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Lifetime income patterns and alcohol consumption: Investigating the association between long- and short-term income trajectories and drinking

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Abstract

Lifetime patterns of income may be an important driver of alcohol use. In this study, we evaluated the relationship between long-term and short-term measures of income and the relative odds of abstaining, drinking lightly-moderately and drinking heavily. We used data from the US Panel Study on Income Dynamics (PSID), a national population-based cohort that has been followed annually or biannually since 1968. We examined 3111 adult respondents aged 30-44 in 1997. Latent class growth mixture models with a censored normal distribution were used to estimate income trajectories followed by the respondent families from 1968-1997, while repeated measures multinomial generalized logit models estimated the odds of abstinence (no drinks per day) or heavy drinking (at least 3 drinks a day), relative to light/moderate drinking (<1-2 drinks a day), in 1999-2003. Lower income was associated with higher odds of abstinence and of heavy drinking, relative to light/moderate drinking. For example, belonging to a household with stable low income (\$11-20,000) over 30 years was associated with 1.57 odds of abstinence, and 2.14 odds of heavy drinking in adulthood. The association between lifetime income patterns and alcohol use decreased in magnitude and became non-significant once we controlled for past-year income, education and occupation. Lifetime income patterns may have an indirect association with alcohol use, mediated through current socioeconomic conditions.

Keywords

socioeconomic position; alcohol use; growth mixture models; income trajectories; USA; income

INTRODUCTION

Excessive alcohol use poses an important public health problem. Approximately 2 billion people consume alcohol worldwide (World Health Organization, 2004). Alcohol abuse accounts for approximately 105,000 deaths each year in the United States, due to intentional and unintentional injury, cirrhosis, stroke, pneumonia, and cancers of the digestive system (McGinnis & Foege, 1999). Almost two-fifths of traffic fatalities are the result of alcohol

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abuse. For each death, excessive alcohol use is associated with many more cases of nonfatal illness due to cirrhosis, cancer, fetal alcohol syndrome and violence (McGinnis & Foege, 1999).

Income may be an important driver of alcohol use. Income directly measures access to material resources and to health-enhancing environments and services, as well as exposure to material stressors such as financial problems and deprivation (Galobardes et al., 2006). Prior research has shown that while lower-income individuals are at higher risk of engaging in heavy, hazardous drinking (Anderson, 2006; Batty et al., 2008; Huckle et al., 2010; Karlamangla et al., 2006) and abstinence (Anderson, 2006; Cummins et al., 1981; Knupfer, 1989), higher income is associated with a higher frequency of light drinking (Huckle et al., 2010; B. L. Peters & Stringham, 2006b; Ziebarth & Grabka, 2009). Disproportionate engagement in heavy drinking among lower-income individuals may be explained by the notion of “self-medication”, whereby respondents exposed to higher levels of material stressors use alcohol as a way to relieve stressful life experiences or to alleviate strain (Boardman et al., 2001). Frequent light consumption among individuals of higher income may be related to the availability of disposable income to purchase alcohol (Wagenaar et al., 2009), social norms supportive of light, frequent drinking in middle- and high-income social groups, and social drinking in the context of social and job-related networking (B. Peters & Stringham, 2006a).

A lifecourse perspective provides a useful theoretical framework to guide research on income and alcohol use. The majority of research on the income-alcohol use relationship has used income measures taken at one point in time, or collected retrospectively. This provides limited insight into the full income-alcohol use relation over the lifecourse. Research suggests that long-term measures of financial conditions may better capture the impact of social stratification on health risk behaviors than single-year measures (Benzeval & Judge, 2001), and that the effect of income on health accumulates over the lifecourse (Lynch et al., 1997). Different aspects of income, such as the duration of time the family is exposed to particular income strata, the magnitude of change in income over time, as well as instability in income, have been linked to health status (Chen et al., 2007; Duncan et al., 2002; McDonough et al., 1997). Moreover, persons who may appear comparable in income at a given point in time may in fact have quite distinct income histories over their lifetime (Do, 2009). For example, studies that have examined the contribution of socioeconomic adversity in childhood and adulthood to drinking levels have concluded that persistent disadvantage in childhood and adulthood was associated with a higher risk of heavy drinking than disadvantage at one particular point in time (Batty et al., 2008; Caldwell et al., 2008; Kestilä et al., 2008; K. Mossakowski, 2008a).

