic women. Descriptive findings revealed varying drinking patterns with more non-to-low drinking patterns among blacks and Hispanics than whites. Jackson and colleagues reported sociodemographic differences within drinking patterns where poverty levels were similar across drinking patterns for whites, but poverty levels increased with higher drinking patterns among blacks, indicating potentially differential impacts on health because of compositional differences in drinking patterns between race/ethnicity.[44] Future studies are needed to further understand lifecourse drinking patterns for blacks and Hispanics, how sociodemographics factors vary within these drinking patterns by race/ethnicity, and whether these findings of prior HED for black women and current nondrinking groups and lower-risk patterns for Hispanics elevate hypertension risks are upheld.

Nonsignificant findings for heart problems may be a result of the younger age of the NLSY79 respondents (aged 47−55 years in 2012). For men, heart disease often begins after age 50 with the average age of first heart attack at 65, although men may experience heart attacks earlier.[45] Women are likely to experience heart problems at older ages than men, and their risk for a heart attack occurs at age 55 years and older.[45] As the NLSY79 cohort ages, future research should examine whether alcohol will significantly elevate the risk of heart problems in their 60s and even 70s. Despite the low prevalence of heart problems in this sample, study findings do report smoking, and for women only, obesity, as strong risk factors even in this younger sample. The extent that hypertension is one risk

Table 4. Discrete-Time Survival Models Predicting Onset of Heart Problems by Sex, NLSY79

	Women		Men	
Predictors	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Current drinking status (ref: low volume/no HED)[a,b]				
Lifetime abstainer	0.86 (0.34, 2.13)	0.738	0.93 (0.28, 3.10)	0.903
Current nondrinker	1.28 (0.71, 2.30)	0.412	1.11 (0.62, 1.99)	0.715
Low volume/HED	1.00 (0.30, 3.32)	0.996	0.87 (0.42, 1.80)	0.711
Risky volume/monthly HED	0.96 (0.17, 5.33)	0.965	2.49 (0.82, 7.59)	0.109
Risky volume/weekly HED	0.83 (0.16, 4.29)	0.824	1.02 (0.34, 3.00)	0.978
High volume	2.30 (0.66, 7.96)	0.191	0.79 (0.21, 2.97)	0.725
Prior HED (past 10 years)[a]				
Monthly HED	0.69 (0.34, 1.38)	0.294	0.67 (0.38, 1.18)	0.164
Weekly HED	0.62 (0.31, 1.25)	0.181	0.92 (0.54, 1.55)	0.749
Age	**1.15 (1.03, 1.27)**	**0.012**	**1.19 (1.08, 1.32)**	**0.001**
U.S. born	**9.63 (2.30, 40.30)**	**0.002**	0.91 (0.21, 3.89)	0.894
Race/ethnicity (ref: white)				
Black	0.79 (0.44, 1.41)	0.423	0.83 (0.48, 1.43)	0.500
Hispanic	1.16 (0.52, 2.62)	0.716	0.50 (0.23, 1.08)	0.076
Native American	1.37 (0.59, 3.20)	0.467	1.76 (0.75, 4.14)	0.192
Other race	0.72 (0.27, 1.91)	0.506	0.55 (0.22, 1.43)	0.221
Frequency of religious attendance 1979	0.99 (0.87, 1.14)	0.927	0.90 (0.78, 1.05)	0.181
Work-health limitation 1979	1.56 (0.76, 3.19)	0.223	1.73 (0.80, 3.72)	0.160
In poverty[a]	1.58 (0.77, 3.22)	0.210	1.03 (0.49, 2.15)	0.942
Education attainment (ref: less than high school)				
High school graduate	0.72 (0.38, 1.37)	0.317	**0.49 (0.28, 0.84)**	**0.009**
Some college	0.82 (0.38, 1.79)	0.623	0.61 (0.31, 1.23)	0.166
College or more	0.71 (0.26, 1.95)	0.503	**0.20 (0.06, 0.69)**	**0.011**
Marital status (ref: married)[a]				
Never married	0.98 (0.49, 1.94)	0.944	1.01 (0.50, 2.04)	0.970
Separated	1.49 (0.60, 3.70)	0.392	1.72 (0.60, 4.90)	0.311
Divorced	1.29 (0.70, 2.41)	0.416	0.94 (0.49, 1.81)	0.852
Widowed	0.25 (0.05, 1.22)	0.087	0.52 (0.06, 4.44)	0.554
Has children[a]	1.12 (0.96, 1.31)	0.153	1.05 (0.87, 1.27)	0.629
Employment status (ref: employed)[a]				
Unemployed	1.37 (0.31, 6.11)	0.677	1.35 (0.39, 4.63)	0.635
Out of labor force	**2.55 (1.44, 4.51)**	**0.001**	1.48 (0.65, 3.38)	0.351
In active forces	**1.00 (0.00, 0.00)**	**<0.001**	0.38 (0.05, 2.92)	0.356
Smoking status (ref: nonsmoker)[a]				
Previous daily smoker	0.93 (0.46, 1.89)	0.835	1.54 (0.78, 3.02)	0.211
Current daily smoker	**2.31 (1.24, 4.31)**	**0.009**	**2.54 (1.33, 4.86)**	**0.005**
BMI (ref: normal weight)[a]				
Underweight	0.84 (0.11, 6.33)	0.863	2.93 (0.36, 23.90)	0.315
Overweight	1.49 (0.73, 3.06)	0.277	1.33 (0.74, 2.39)	0.345
Obese	**3.57 (1.87, 6.82)**	**<0.001**	1.65 (0.91, 3.00)	0.102
Time	**1.52 (1.23, 1.87)**	**<0.001**	**1.52 (1.12, 0.99)**	**0.007**
Time^2	**0.99 (0.98, 0.99)**	**<0.001**	**0.99 (0.98, 0.99)**	**0.018**

