
Article

Early Life Health, Trauma and Social Determinants of Lifetime Abstinence from Alcohol

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Abstract

Aims: Factors influencing lifetime abstinence from alcohol may be relevant to the validity of analyses of alcohol's impact on health outcomes. We evaluate relationships between early life experiences, social factors, and demographic characteristics on lifetime abstainer status in models disaggregating by gender and, among women, race/ethnicity.

Methods: Analyses use the landline sample ($N = 5382$) of the 2010 U.S. National Alcohol Survey. Surveyed participants who reported never drinking alcohol were defined as lifetime abstainers. Additional variables assessed included demographics, dispositions to risk taking and impulsivity, and indicators of early life stress like economic difficulty, childhood trauma and early onset of health conditions. Logistic regression models predicting lifetime abstinence were estimated.

Results: Lifetime abstainers are more likely to be women and, among women, to be non-White and Latina. Those reporting that their religion discouraged drinking and that religion was very important to them were more likely to be lifetime abstainers. Higher education levels were associated with reduced rates of lifetime abstinence among women. Also among women, family problem drinking was associated with lower rates of lifetime abstinence. However, childhood economic difficulty significantly predicted lower abstinence only for White women, and childhood sexual abuse was significantly related to lower lifetime abstinence only for Black women.

Conclusions: Understanding the characteristics and determinants of individuals who never drink alcohol is relevant to any analysis of alcohol-related health outcomes. Results point to specific factors related to lifetime abstinence with potential to bias such analyses if not included as control measures.

Short summary: Analyses evaluating relationships between early life experiences, social factors, and demographics with lifetime abstainer status identified characteristics associated with both poor health and with better health. These included lower risk taking and impulsivity scores and lower rates of family problem drinking, childhood economic difficulties and childhood sexual abuse.

INTRODUCTION

In alcohol-related health studies, the health outcomes of drinkers are often compared to a non-drinking control group. How we define this control group is critical for how we understand the relationship

between alcohol and health, given the particular risks or benefits of different drinking patterns and how these drinking patterns change or remain constant over the life course (Rehm *et al.*, 2008). The most common measurement for a non-drinking control group is

current abstainers, a category that includes both former drinkers of various types and lifetime abstainers. These two groups are likely very different from one another in terms of health outcomes as well as characteristics that influence their decision not to drink. Concerns about analyses using current abstainers as the control group for estimating alcohol-related health outcomes have been addressed by excluding former drinkers and focusing on lifetime abstainers. However, Shaper and colleagues pointed out in their British study that lifetime abstainers constitute a small group with unique characteristics and often a lack of social integration (Shaper *et al.*, 1988; Shaper, 1995). While lifetime occasional drinkers were instead suggested as a more appropriate control group, this group has rarely been identified in alcohol-health studies. Thus, who makes up lifetime abstainers and what early life factors contribute to their likelihood of being a lifetime abstainer are important issues to consider for alcohol-related health studies.

In a 2006 meta-analysis, very few studies measured lifetime drinking status and those that did focused on lifetime abstinence (Fillmore *et al.*, 2006). Results from these studies place doubts as to whether light-to-moderate drinking has a protective effect against disease and mortality. However, this protective effect finding could be due to a systematic bias that results from mis-classification of drinkers when considering the lifetime context. When lifetime abstainers are distinguished separately from former drinkers, studies that exclude former drinkers could lead to biased estimates of mortality because former drinkers who quit due to ill health are removed from the drinking risk group, while lifetime abstainers with ill health cannot be removed from the risk group in a similar manner (Kerr and Ye, 2010; Liang and Chikritzhs, 2011).

Several other factors make lifetime abstainers a poor choice for a control group as they can be different from drinkers in ways relevant to health behaviors and outcomes. First, abstainers are more likely to have lower socioeconomic status than drinkers. Further, use of lifetime abstainers as a control may create a bias leading to poorer health outcomes among abstainers as they can be different from drinkers in ways relevant to health outcomes and other health behaviors. For instance, a British cohort study found abstainers were more likely to have persistent socioeconomic disadvantages over the life course (Caldwell *et al.*, 2008). Data from the 2000 U.S. National Alcohol Survey (NAS) showed that religions proscribing alcohol and self-reported degree of religiosity were both associated with increased odds of abstinence (Michalak *et al.*, 2007); however, no studies to date have investigated the role of religion in lifetime abstinence. Linking abstinence with health, a British study of two cohort samples found that non-drinkers at age 16 had more medical conditions than drinkers, and that among never drinkers at age 23 or 26, having a longstanding illness predicted continued abstinence at follow-up interviews at age 34 and 42 (Ng Fat *et al.*, 2014). In contrast, some characteristics of lifetime abstainers indicate association with factors related to better health. For example, a U.S. study of lifetime abstinence and mental health outcomes found that lifetime abstainers had lower odds of lifetime major depression (OR = 0.39) and anxiety disorders (OR = 0.55) compared to current non-binge drinkers (Marti *et al.*, 2015).