Income is highly correlated with other indicators of socioeconomic position, including education and occupation, each of which captures a particular aspect of social stratification and is also associated with alcohol use (Dooley & Prause, 1998; M. Droomers et al., 1999; Galobardes et al., 2006; Kestilä et al., 2008). First, education denotes the knowledge-related assets of an individual, which may make individuals more receptive to health education messages and affect “time preference” (living in the present vs. investing in the future) for shaping risk behaviors (Galobardes et al., 2006; Krieger et al., 1997). Hence, education may increase individual understanding of the health benefits of moderate alcohol use and the negative effects of heavy drinking, and may build individual capacity to manage drinking by stopping or keeping consumption low before problems escalate (Huerta & Borgonovi, 2010). Occupation, in turn, reflects social standing, access to job-related social networks, and psychosocial demands and resources related to the job structure (Galobardes et al., 2006; Krieger et al., 1997). Individuals in lower occupational ranks, characterized by little decision latitude, low remuneration and limited promotion prospects may engage in heavy drinking

as a stress coping mechanism. Different types of occupation may also determine the types of drinking individuals engage in: for example, blue-collar occupations may involve after-hours socializing at bars, involving heavy beer consumption, while professional occupations may involve moderate consumption of wine at networking events and job-related social occasions (Ziebarth & Grabka, 2009). In order to distinguish the contribution that the material aspects of income itself—including alcohol purchasing power on the one hand and material deprivation on the other—make to different patterns of alcohol use over and above education and occupation, it is important to jointly examine the contribution each dimension of socioeconomic position makes to drinking patterns.

In this study, we adopted a lifecourse framework to compare the contribution that lifetime patterns of household income and past-year income levels made to drink patterns. We addressed two questions. First, how do lifetime patterns of family income over a 30-year period relate to adult drinking levels (abstinence, light, or moderate/heavy drinking? Second, how is adult, past-year income associated with adult drinking patterns, after accounting for the association between lifetime family income patterns and alcohol use? We adjusted for the contribution that lifetime and past-year education and occupation made to alcohol consumption patterns in our analyses, in order to distinguish the aspect of socioeconomic position captured by each construct.

METHODS

We used data from the Panel Study on Income Dynamics (PSID) for this analysis. The PSID consists of two sub-samples: a sample of 3000 families taken from all areas of the country, and a sample of 2000 families living in low-income counties. Taken together, the two original samples, with appropriate weights, constituted a national sample of the US population with an oversample of poor families. Interviews were conducted annually from 1968-1997 and biannually since 1997. The initial response rate for the entire PSID sample in 1968 was 76%, in 1969 it was 88.5%, and since then it has ranged between 96.9-98.5%. Socioeconomic and health information was collected for the head of the household and the wife or long-term cohabitating partner at each interview. This is a multi-generational sample. Once the family offspring left the family and became heads or partners in their own households, the new family unit was followed by PSID as well. Our original analytic sample consisted of 9053 respondents who were household heads or “wives” in 1999, 2001 or 2003. From this sample, we restricted the analytic sample to those who were: 1) heads or wives who responded to the alcohol questions for at least one year of 1999, 2001, and 2003; 2) had a minimum of three years of income data for their family in 1968-1997; and 3) were adults (30-44 years old) by 1997. We restricted our analytic sample to this age group in order to ensure the sample was relatively homogeneous in age and to ensure that we had sufficient numbers of respondents who had reported heavy drinking, to make it possible for us to compare the influence of income on the range of drinking patterns. As the PSID consists of de-identified, public use data, we were exempt from review by an Institutional Review Board.

Measures

Daily alcohol consumption—Alcohol use was measured in 1999, 2001 and 2003, using categories based on the self-reported number of drinks respondents had on average per day: 0=non-drinker, 1= <1 drink per day, 2=1-2 drinks per day, 3=3+ drinks per day. We grouped reports of <1 drink per day and 1-2 drinks per day into one group classified as “light/moderate drinkers”. Alcohol use measures were restricted to these years because PSID only measured alcohol use starting in 1999; while alcohol use was also measured in 2005, the questions were not comparable to those used in prior years.

