



## Alcohol use patterns and risk of diabetes onset in the 1979 National Longitudinal Survey of Youth Cohort



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### ABSTRACT

One of the major limitations in studying alcohol's effect on risk for diabetes is the issue of classifying drinking patterns across the life course prior to the onset of diabetes. Furthermore, this research often overlooks important life course risk factors such as obesity and early-life health problems that may complicate estimation of the relationship between alcohol and diabetes. This study used data from the US National Longitudinal Survey of Youth 1979 cohort of 14–21 year olds followed through 2012 (n = 8289). Alcohol use was captured through time-varying measures of past month volume and frequency of days with 6+ drinks. Discrete-time survival models controlling for demographics, early-life characteristics and time-varying risk factors of employment, smoking, and body mass index (BMI) group, stratified by sex and race/ethnicity, were estimated. Increased odds of diabetes onset was found among lifetime abstainers for women compared to the low volume reference group (odds ratio (OR) 1.57; 95% Confidence Interval (CI) 1.07–2.3). Increased odds of diabetes onset was also found among women who reported drinking 6+ drinks in a day on a weekly basis during the prior 10 years (OR 1.55; CI 1.04–2.31). Models interacting alcohol and BMI groups found increased odds of diabetes onset from lifetime abstinence among overweight women only (OR 3.06; CI 1.67–5.60). This study confirms previous findings of protective effects from low volume drinking compared to lifetime abstinence and harmful effects from regular heavy occasion drinking for women. Further, protective effects in this US sample were found to be limited to overweight women only.

### 1. Introduction

Population-based prospective cohort studies have shown a reduced risk of diabetes among low-to-moderate alcohol drinkers relative to abstainers and heavy drinkers (Marques-Vidal et al., 2015) or have found significant U-shaped relationships between alcohol and diabetes risk (Koloverou et al., 2015). Studies examining the effect of binge drinking have produced mixed results, with findings of both increased risk (Hodge et al., 2006) and no effect (Rasouli et al., 2013). Reviews and meta-analyses, including those considering misclassification bias, have consistently indicated that moderate alcohol consumption reduces diabetes risk, and found non-linear dose-response relationships (Baliunas et al., 2009; Carlsson et al., 2005; Howard et al., 2004; Koppes et al., 2005; Pietraszek et al., 2010). Few studies have considered a lifecourse perspective on alcohol in relation to diabetes risk. When using lifetime abstinence (versus current abstinence), a study of the U.S. National Alcohol Survey found protective effects of moderate

drinking compared to lifetime abstinence for diabetes (Kerr and Ye, 2010). However, findings of increased risk among heavy drinkers are less consistent (Li et al., 2016). Where gender has been considered, a stronger protective effect of moderate alcohol use among women has been found (Hodge et al., 2006; Knott et al., 2015).

A few studies have considered the potential for interactions between obesity, measured via body mass index (BMI), and alcohol use patterns in diabetes risk. The possibility that the alcohol risk relationship with diabetes is confounded by diet was not supported by one of the few studies where detailed information on both was available (Imamura et al., 2009). A French study focused on wine and diabetes risk found protective effects for women only, and furthermore, the effects appeared to be limited to women who were overweight (Fagherazzi et al., 2014).

A European study found reduced risk among moderate and heavier drinking women compared to all non-drinkers with greater risk reductions among overweight and obese women compared to normal

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weight women (Beulens et al., 2012). A study from New Zealand also found reduced risk compared to no current drinking for both genders in the normal weight and overweight groups, but not among the obese (Metcalf et al., 2014). A European case-control study found increased risk from moderate to heavy alcohol use compared to light or no use among normal weight respondents and reduced risk among overweight respondents (Eckel et al., 2015). Although these studies results are somewhat conflicting and vary in the groups considered and methodological limitations, they indicate the potential importance of BMI, a major diabetes risk factor, for determining diabetes risks from alcohol use patterns.

Research on disparities in diabetes have found that Blacks and Hispanics have 50% to 100% higher rates of measured diabetes compared to Whites. While some studies reported differences even after controlling for risk factors including poverty (Gaskin et al., 2014), other studies suggest that these racial/ethnic disparities are eliminated after controlling for obesity, risk behaviors, insurance status, and other socioeconomic measures (LaVeist et al., 2009; Link and McKinlay, 2009). If these factors do explain racial/ethnic disparities in diabetes, then differences in drinking patterns could play a role in the disparities, however, little is known regarding differential alcohol risk relationships among U.S. racial/ethnic groups.

The current study utilizes data from the U.S. National Longitudinal Survey of Youth 1979 Cohort (NLSY79) collected through 2012 to evaluate the risk of diabetes onset in relation to lifecourse-defined alcohol pattern measures. The study design addresses some key limitations of prior alcohol-related health studies including a clearly defined lifetime abstainer group, the inclusion of repeated measures of alcohol volume and heavy drinking days, as well as repeated measures of other risk factors such as BMI and smoking, and attention to gender and racial/ethnic differences. Study goals focused on hypotheses regarding increased risk for diabetes onset among lifetime abstainers and heavy drinkers with an expectation of finding such effects among women only. Secondly, we consider whether these effects vary across White, Black and Hispanic groups and the interplay of BMI with alcohol.