It is also important to recognize that childhood experiences can potentially have a profound impact on one's likelihood of being a lifetime abstainer. According to the life course perspective, key events in childhood can have long-lasting effects into adulthood (Elder *et al.*, 2003). Alcohol use can provide relief from psychological distress related to childhood trauma, (Khantzian, 1985; Cappell and Greeley, 1987; Rheingold *et al.*, 2003) and has been documented to be greater among those reporting child abuse

(Widom *et al.*, 1995; Wilsnack *et al.*, 1997; Vogeltanz *et al.*, 1999; Molnar *et al.*, 2001; Schuck and Widom, 2001). In a national representative sample of women, based on the NAS, childhood physical and sexual abuse was associated with numerous measures of problematic alcohol consumption. Child sexual abuse increased risk for heavy episodic drinking, alcohol dependence, alcohol-related consequences and high alcohol volume (Lown *et al.*, 2011). Childhood abuse is also associated with greater risk for adult health problems. (Felitti *et al.*, 1998) Early life illness can also increase the likelihood of lifetime abstinence or result in decreased drinking (Lown *et al.*, 2008) (Marjerrison *et al.*, in press) and be associated with greater health problems as an adult (Hudson *et al.*, 2003; Oeffinger *et al.*, 2006; Armstrong *et al.*, 2009; Shonkoff *et al.*, 2009) as well as lifelong education and employment deficits (Nagarajan *et al.*, 2003; Pang *et al.*, 2008). If childhood experiences (e.g. childhood cancer) as well as other social or demographic factors that are positively related to lifetime abstinence are not included in studies of alcohol-related health risks, then study findings would be biased toward finding protective effects from drinking even when former drinkers were excluded from the reference group. As these measures are rarely available in prospective health studies, findings on the potential for bias could have broad relevance.

Given the rising interest in how alcohol influences health it is important that we understand how studies operationalize drinkers versus non-drinkers, who is a lifetime abstainer and which early life experiences influence abstinence. These factors can have a direct impact on study findings related to health outcomes. The current study uses data from the 2010 National Alcohol Survey to evaluate relationships between early life experiences, social factors and demographic characteristics on lifetime abstainer status. Models will examine gender and race/ethnicity separately to predict lifetime abstinence.

METHODS

Data

The 2010 U.S. National Alcohol Survey (2010 NAS) was a Computer Assisted Telephone Interview (CATI) household survey of the U.S. adult population aged 18 or older. Conducted for the Alcohol Research Group by ICF Macro between June 2009 and March 2010, NAS utilized a sampling frame of all 50 states and the District of Columbia. A Dual-Frame design, including both landline and cellular phone cases, was implemented. The landline sample included a base sample and ethnic minority oversamples for Latino and African American populations. One adult in the surveyed household at a private residence was randomly selected for interview. The average interview time was 55 minutes for landline completed interviews. Cell phone respondents were asked a limited set of questions that did not include some key predictors for this study, such as childhood difficulties and lifetime injury and disease, and were therefore excluded from these analyses. The cooperation rate was 52.1% overall, and 49.9% for the landline sample analyzed in this study ($N = 5382$). The cooperation rate is consistent with those from recent telephone surveys (Curtin *et al.*, 2005), and is also of reduced concern in this study as our interest is to examine lifetime abstinence associated risk factors, rather than any population prevalence estimates.

Measures

Lifetime abstinence

All respondents were first asked about their usual frequency of drinking in the last 12 months, with response categories ranging

from 'More than once a day', 'Once a day', to 'Less than once a year' and 'Have you never had any beverage containing alcohol'. Those who answered never had any alcohol were further probed in another question 'Have you never in your whole life had a drink of alcohol'. Those who gave the confirmative negative answer were defined as lifetime abstainers.