Socioeconomic history—We used growth mixture modeling, as described below, to empirically classify individuals into groups that summarized the average income trends their households followed from 1968 (when the respondent was 1-15 years old) to 1997 (when the respondent was 30-44 years old), thus capturing both level and fluctuation in income over time prior to the measurement of adult alcohol use. We used taxable and transfer household income, adjusted for inflation using the Consumer Price Index. We captured lifetime occupational history by measuring the proportion of years (1968-1997) the head of the household worked in a blue-collar position, the proportion of years he/she had worked in a professional/manager position (reference group), and the proportion of years he/she had been unemployed. We also measured the average number of years of education of the head of household from 1968-1997.

Indicators of past-year socioeconomic position—We also used several indicators to capture the respondent socioeconomic position in the year prior to the interview. We measured past-year socioeconomic position in the same interview year as the one where he/she reported alcohol use (thus, as reported in 1999, 2001 and 2003 in reference to the prior year). We presented total household income in quartiles, total lifetime years of respondent education up to the interview, and occupation of the household head (blue-collar, professional/manager (reference group), and unemployed).

Confounders—We controlled for marital status and age at the interview when alcohol was measured (i.e. in 1999-2003). Marital status was classified as: 1) widowed, divorced, or separated; 2) single; and 3) married (reference group). We also controlled for gender (reference group was female), race/ethnicity (white, black, and other; reference group was white), and interview year.

Analysis

We conducted two types of analyses: 1) to estimate the types of income trajectories respondents followed from 1968-1997; and 2) to estimate the relationship between short- and long-term income and alcohol consumption.

Income trajectories—We used semi-parametric group-based modeling (Nagin, 2005) to identify the types of lifetime household income trends respondents followed. These models were determined based on income data that was available in 1968-1997 for the respondents' household during the time the respondent was alive (since we measured income trajectories from ages 1-15 to 30-44, this included years when the respondent was a household dependent, as well as years when the respondent was the household head or partner).

Rather than capturing variability in trajectories through a random coefficient like traditional growth curve models do, group-based models assume that the sample is composed of a mixture of underlying trajectory groups, each defined by an average growth curve (Wiesner et al., 2007). Using PROC TRAJ, we estimated cubic polynomial censored normal models of log adjusted household income. We first fit four alternative group-based models of income trajectories, each with a different number of income trajectory groups, ranging from two to five groups (we restricted the maximum number of groups to five due to sample size restrictions), and used the Bayesian Information Criterion (BIC) to select the best-fitting model, which would adequately capture the number of lifetime income patterns found in the data. We set the maximum group number at five in order to ensure we had sufficient numbers in each group to obtain stable group estimates. Once we had selected the optimal number of groups for each outcome, we determined the optimal number of parameters to define the shape of each trajectory group (i.e. linear, quadratic, cubic) by their significance at the $p < 0.05$ significance level. With this method, we were able to classify respondents by

the average type of income trend their household had followed over 30 years. By using an income trend as the measure of interest, we could capture two aspects of income history: level and average change over time, which could not have been captured by using a measure of average income level history alone. In this way, we could, for example, assess whether individuals who grew up in households with constant deprivation (i.e. a stable low income) were worse off than individuals who started out in middle-income households but who experienced a meaningful drop in income later in life.

Alcohol use patterns—Once we had identified the optimal number of income trajectories, we used repeated measures multinomial generalized logit models to estimate the odds of abstinence (no drinks per day) or heavy drinking (at least 3 drinks a day), relative to light/moderate drinking (<1-2 drinks a day), in 1999-2003. We accounted for similarity of reports within individuals over time using a two-level model with a random intercept for each of the two outcomes (abstinence and heavy drinking). Full maximum likelihood models were estimated using HLM software. We first estimated the association between lifetime income patterns (1968-1997) and alcohol use patterns (1999-2003), controlling for lifetime proportion of years the household head was unemployed, in professional/managerial, or blue-collar occupations, mean years of education of the household head, and demographic characteristics. We then estimated the association between past-year income measures (measured in 1999-2003) and alcohol use patterns (1999-2003), and controlled for past-year occupational status, years of education, and demographic characteristics. In this second model we did not include measures of lifetime income in order to estimate the total relationship between past-year income and alcohol use. Finally, we estimated a joint model with both lifetime income patterns and recent income measures, to assess the independent contribution that each type of income measure made to alcohol use. In this model we controlled for lifetime and recent measures of occupational status, years of education, and demographic characteristics.