## 2. Methods

Secondary data analysis was conducted using panel data from the NLSY79, an on-going study conducted by the U.S. Bureau of Labor. The NLSY79 used a stratified, clustered design to select a nationally representative sample of individuals born between 1957 and 1964. A sample of 6111 non-institutionalized, civilian youths ages 14–21 and an oversample of 5295 civilian Hispanic, Black, and economically disadvantaged youths were selected in 1979. Respondents were re-interviewed annually from 1979 through 1994 and every two years since then. The initial NLSY79 response rate was 90%, and retention rates during follow-up assessments were 90% or better during the first 16 survey waves and remained above 80% in more recent waves. This study used data up to the 2012 survey wave when respondents were aged 47 to 55 years. The study was approved by the Public Health Institute IRB #114-007. Starting in 1998, as respondents turned 40 and then later 50, at the subsequent NLSY interview, they were given a specific module on general health and diagnoses of health conditions. Subjects who missed either of these health modules were excluded. Subjects who reported health problems before 1982 were also excluded because their alcohol consumption information was not obtained until the 1982 survey.

### 2.1. Measures

The outcome variable is the age of onset of diabetes. In the 40+ / 50+ Health Modules, respondents were asked, “Have you ever had, or has a doctor ever told you that you have diabetes or high blood sugar?” If respondents answered yes, then they reported the month and year of onset. Age of diabetes onset was calculated based on respondents'

month and year of birth provided at the baseline 1979 survey.

For alcohol consumption, respondents were asked about their alcohol use in survey years 1982–1985, 1988, 1989, 1994, 2002, and every other year starting in 2006 to 2012. Because of the intermittent years of alcohol availability, and changes in wording of alcohol questions across survey years, we created a categorical repeated measure of past month alcohol consumption that combined total volume and frequency of heavy drinking (HD) days (6 or more drinks in 1 sitting). Past-month heavy drinking frequency was categorized into: none, less than once a week and weekly or more. For each year, our final alcohol variable was based on a combined total volume and HD frequency to capture no alcohol, low volume with no HD, low volume with any HD, risky volume and monthly HD, risky volume and weekly HD, and high volume with any HD. Finally, to address concerns of appropriate non-drinking groups in prior alcohol-related health studies, we further distinguished the no alcohol group into lifetime abstainers and no current alcohol use/former drinkers. We describe our construction of lifetime abstainers elsewhere (Kerr et al., 2017). We use the low volume/non-heavy drinking group as the reference. To capture history of HD, we created two time-varying indicators to capture any monthly and any weekly HD of 6+ drinks in the ten years prior to the current year.

Alcohol volume calculations differed across the years due to changes in questions asked. For 1982–1985, volume was the sum of past week wine, beer and spirits drinks. For 1988–2012, total volume was past month usual quantity multiplied by usual frequency for all beverages combined. The 1982–1985 volume measure resulted in much higher and more variable numbers of drinks due to these measurement differences. For example, the mean monthly volume ranged from 57 to 68 drinks in 1982–1985, while the mean values are all < 20 drinks for later survey years. Two adjustments were made to improve comparability across years. For 1988–2012, the measure of 6+ days was used to adjust the volume upward. Volume for 1982–1985 was adjusted downward, dividing by the factors 1.25, 1.5, 1.75, 2, 2.5, 3 and 4 for each 5-percentile increase starting from the 65th percentile to address outliers resulting from high numbers of drinks weekly. The resulting adjusted volume distribution from 1982 to 1985 is consistent with volume from the later years. We then created categories of total volume: zero, low (less than or equal to 14/7 (men/women) drinks per week), risky (> 14/7 drinks and < 28/14 drinks per week), and high (> 28/14 drinks per week).

#### 2.1.1. Covariates

We characterized respondents as foreign or U.S.-born. Self-reported race/ethnicity from 1979 was categorized into (1) White (reference group), (2) Black, (3) Hispanic, (4) Native American, and (5) Other racial/ethnic groups including Asian, Hawaiian, and Pacific Islander. Age was calculated based on month and year of interview from month and year of birth. Frequency of religious participation in 1979 was categorized into none up to more than once per week (0–5). Educational attainment by age 25 included less than high school, high school graduate, some college, and college degree or more.

To account for early life health conditions, we used a work-related health limitation construct from the 1979 survey. Respondents were asked three questions on work-related health limitations: (1) “(Are you/ Would you be) limited in the kind of work you (could) do on a job for pay because of your health?”; (2) “(Are you/ Would you be) limited in the amount of work you (could) do because of your health?”; and (3) For those not working for pay, “Would your health keep you from working on a job for pay now?” Respondents reporting yes to any of these questions were considered to have had an early life health problem. Prior studies have found strong correlations of this construct with disability, health impairments, and chronic health conditions (Besen and Pranksy, 2014; Burkhauser et al., 2002; Walsemann et al., 2008), and we found this predictive of lifetime abstinence (Kerr et al., 2017).

To capture factors across the risk period, we include repeated measures of poverty status (yes/no), marital status (never married,

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