Personal characteristics

Basic demographic variables included gender, race/ethnicity (White, Black, Hispanic and other), continuous age, birth cohorts by 10 year groups (<1935, 1935–44, 1945–54, 1955–64, 1965–74, 1975+), born outside of the United States and highest education achieved (less than high school graduate, high school graduate, some college and college graduate or more). Given the strong association with abstinence (Michalak *et al.*, 2007), religion was examined including (1) religious preference (Protestant, Catholic, other religion, and no religion), (2) importance of religion in life (Very important, somewhat important, and not important), and (3) a dichotomous variable indicating whether religion discourages the drinking of alcohol. Last, the risk taking/impulsivity scale was included (Greenfield *et al.*, 2011), consisting of a 0–3 scale based on the mean of seven items (e.g. 'I often act on the spur of moment without stopping to think', 'I like to try new things just for excitement').

Childhood experiences

First, childhood experiences with problem drinkers were included via (1) living with problem drinkers during childhood, and (2) problem drinking status of biological family members (no family members being problem drinkers, 2nd degree only (e.g. grandparents, aunt and uncle), 1st degree only (e.g. parents, siblings) and both 1st and 2nd degree family members being problem drinkers). Second, childhood difficulty is a measure of the times when the respondent suffered from economic difficulty before age of 18 (never, once, more than once). Third, childhood abuse was examined as (1) physical abuse (hit with something, beat up, intentionally burned or scalded, use of knife or gun on you or threaten to) and (2) sexual abuse (forced to have sex against will) before age 18 (Sorenson *et al.*, 1987; Straus, 1990). Finally, childhood health conditions were based on respondent's self-reported age of occurrence or diagnosis of injury from a severe accident and from chronic diseases (i.e. hypertension, heart disease, diabetes, stroke and cancer). Two measures, childhood injury and disease, were created based on whether they had an injury or diagnosed with a chronic disease before age 18.

Data analysis

Bivariate analyses were first performed examining associations between lifetime abstinence and factors related to personal characteristics and childhood experiences. Multiple logistic regressions were then used to estimate the odds of lifetime abstinence including all predictors in the model. The focus of these regression models was to evaluate the effect of childhood experience on the choice of drinking or abstinence, an area not well studied, after controlling for main personal characteristics which were known to be highly predictive of lifetime abstinence. The analyses were done for the total 2010 NAS landline sample, then separately by gender. Given that a vast majority of abstainers are women, further analyses were performed only among White, Black and Latina women. Data were weighted to adjust for the probability of selection (multiple phone lines and adult residents in households), ethnic oversampling, and

non-response. Data were also post-stratification weighted to reflect the U.S. adult (18+) population proportions of ethnicity by region, age and gender.

RESULTS

Preliminary analyses showed that only 58% of lifetime drinkers reported starting drinking at age 18 or younger, compared to 73% by age 20 or younger and 92% by age 24 or younger. Based on this, we restricted our sample to respondents aged 25 and older because respondents who identified as lifetime abstainers at this age would have a much smaller chance of becoming drinkers. Of the 5382 respondents who completed the landline interview, 213 respondents aged 24 or younger and 121 respondents with missing values on age were excluded, resulting in an analytic sample of 5048. The prevalence of lifetime abstinence for the total sample aged 25 + is 14.5% overall, 10.1% for men and 18.6% for women.

Descriptive information on personal characteristics, childhood hardship and health variables between lifetime abstainers and ever-drinkers for the analytic sample, by men and women separately are presented in Table 1. Bivariate relationships between personal characteristics and lifetime abstinence are essentially as expected. Lifetime abstainers are over-represented among females, ethnic minorities, older participants, older birth cohorts, foreign-born, lower education groups and those involved in less risk taking. Religion is an important factor predicting abstinence. Catholics and those having no religion are more likely to drink than Protestants and other religions. Respondents who considered religion as very important, and those affiliated with a religion that discourages drinking are more likely to be lifetime abstainers. Among the childhood experience measures, living with problem drinkers during childhood and having either or both 1st and 2nd degree family members who were problem drinkers was significantly negatively related to lifetime abstinence. Respondents reporting childhood physical and sexual abuse were also less likely to be abstainers. However, childhood injury and chronic disease were not found to be associated with lifetime abstinence. In general, the bivariate associations also hold for men and women separately, as shown in Table 1. Fewer significant effects were observed for men, partly because of reduced effect size and partly because of lower power resulting from fewer lifetime abstainers, compared to women. Childhood economic difficulty was associated with lifetime abstinence for men but not for women. Childhood physical abuse was associated with lower prevalence of abstinence for the total sample and for men, while sexual abuse was associated with lower abstinence for women only. Finally, those who had a chronic disease during childhood were much less likely to be abstainers among men.