RESULTS

The analytic sample included 3111 respondents who met inclusion criteria: of respondents who were household heads or spouses and 30-44 years olds in 1997 (n=3413), 301 were dropped because they did not have at least three years of income data from 1968-1997, and one was dropped because they did not report alcohol use in at least one interview in 1999-2003. Respondents reported on income (and thus contributed information to the estimation of lifetime income patterns) on an average of 28.2 out of 30 interviews (standard deviation: 4.4; range=3-30). By 1999, those removed from the sample because they did not fulfill our inclusion criteria were less likely to be black or a homeowner, but more likely to have a blue-collar occupation, to be married, and to abstain from drinking alcohol. Respondents removed from the sample had fewer years of education and a lower income in 1999 than those kept in the analytic sample.

Table 1 presents descriptive characteristics of the sample, weighted to account for unequal selection probabilities in the oversample of poor families and wave-specific participant non-response. Approximately half of the sample (61.4%) drank lightly to moderately in 1999. The weighted prevalence of heavy drinking (3+ drinks per day) was 3.84-4.35% in 1999-2003, which impeded us from using a traditional definition of heavy drinking (i.e. 5+ drinks per day). 82.41% of the respondents were of White race/ethnicity, and 15.0% were Black. From 1968-1997, the average income was \$56,936. Respondents had spent, on average, 24.0% of the years from 1968-1997 living in a household where the head held a blue-collar job, and in 1999, 43.09% of respondents lived in a household where the head of the household had a blue-collar type of employment. On average, respondents had received up to 13.4 years of education by 1999.

Identification of income trajectories

We found five different types of household income trends from 1968-1997 (Figure 1). Average posterior group membership probabilities for the five-group model ranged between 0.90 and 0.98 (Appendix Table 1: [\[INSERT LINK TO ONLINE FILES\]](#)). The largest proportions of respondents had either lived in a high-income household, with average incomes ranging from a low of \$61,707 in 1968 to a high of \$87,329 in 1997 (“high-income” group), or a middle-income household that experienced a slight drop in income over time (on average, household income ranged from \$53,712 in 1973 to \$40,576 in 1997—hence it was designated the “decreasing-medium income” group). The third-largest group experienced an increase from low to middle income over time: on average, household income ranged from \$19,195 in 1968 to \$43,846 in 1997 (“increasing-low-to-medium income” group). Two small groups of respondents lived in households with a consistent history of low income: the “stable-low income” group had an average income which ranged from \$20,694 in 1968 to \$11,051 in 1996, while the “decreasing-low income” experienced a gradual decrease in income over time, from an average of \$21,554 in 1968 to \$1,690 in 1997.

Level of alcohol consumption

Controlling for age, year of interview, sex, race/ethnicity, and marital status, having lived in a household with middle or low income over 30 years of life was associated with a higher odds of heavy drinking or abstinence in adulthood than having inhabited a household with constant high income for the past 30 years (Table 2, Model 1). Living in a household that experienced a decrease in income from low to very low levels, or in a household with a history of increasing low-to-medium income, was associated with higher odds of reporting abstinence than living in a high-income household (OR: 2.12 (95% CI: 1.26, 3.57); and OR: 1.59 (95% CI: 1.18, 2.14) respectively). Living in a household with a stable low-income history was associated with 1.57 (95% CI: 1.09, 2.27) and 2.14 (95% CI: 1.07, 4.27) odds of abstinence and heavy drinking respectively. Similarly, a decreasing-medium income was associated with higher odds of abstinence and heavy drinking (OR: 1.42; 95% CI: 1.11, 1.83) (OR: 1.72; 95% CI: 1.05, 2.80) than a high-income history. Living in a household where the head of the household had a blue-collar profession for a greater number of years than a professional/managerial profession was associated with higher odds of abstinence (OR: 1.59 (95% CI: 1.18, 2.14); and OR: 1.68 (95% CI: 1.13, 2.49) respectively). Finally, having lived in a household where the household head had, on average, a higher number of years of education was associated with lower odds of abstinence and heavy drinking (OR: 0.88 (95% CI: 0.85, 0.92) and OR: 0.89 (95% CI: 0.83, 0.96) respectively).

Recent socioeconomic status was also associated with abstinence and heavy drinking. Having an income in the lower three quartiles in the past year was consistently associated with higher odds of abstinence and heavy drinking: for example, an income in the lowest quartile was associated with 2.28 (95% CI: 1.80, 2.90) times higher odds of abstinence and 1.71 (1.07, 2.74) higher odds of heavy drinking than having an income in the highest quartile (Table 2, Model 2). A higher number of years of respondent education were associated with lower odds of abstinence and heavy drinking (OR: 0.89 (95% CI: 0.85, 0.93); and OR: 0.81 (95% CI: 0.73, 0.90) respectively).