Note: Boldface indicates statistical significance ($p<0.05$).
[a]Indicates time-varying variable.
[b]Current drinking status is a combined total volume and frequency of HED of ≥6 drinks. Total volume is categorized into low volume (≤7/14 drinks per week for women and men, respectively), risky volume (>7/14 drinks per week and ≤14/28 drinks per week), and high volume (>14/28 drinks per week). Frequency of ≥6 HED is grouped into any in the last month, monthly, and weekly. High volume includes those with no HED and those with HED.
HED, heavy episodic drinking; NLSY79, National Longitudinal Survey of Youth 1979.

factor for heart problems[46] suggests that study results may similarly reflect alcohol's risk on heart problems. Future studies should continue to investigate alcohol's relationship to heart problems given recent findings of increases in hospitalizations for heart attacks among women aged 35 to 54 years, in particular black women.[47]

Limitations

Findings should be considered within the following study limitations. Data are from a sample of U.S. adults born between 1957 and 1964, and thus may not represent other birth cohorts. The key alcohol measures were not consistent across all survey years, and adjustments were made as best as possible. HED is captured at a higher threshold of 6 or more drinks on a single occasion than the typical 5+ drinks, or 4+ drinks for women. This higher threshold and lack of sex specificity could lead to lower risk estimates for men and especially for women. The health outcomes were self-reported at age 40 or 50, and thus recalling the specific month and year may not be accurate. Racial/ethnic analyses should be replicated to see if findings are similar given NLSY79's smaller sample sizes and multiple drinking categories, which may lead to underpowered analyses.

CONCLUSIONS

A lifecourse perspective is needed to better understand the complex relationship between alcohol and onset of hypertension and heart problems. In this study, higher volume with or without HED contributed to elevated hypertension risks for women and men, and in particular for white women and men. These findings point to screening for history of weekly HED for women and current risky drinking (>28/14 drinks per week) for men and women as a risk factor for hypertension. Alcohol was not a major risk factor for hypertension risk among blacks and Hispanics; although future studies should explore lifecourse drinking patterns to see if the accumulation of risk from low-risk drinking patterns or prior HED history are related to earlier onset or elevated risk for hypertension among blacks and Hispanics. Future studies should also adopt a lifecourse framework to assess drinking patterns on hypertension and heart disease risk and to examine racial/ethnic differences in drinking patterns on disease risk.

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SUPPLEMENTAL MATERIAL

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