Table 2 presents adjusted odds ratios from multiple logistic regression models for the total sample, and separately for men and women. For the full sample, almost all significant relationships found in the bivariate analysis were observed with the exception of child sexual abuse for women, which was no longer significant. Comparing the regression results between men and women illustrate a number of relationships that differ by gender. For example, ethnic minority women were more likely to be lifetime abstainers than White women, but this pattern was not found for men. While older cohorts were more likely to report being lifetime abstainers for both men and women, the effects were not significant for either group. Lower education was associated with lifetime abstinence for both gender groups also, but stronger effects were shown for women while estimates from men were not significant. For men, those

Table 1. Comparison between lifetime abstainers and ever-drinkers aged 25+

	Total		Men		Women	
	Abstainer N = 864	Ever drinking N = 4184	Abstainer N = 173	Ever drinking N = 1639	Abstainer N = 691	Ever drinking N = 2545
Gender male	33.7%	51.0%***				
Race/ethnicity: White	49.3%	73.8%***	49.1%	72.3%***	49.4%	75.3%***
Black	15.7%	10.1%**	17.7%	10.1%*	14.7%	10.1%*
Latino	25.2%	10.2%***	23.5%	11.8%**	26.0%	8.5%***
Others	9.8%	5.9%*	9.8%	5.8%	9.8%	6.0%
Age continuous (mean)	53.2	49.3***	49.0	48.8	55.4	49.7***
Birth year: <1935	16.5%	7.4%***	12.0%	6.7%	18.8%	8.2%***
1935–1944	15.3%	9.5%***	14.0%	8.9%	16.0%	10.1%**
1945–1954	13.8%	16.9%	11.6%	17.1%	14.8%	16.8%
1955–1964	15.2%	23.3%***	13.1%	23.6%*	16.3%	23.1%**
1965–1974	17.8%	22.4%*	14.1%	23.7%*	19.6%	21.2%
1975+	21.4%	20.4%	35.2%	20.0%**	14.5%	20.7%*
Birth place: Outside the U.S.	29.7%	10.4%***	30.3%	10.9%***	29.4%	10.0%***
Education: Less than HS	32.9%	12.8%***	29.0%	14.9%**	34.9%	10.6%***
HS grad	32.0%	29.4%	30.8%	29.9%	32.6%	29.0%
Some college	18.9%	28.7%***	17.8%	26.5%	19.5%	30.9%***
College grad/more	16.2%	29.1%***	22.4%	28.6%	13.1%	29.5%***
Religion: Protestant	46.3%	40.2%*	42.8%	39.4%	48.1%	41.0%*
Catholic	20.7%	23.9%	17.2%	23.2%	22.5%	24.6%
Other religion	25.9%	17.1%***	32.8%	15.2%***	22.4%	19.1%
No religion	7.1%	18.8%***	7.2%	22.2%***	7.0%	15.3%***
Religion important: Very important	79.8%	54.6%***	76.3%	48.6%***	81.5%	60.7%***
Somewhat important	14.9%	26.7%***	17.6%	29.4%*	13.6%	24.0%***
Not important	5.3%	18.7%***	6.1%	22.0%***	4.9%	15.3%***
Religion discourage drinking	57.9%	30.7%***	53.4%	30.3%***	60.2%	31.1%***
Risk taking and impulsivity (mean)	0.51	0.78***	0.67	0.91**	0.43	0.64***
Live with problem drinkers during childhood	23.0%	29.9%**	22.3%	28.6%	23.4%	31.3%**
Biological family problem drinking: Negative	57.8%	46.5%***	53.5%	47.2%	60.0%	45.8%***
2nd degree only (e.g. grandparents)	15.3%	18.2%	16.3%	20.2%	14.8%	16.2%
1st degree only (parents, siblings)	22.4%	23.2%	23.9%	20.6%	21.7%	25.8%
Both 1st and 2nd degree	4.4%	12.1%***	6.3%	12.0%	3.5%	12.3%***
Childhood economic difficulty: >once	31.4%	29.4%	40.2%	28.3%*	27.0%	30.7%
Once	13.2%	15.5%	14.0%	16.0%	12.8%	15.0%
None	55.4%	55.0%	45.8%	55.7%	60.2%	54.3%
Childhood physical abuse	13.3%	27.3%***	13.7%	32.2%**	13.1%	22.1%**
Childhood sexual abuse	7.8%	11.9%*	3.5%	5.8%	10.0%	18.3%**
Childhood injury	2.5%	4.7%	4.1%	6.0%	1.7%	3.5%
Childhood disease	1.9%	2.8%	0.3%	3.3%***	2.8%	2.3%