Model 3 assessed the relative contribution of socioeconomic history and short-term socioeconomic measures with alcohol use patterns (Table 2). Controlling for short-term income, education and occupation, having a history of decreasing low income or increasing low to medium income was marginally associated with higher odds of abstinence than having a history of high income. Lower levels of past-year income were associated with higher odds of abstinence and marginally associated with higher odds of heavy drinking,

independent of prior income history. A longer history of living in a household where the household head had a blue-collar occupation rather than a professional/managerial occupation was only associated with higher odds of abstinence (OR: 1.55; 95% CI: 1.04, 2.32), while past-year blue-collar occupation was marginally associated with heavy drinking (OR: 1.32; 95% CI: 0.96, 1.81). Living in a household where the household head had a higher average level of education from 1968-1997 was associated with lower odds of abstinence (OR: 0.92; 95% CI: 0.88, 0.96), while past-year total years of respondent education were associated with lower odds of abstinence (OR: 0.93; 95% CI: 0.88, 0.97) and heavy drinking (OR: 0.82; 95% CI: 0.74, 0.92).

DISCUSSION

In one of the first studies to compare the contribution of lifetime vs. short-term income on alcohol use patterns, we found that lower income was associated with higher odds of abstinence and heavy drinking, and lower odds of light/moderate drinking (Arellano et al., 1998; Bloomfield et al., 2006; Bobak et al., 1999; Dooley & Prause, 1998; M Droomers et al., 2003; M. Droomers et al., 1999). When we estimated lifetime and past-year income in separate models, we found that a history of low or middle lifetime income from childhood to adulthood was associated with higher odds of abstinence and heavy drinking, although confidence intervals were wide in certain cases. Lower levels of past-year income also contributed to abstinence and heavy drinking independently of prior income history, and were found to be a potential mediator of the association between lifetime income history and drinking patterns.

A history of living for a greater proportion of years in a household headed by someone with a blue-collar occupation rather than a professional/managerial occupation was also associated with higher odds of abstinence, while past-year blue-collar employment was marginally associated with higher odds of heavy drinking than professional/managerial employment (Caldwell et al., 2008; Jefferis et al., 2007). Higher household and individual educational attainment were associated with lower odds of abstinence and heavy drinking (Caldwell et al., 2008; Casswell et al., 2003a).

The relationship among income history, abstinence and heavy drinking differed in shape. A monotonic relationship existed between income and the odds of heavy vs. light/moderate drinking (i.e. the lower the income group, the higher the relative odds of heavy vs. light/moderate drinking). This is consistent with prior research (Arellano et al., 1998; Bloomfield et al., 2006; Bobak et al., 1999; Dooley & Prause, 1998; M Droomers et al., 2003; M. Droomers et al., 1999). Findings also fit in with the stress-vulnerability model, whereby life stressors (such as economic deprivation) place an individual at greater odds of self-medicating through excessive substance use, while the resources available to an individual, and individual susceptibility factors, influence the impact these stressors may ultimately exert (Pearlin, 1989; R. Turner et al., 1995; R. J. Turner & Lloyd, 1995). In contrast, while there was also an inverse relationship between income and abstinence, the relationship was not monotonic. The groups at highest odds for abstinence were those that had a history of extremely low income (i.e. who had experienced an average decrease in income from \$21,554 in 1968 to \$1,690 in 1997) and those who had experienced a shift from low to middle household income over time. The higher prevalence of abstinence among very low-income households may reflect a prior history of heavy drinking (Caldwell et al., 2008). The high odds of abstinence among those who lived in a household that experienced a shift from low into middle income (perhaps by entry into a blue-collar position) is consistent with the finding that individuals who came from households where the head held a blue-collar position for more years had higher odds for abstinence. Prior studies have found that abstinence is disproportionately concentrated among groups with unskilled manual

occupations (Caldwell et al., 2008; Jefferis et al., 2007), perhaps reflecting a culture of polarized drinking behaviors, characterized by either abstinence or excessive drinking.

Lifetime income trajectories and recent income levels both shape alcohol use patterns. However, lower past-year income, fewer years of respondent education, and past-year blue-collar occupation statistically accounted for the increased odds of abstinence and heavy drinking among people who exhibited lower lifetime patterns of income. A comparison of the magnitude of associations between lifetime income and alcohol use patterns in models separately adjusting for past-year income, education and occupation (results not shown) indicate that past-year income may largely explain the association between lifetime income patterns and adult alcohol use. This is consistent with the notion of intergenerational transmission of socioeconomic status, or the transition from parent to offspring adult income (Galobardes et al., 2006). Health risk behaviors such as alcohol use may be more sensitive to short-term changes in the social environment, and as such, long-term income patterns may shape alcohol use indirectly, through their impact on recent household income and, to a lesser extent, on respondent education and choice of occupation (Galea & Ahern, 2005). At the same time, past-year income could act as a marker for lifetime history of income, so that in models that jointly adjusted for past-year income and lifetime income patterns, the association between lifetime income patterns and alcohol use was washed out. We are not aware of any prior studies that have compared the influence of lifetime and recent income on adult alcohol use. Prior studies comparing the influence of other measures of lifetime and recent socioeconomic status have found contradictory results, indicating that the relationship may depend on the socioeconomic dimension of interest. For example, Mossakowski found that duration of poverty and unemployment were associated with heavy drinking independently of present socioeconomic conditions (K. N. Mossakowski, 2008b), while Caldwell et al. found that neither childhood or adulthood occupation were associated with heavy drinking (Caldwell et al., 2008).

This study has several advantages over previous research on lifetime income and risk behaviors. First, we took advantage of the longitudinal, multi-generational study design to measure respondents' annual or biannual household income from 1968 to 1996 without having to rely on retrospective reports. Lifetime income trajectories reflect childhood as well as adult household income. Second, we used empirical methods to identify the lifetime patterns of household income; hence, we can examine the heterogeneity of income patterns across the study sample, and we can simultaneously characterize how level and change in income over twenty-seven years influence alcohol use. Hence, we were able to go beyond concluding that individuals with a low-income history were at higher odds for abstinence and heavy drinking than high-income individuals, and were able to identify that within the low-income groups, those with a stable low-income history were at particularly high odds for abstinence and heavy drinking. The few existing studies on income and alcohol use that have integrated a temporal component into their measure of income have used repeated measures of income and alcohol (Casswell et al., 2003b; Jefferis et al., 2007), measures of social class and education in childhood and adulthood (Caldwell et al., 2008; Hemmingsson et al., 1999), change in employment status (Temple et al., 1991), and duration of poverty (K. N. Mossakowski, 2008b). No studies, to our knowledge, have used an empirical approach to identify the heterogeneity in household income histories across the sample, and to devise income history measures that reflect not only level but also trajectories of income over time.

While having longitudinal data over the lifecourse to characterize income might be ideal, such data will not be available in most studies. However, we can draw lessons from this study about the types of information that might be collected retrospectively about socioeconomic history. The income patterns found in this study, which indicate that more than half of individuals exhibit a major change in income patterns between childhood and

adulthood, suggest that collecting information about socioeconomic position in childhood and adulthood may be adequate to characterize lifetime patterns that shape alcohol use. Retrospective measures about family income in childhood are likely unreliable; instead, individuals can report on parent education and occupation, as well as alternative indicators of financial resources during childhood, including home ownership, overcrowding (number of people in the household per rooms in the home), and car ownership, with reasonable reliability (Kestilä et al., 2008; Packard et al., 2011). Such data on financial resources can be used to create composite estimates of childhood material resources, which may act as a marker for childhood income. Retrospective measures of childhood material resources, parent education, and occupation can be complemented by adult offspring measures of income, occupation and education, to estimate the relationship between different aspects of lifetime socioeconomic position and risk behaviors such as heavy alcohol use.