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

reporting 'other religion' and who reported religion was very important were more likely to be abstainers. For women, reporting religion was very important or that their religion discouraged drinking was significantly related to abstention. Risk taking was associated with drinking for both men and women. For childhood experience variables, family problem drinking was significantly associated with decreased likelihood of abstention only for women. Childhood economic difficulty was positively associated with lifetime abstention for men, although this was not significant in bivariate analysis. On the contrary, women having any economic difficulty in childhood were less likely to be abstainers. Further, the negative association between child physical abuse and lifetime abstention was only observed for men, whereas men with childhood chronic disease were less likely to be lifetime abstainers.

We then examined whether the patterns found for women are consistent across racial/ethnic groups (Table 3). Nativity was only significant for Latina women, while reporting that religion was

important was associated with abstention for White women only. On the other hand, education was negatively associated with lifetime abstention across all three racial/ethnic groups. Risk taking was also negatively associated with lifetime abstention for all three racial/ethnic groups, but was only significant for Black women. Family problem drinking was associated with lower rates of lifetime abstention for all three groups. However, childhood economic difficulty significantly predicted lower abstention only for White women, and childhood sexual abuse was significantly related to lower lifetime abstention only for Black women. Last, lifetime abstinence was more likely among Latina women who were injured during childhood.

DISCUSSION

This study contributes to the alcohol research field by describing lifetime abstainers' sociodemographic characteristics and early life experiences (i.e. economic difficulty, childhood trauma, early onset

Table 2. Odds ratios and 95% confidence intervals from 3 multivariable logistic regressions predicting lifetime abstainer status for total sample and by gender aged 25+