This study also has several limitations. First, due to the low number of respondents per household (1-2 respondents given the restriction of the sample to household heads and spouses), we were unable to account for intra-household correlation in our models. This may have resulted in an underestimation of standard errors associated with parameter estimates. Further work on this issue should use samples with one respondent per household to avoid potential problems of intra-household correlation. Second, our sample included respondents aged 30-44 years in 1997; hence, income trajectories from 1968-1997 reflected household income patterns at ages 1-30 to ages 15-44, depending on the age of the respondent. Household income from childhood to young adulthood vs. income from adolescence to middle adulthood may have different associations with alcohol use, which we were not able to capture in our analysis. However, we adjusted for age, reducing the risk that age-related confounding would have affected our findings. Third, health selection, or reverse causation of health status on income, is always a concern in observational studies. The longitudinal study design, and the use of income measures prior to the measurement of alcohol, was used to account for temporality concerns. However, we cannot discount the possibility that prior drinking patterns may have determined adult income levels as well as alcohol use reported in 1999-2003. Fourth, the low number of respondents who reported drinking three or more drinks per day limited our ability to examine the association between income and extremely heavy drinking (i.e. five or more drinks per day). However, three or more drinks per day are above the daily-recommended limits for both men and women, and reflect heavy drinking. While bingeing is defined as five or more drinks, it is typically assessed over a longer time frame, such as in the past month or in the past year, given that very few people actually consume five or more drinks on a daily basis. Fifth, joint inclusion of income, education and occupation as predictors may have led us to underestimate the contribution each made to alcohol use, as the three dimensions are causally interdependent and highly correlated. However, this approach allowed us to examine the particular contribution that each socioeconomic dimension made to alcohol use patterns, over and above the other two dimensions. Finally, low-income, low-education, blue-collar alcohol abstainers were less likely to report income data in three or more interviews from 1968-1997 and were more likely to be excluded from the analytic sample; this may have led us to underestimate the relationship between socioeconomic position indicators and alcohol use patterns.

In conclusion, we found that long-term and recent income levels were both associated with higher odds for abstinence and heavy drinking, although recent income may explain the association between long-term income patterns and adult drinking habits. A comparative analysis of the influence of long- vs. short-term exposure to income on alcohol use highlighted the particular importance of recent income levels in shaping risk behaviors such as alcohol use. Future research needs to uncover the pathways through which income may influence alcohol use, so that we may devise appropriate interventions to reduce income disparities in key health risk behaviors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- This longitudinal study investigates the relation between lifetime income patterns, past-year income, and adult alcohol use in the USA.
- The unique design employs growth mixture models to identify heterogeneous 30-year household income patterns.
- Lower lifetime income trajectories were associated with higher odds of adult alcohol abstinence and heavy drinking.
- Lifetime income patterns may have an indirect association with alcohol use, mediated through current socioeconomic position.

Figure 1.
Estimated household income trajectories, 1968-1997, for PSID respondents aged 30-44 in 1997

Table 1

Weighted respondent lifetime and recent characteristics, PSID 1968-2003 (n=3111)

	1999 (n=2911)		2001 (n=2922)		2003 (n=2881)	
	Mean or %	(SD or N)	Mean or %	(SD or N)	Mean or %	(SD or N)
Average number of drinks per day, 1999-2003						
0	34.69	1163	33.16	1136	32.16	1123
<1-2	61.41	1638	63.00	1681	63.49	1631
3+	3.89	110	3.84	105	4.35	127
Socioeconomic characteristics, 1968-1997						
<i>Income</i>						
Average income, 1968-1997	56,936	709.38	59,063	802.79	59,558	798.10
<i>Employment</i>						
Proportion of years in blue-collar employment, 1968-1997	0.24	0.005	0.22	0.005	0.22	0.005
Proportion of years in professional/managerial employment, 1968-1997	0.65	0.007	0.66	0.007	0.66	0.007
Proportion of years unemployed, 1968-1997	0.12	0.004	0.11	0.004	0.11	0.004
<i>Education</i>						
Mean years of education of household head, 1968-1997	12.42	0.05	12.58	0.05	12.61	0.05
Socioeconomic characteristics, 1999-2003						
<i>Income</i>						
Quartile 1	Range \$0- 31,934 \$31,933	729	Range \$0-30,649	730	Range \$0-30,070	721
Quartile 2	4.01- 53,543 \$53,54	726	\$30,649.0 1-55,515	731	\$30,070.01- 55,400	720
Quartile 3	\$53,54 3.01- 82,944	729	\$55,515.0 1-87,273	732	\$55,400.01- 88,437	720
Quartile 4	\$82,94 4.01- 896,476	727	\$87,273.0 1-2,194,598	729	\$88,437.01- 2,104,200	720

	1999 (n=2911)		2001 (n=2922)		2003 (n=2881)	
	Mean or %	(SD or N)	Mean or %	(SD or N)	Mean or %	(SD or N)
<i>Employment in the past year</i>						
Blue-collar employment	43.09	1328	37.82	1270	36.96	1205
Professional/managerial employment	47.77	1260	51.26	1272	56.32	1384
Unemployed	9.14	311	10.92	369	6.72	242
<i>Education</i>						
Total years of education	13.40	0.05	13.56	0.05	13.58	0.05
Demographic characteristics, 1999-2003						
<i>Sex</i>						
Female	56.47	1802	57.01	1806	56.70	1773
Male	43.53	1109	42.99	1116	43.3	1108
<i>Race/ethnicity</i>						
White	82.41	1720	81.90	1717	82.98	1673
Black	15.00	1127	15.29	1145	14.27	1147
Other	2.58	61	2.81	58	2.75	59
Age (years)	39.29	0.11	41.35	0.10	43.30	0.10
<i>Marital status</i>						
Married	62.25	1884	61.52	1856	60.70	1756
Single	15.64	405	14.27	377	13.28	368
Widowed, divorced, separated	22.11	622	24.20	689	26.02	757

Table 2

Multinomial generalized logit models comparing the odds of average daily abstinence and heavy drinking, relative to light/moderate drinking, for respondents aged 30-44 years old in 1997, PSID, 1999-2003*

	Model 1				Model 2				Model 3			
	0 vs. <1-2 (reference) drinks	CI	OR	95% CI	0 vs. <1-2 (reference) drinks	CI	OR	95% CI	0 vs. <1-2 (reference) drinks	CI	OR	95% CI
Socioeconomic history, 1968-1997												
<i>Income history 1968-1997 (reference = high income)</i>												
Decreasing low income	2.12	(1.26, 3.57)	1.96	(0.80, 4.80)					1.58	(0.91, 2.72)	1.42	(0.54, 3.76)
Stable low income	1.57	(1.09, 2.27)	2.14	(1.07, 4.27)					1.13	(0.77, 1.65)	1.59	(0.75, 3.38)
Increasing low to medium income	1.59	(1.18, 2.14)	1.49	(0.82, 2.71)					1.34	(0.99, 1.83)	1.27	(0.68, 2.36)
Decreasing medium income	1.42	(1.11, 1.83)	1.72	(1.05, 2.80)					1.16	(0.89, 1.50)	1.35	(0.79, 2.30)
<i>Employment history (reference=% of years in professional/managerial job)</i>												
% of years in blue collar job	1.68	(1.13, 2.49)	0.82	(0.40, 1.71)					1.55	(1.04, 2.32)	0.70	(0.33, 1.47)
% of years unemployed	1.26	(0.73, 2.16)	0.75	(0.29, 1.91)					1.25	(0.72, 2.16)	0.68	(0.26, 1.80)
<i>Education history</i>												
Mean years of education of household head	0.88	(0.85, 0.92)	0.89	(0.83, 0.96)					0.92	(0.88, 0.96)	0.97	(0.89, 1.06)
Recent socioeconomic status (time-varying, reported in 1999-2003 for the past year)												
Household income												

	Model 1				Model 2				Model 3			
	0 vs. <1-2 (reference) drinks		3+ vs. <1-2 (reference) drinks		0 vs. <1-2 (reference) drinks		3+ vs. <1-2 (reference) drinks		0 vs. <1-2 (reference) drinks		3+ vs. <1-2 (reference) drinks	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Quartile 1												
Quartile 2					2.28	(1.80, 2.90)	1.71	(1.07, 2.74)	2.11	(1.64, 2.70)	1.59	(0.96, 2.63)
Quartile 3					1.87	(1.51, 2.30)	1.62	(1.04, 2.53)	1.74	(1.40, 2.16)	1.53	(0.95, 2.44)
Quartile 4					1.49	(1.24, 1.80)	1.45	(0.96, 2.19)	1.43	(1.19, 1.73)	1.39	(0.91, 2.14)
Employment (reference = professional)												
Blue-collar employment					1.08	(0.92, 1.25)	1.33	(0.97, 1.81)	1.03	(0.88, 1.20)	1.32	(0.96, 1.81)
Unemployed					1.06	(0.83, 1.34)	1.12	(0.71, 1.79)	1.02	(0.80, 1.30)	1.13	(0.70, 1.82)
Years of education												
Respondent total years of education					0.89	(0.85, 0.93)	0.81	(0.73, 0.90)	0.93	(0.88, 0.97)	0.82	(0.74, 0.92)

* All models control for age, year of interview, sex, race/ethnicity, and marital status at the past interview