	Total	Men	Women
Gender: Male (Female Ref)	0.55 (0.40, 0.74)***		
Race/ethnicity: White (Ref)			
Black	1.46 (0.99, 2.16)	1.11 (0.51, 2.41)	1.54 (1.01, 2.37)*
Latino	2.51 (1.60, 3.95)***	1.17 (0.42, 3.26)	4.42 (2.75, 7.09)***
Others	2.11 (1.18, 3.75)*	1.12 (0.46, 2.73)	2.48 (1.28, 4.79)**
Age continuous	0.99 (0.94, 1.03)	0.99 (0.91, 1.08)	1.00 (0.95, 1.04)
Birth year: <1935	4.70 (1.11, 19.80)*	3.13 (0.17, 57.03)	3.78 (0.77, 18.47)
1935–1944	3.19 (1.26, 8.10)*	3.57 (0.59, 21.62)	2.38 (0.83, 6.81)
1945–1954	1.43 (0.79, 2.60)	1.64 (0.49, 5.55)	1.20 (0.62, 2.33)
1955–1964 (Ref)			
1965–1974	1.00 (0.57, 1.74)	0.92 (0.31, 2.70)	1.19 (0.62, 2.28)
1975+	1.30 (0.53, 3.15)	3.46 (0.62, 19.22)	0.78 (0.27, 2.27)
Birth place: Outside the U.S. (U.S. Ref)	2.41 (1.63, 3.56)***	3.33 (1.51, 7.34)**	2.13 (1.40, 3.25)***
Education: Less than HS (Ref)			
HS grad	0.57 (0.40, 0.82)**	0.70 (0.35, 1.39)	0.48 (0.31, 0.73)**
Some college	0.37 (0.25, 0.57)***	0.47 (0.20, 1.13)	0.29 (0.18, 0.45)***
College grad/more	0.38 (0.25, 0.58)***	0.54 (0.24, 1.19)	0.24 (0.15, 0.40)***
Religion: Protestant (Ref)			
Catholic	0.54 (0.36, 0.81)**	0.55 (0.22, 1.38)	0.58 (0.37, 0.91)*
Other religion	1.60 (1.11, 2.29)*	3.24 (1.71, 6.16)***	1.11 (0.73, 1.69)
No religion	0.80 (0.47, 1.35)	0.58 (0.21, 1.62)	1.02 (0.55, 1.89)
Religion important: Very important	3.07 (1.75, 5.40)***	3.05 (1.17, 7.95)*	3.00 (1.53, 5.86)**
Somewhat important	1.81 (0.97, 1.96)	1.65 (0.58, 4.64)	1.83 (0.88, 3.80)
Not important (Ref)			
Religion discourages drinking (Not Ref)	2.16 (1.60, 2.93)***	1.57 (0.90, 2.76)	2.83 (2.02, 3.97)***
Risk taking and impulsivity score	0.70 (0.55, 0.89)**	0.56 (0.37, 0.84)**	0.65 (0.48, 0.87)**
Live with problem drinkers in childhood (Not Ref)	1.31 (0.87, 1.96)	1.04 (0.46, 2.37)	1.47 (0.94, 2.31)
Biological family problem drinking: Negative (Ref)			
2nd degree only (e.g. grandparents)	0.78 (0.53, 1.17)	0.72 (0.35, 1.50)	0.85 (0.55, 1.32)
1st degree only (parents, siblings)	0.62 (0.42, 0.94)*	1.07 (0.46, 2.51)	0.42 (0.27, 0.65)***
Both 1st and 2nd degree	0.25 (0.14, 0.45)***	0.38 (0.13, 1.12)	0.17 (0.08, 0.36)***
Childhood economic difficulty: >once	1.01 (0.73, 1.41)	1.71 (0.90, 3.24)	0.64 (0.45, 0.92)*
Once	0.75 (0.52, 1.09)	1.05 (0.55, 2.01)	0.55 (0.36, 0.84)**
None (Ref)			
Childhood physical abuse (Not Ref)	0.63 (0.41, 0.98)*	0.31 (0.13, 0.75)**	1.10 (0.69, 1.75)
Childhood sexual abuse (Not Ref)	0.74 (0.45, 1.20)	0.42 (0.10, 1.68)	0.80 (0.49, 1.32)
Childhood Injury (Not Ref)	1.05 (0.43, 2.57)	2.17 (0.72, 6.50)	0.74 (0.23, 2.43)
Childhood Disease (Not Ref)	0.94 (0.47, 1.85)	0.15 (0.04, 0.54)**	1.90 (0.88, 4.14)

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

of health conditions) that may have influenced the decision to never have an alcoholic drink in their whole life. Key results from our analyses of the 2010 NAS sample include that women constitute two-thirds of lifetime abstainers and that abstinence is becoming less common in more recent birth cohorts. As expected, those reporting that their religion discouraged drinking and that religion was very important to them were more likely to be lifetime abstainers. Furthermore, these measures were very strong predictors of lifetime abstinence and so it is important to note that our other results based on the multivariate analyses controlled for religion measures. We also found that dispositions to risk taking and impulsivity reduced the likelihood of lifetime abstinence. A focus of this study was on the impact of childhood illness and injury on the choice of lifetime abstinence. The prevalence of childhood injury and disease was very low in our general population sample, indicating the limited extent for these to be a major influence on lifetime abstinence. Larger studies are needed to investigate whether serious childhood illness predisposes to lifetime alcohol abstinence due to long-term vulnerable health or to restrictions in

accessing social drinking contexts among those with chronic health conditions (Lown *et al.*, 2008).

Focusing on women, demographic and social factors appear to be important in predicting lifetime abstinence across racial/ethnic groups. Higher education levels were associated with reduced rates of lifetime abstinence among women. These estimated effects were very strong in general, stronger for Black and Latina women as compared to White women. Not having biological relatives with drinking problems was found to increase the odds of lifetime abstinence, which is generally consistent with findings that problem drinking in family members influences problem drinking in offspring as a result of genetics and environment (Fox and Gilbert, 1994; Anda *et al.*, 2002). While living with problem drinkers did not have a significant effect on lifetime abstinence, it did show positive coefficient estimates that were nearly significant for women. The finding of less lifetime abstinence among those with biological relatives who are problem drinkers is consistent with a strong heritability component.

Adverse events in childhood were associated with a reduced likelihood of lifetime abstinence, but varied by measure and subgroups.

Table 3. Odds ratios and 95% confidence intervals from 3 multivariable logistic regressions predicting lifetime abstainer status for White, Black, and Latina women aged 25+

	White women	Black women	Latina women
Age continuous	1.02 (0.96, 1.08)	0.96 (0.86, 1.07)	1.00 (0.92, 1.10)
Birth year: <1935	2.14 (0.28, 16.40)	9.17 (0.30, 279.25)	5.54 (0.24, 129.65)
1935–1944	1.58 (0.40, 6.28)	5.18 (0.56, 47.56)	3.93 (0.47, 33.08)
1945–1954	0.68 (0.26, 1.77)	3.47 (0.96, 12.54)	1.77 (0.41, 7.59)
1955–1964 (Ref)			
1965–1974	1.72 (0.71, 4.19)	0.73 (0.19, 2.83)	1.47 (0.39, 5.64)
1975+	0.79 (0.16, 3.97)	0.28 (0.03, 2.88)	1.22 (0.18, 8.51)
Birth place: Outside the U.S. (U.S. Ref)	0.97 (0.36, 2.64)	0.45 (0.10, 1.94)	3.53 (1.82, 6.82)***
Education: Less than HS (Ref)			
HS grad	0.70 (0.36, 1.37)	0.74 (0.32, 1.74)	0.26 (0.13, 0.50)***
Some college	0.48 (0.24, 0.94)*	0.28 (0.11, 0.71)**	0.12 (0.05, 0.30)***
College grad/more	0.39 (0.18, 0.82)*	0.32 (0.13, 0.79)*	0.06 (0.02, 0.16)***
Religion: Protestant (Ref)			
Catholic	0.74 (0.39, 1.38)	0.96 (0.27, 3.43)	0.38 (0.17, 0.89)*
Other religion	1.26 (0.70, 2.26)	1.25 (0.58, 2.70)	1.27 (0.49, 3.27)
No religion	0.99 (0.34, 2.87)	0.65 (0.18, 2.37)	0.80 (0.23, 2.75)
Religion important: Very important	7.04 (1.56, 31.80)*	0.80 (0.15, 4.30)	1.63 (0.53, 5.01)
Somewhat important	4.10 (0.85, 19.70)	0.32 (0.05, 2.10)	2.44 (0.67, 8.89)
Not important (Ref)			
Religion discourage drinking (Not Ref)	5.22 (3.34, 8.15)***	1.00 (0.53, 1.88)	0.78 (0.41, 1.50)
risk taking and impulsivity score	0.78 (0.52, 1.19)	0.50 (0.26, 0.94)*	0.55 (0.25, 1.18)
Live with problem drinkers in childhood (Not Ref)	1.54 (0.85, 2.78)	2.26 (0.98, 5.21)	1.57 (0.56, 4.39)
Biological family problem drinking: Negative (Ref)			
2nd degree only (e.g. grandparents)	1.32 (0.75, 2.30)	0.34 (0.05, 2.10)	0.50 (0.22, 1.14)
1st degree only (parents, siblings)	0.62 (0.34, 1.12)	0.15 (0.06, 0.36)***	0.24 (0.08, 0.70)**
Both 1st and 2nd degree	0.32 (0.13, 0.84)*	0.07 (0.01, 0.54)*	0.16 (0.04, 0.70)*
Childhood economic difficulty: >once	0.58 (0.35, 0.96)*	0.91 (0.45, 1.82)	0.71 (0.39, 1.31)
Once	0.41 (0.23, 0.74)**	0.77 (0.27, 2.24)	0.95 (0.43, 2.10)
None (Ref)			
Childhood physical abuse (Not Ref)	1.06 (0.60, 1.90)	1.23 (0.51, 2.94)	0.75 (0.33, 1.72)
Childhood sexual abuse (Not Ref)	0.98 (0.54, 1.77)	0.38 (0.16, 0.95)*	0.55 (0.17, 1.83)
Childhood Injury (Not Ref)	0.76 (0.18, 3.16)	0.14 (0.01, 1.83)	29.19 (4.82, 176.79)***
Childhood Disease (Not Ref)	2.21 (0.75, 6.53)	0.44 (0.10, 1.88)	1.07 (0.24, 4.81)

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Childhood physical abuse was found to reduce lifetime abstinence for men and childhood sexual abuse was found to reduce lifetime abstinence for Black women, both results consistent with previous studies (Felitti *et al.*, 1998; Anda *et al.*, 2002; Lown *et al.*, 2011; Nayak *et al.*, 2012). Childhood economic difficulty was found to reduce lifetime abstinence for White women, a finding that is also consistent with past findings of heavier drinking in those with childhood economic difficulty (Kahn and Pearlin, 2006).

While prior research has documented increased risk for problematic drinking among those with adverse childhood experiences including physical or sexual abuse, economic difficulties, and biological relatives with problem drinking, it has not been certain that the absence of these experiences is associated with opposite effect—i.e. abstinence from alcohol. It was possible that the absence of these negative experiences would have been associated with moderate or light drinking and not abstinence. Thus, the current finding clarifies and contributes to the alcohol field by providing original data that allows for more accurate assessment of factors that could influence studies of health and drinking histories including lifetime abstinence. Failure to measure adverse childhood experiences such as child abuse or serious childhood illness that is associated with both drinking pattern and certain adult health problems and premature mortality (they are confounders) (Brown *et al.*, 2009) (Hudson *et al.*, 2003)

could bias results toward overstating the risks from moderate or heavy drinking.

Study limitations include the retrospective, self-reported and potentially sensitive nature of key measures for alcohol use, health conditions and adverse childhood experiences, which could have resulted in under-reporting, biasing results away from finding an effect. The childhood health conditions assessed are also not comprehensive, contributing further to under-report of relevant health problems. Mis-measurement of lifetime abstainers, ex- and current-drinkers has been found in earlier studies, including a study of the 1984 NAS involving a sub-sample followed up in 1992. Weighted analyses determined that slightly more than half (53%) of those who reported never having had a full drink of any alcoholic beverage in the 1992 survey had reported some drinking in at least one of the prior surveys. Most of these, however, reported infrequent, very low levels of alcohol intake (Rehm *et al.*, 2008). Misclassification of alcohol use was also common in the 1958 British Birth Cohort study, that followed 9377 individuals until age 45 with drinking assessments occurring at ages 16, 23, 33 and 42. Of the 45-year-olds who said they had never drunk alcohol, 67% had previously reported drinking, with 25% of these reporting weekly or daily drinking, with amounts not noted (Caldwell *et al.*, 2006). The importance of misclassification may be mitigated in this NAS study

by the likely limited drinking of most of those who might have incorrectly reported lifetime abstinence (Rehm *et al.*, 2008), thus reducing the potential impact on results lifetime abstinence due to misclassification.

Overall, our results point to specific factors related to lifetime abstinence that have the potential to bias results when analyzing drinking groups in relation to alcohol-related health outcomes. Lifetime abstainers are more likely to be women and, among women, to be non-White and Latina. Educational attainment is strongly related to abstinence with over-representation of those who did not graduate from high school, especially among women, with a stronger effect seen for Latina women. There is a wealth of literature linking low education to poor health outcomes (Masters, 2003; Cutler and Lleras-Muney, 2006), and thus if abstainers are more likely to be less educated, then having lifetime abstainers as a reference group in alcohol-related health studies could potentially prejudice results against finding health risks among drinkers. In contrast, we found health risk factors that were negatively associated with lifetime abstinence, specifically risk taking and impulsivity, U.S. nativity, childhood physical abuse (for men), childhood economic difficulty (for White women) and childhood sexual abuse (for Black women), which could inflate findings of health problems among drinkers in alcohol-related health studies. These potential biases could be accounted for by including each of these measures in alcohol-related health analyses. However, we recognize that some of these measures have rarely been available in the few mortality and morbidity studies where lifetime abstainers have been identified (Fillmore *et al.*, 2006; Greenfield and Kerr, 2014). Importantly, we found very low rates of childhood injury and illness among abstainers, suggesting that these are unlikely to much affect population estimates of lifetime abstinence, even if childhood illness is associated with abstinence on an individual level for men. Understanding the characteristics and determinants of individuals who never drink alcohol is relevant to any analysis of alcohol-related health outcomes where a primary methodological concern is determining a reference group to which those with differing drinking patterns, including past heavy drinking, can be compared (Fillmore *et al.*, 2007). Without a clearly defined never-drinking group, only risks relative to other drinking patterns could be determined. This study has identified a number of potential health risk confounders related to lifetime abstinence. Importantly, early life adverse experiences not often measured in alcohol-related health studies could bias results toward greater risks from alcohol where not controlled.

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CONFLICT OF INTEREST STATEMENT

None declared.

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