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Unemployment and substance use problems among young adults: Does childhood low socioeconomic status exacerbate the effect?

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Abstract

The current study tested whether unemployment predicted young adults' heavy episodic drinking, cigarette smoking, and cannabis use after taking into account individual development in substance

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use. Furthermore, building on the life course perspective, this study examined whether the link between unemployment and substance use among young adults differed for those who experienced low childhood SES compared to those who did not. Data for the present study came from the Seattle Social Development Project (SSDP), a panel study examining a broad range of developmental outcomes from ages 10 to 33. A life history calendar (LHC) was administered to assess substance use and unemployment status during young adulthood. Covariates included baseline symptoms of psychopathology, baseline substance use, gender, ethnicity, and adult educational attainment. Results suggest that unemployment is associated with young adults' heavy episodic drinking and possibly cigarette use, but not cannabis use. Moreover, for all three substances, the detrimental impact of unemployment on substance use seems to be exacerbated among young adults who spent their childhood and adolescence in a lower SES household. Public health efforts that provide other viable and affordable options to cope with unemployment among young adults from low SES backgrounds are needed to address this disproportionate concentration of adverse impacts of unemployment on behavioral health.

Keywords

substance use; behavioral health; life course; young adulthood; unemployment; parental SES

Introduction

During the financial crisis of 2007 and the subsequent Great Recession, the unemployment rate in the United States substantially increased. In January 2006, the unemployment rate was 4.7% (U.S. Bureau of Labor Statistics, 2014). Four years later, the rate climbed to 9.7% (U.S. Bureau of Labor Statistics, 2014). For young adults, the unemployment rate almost doubled in 2010 (17.2%) (U.S. Congress Joint Economic Committee, 2010). Such disproportionate concentration of unemployment among young adults (those from the late teenage years to the early 30s; Oesterle, 2013) has been historically persistent since 1971 in the United States (Edwards & Hertel-Fernandez, 2010), and thus warrants urgency in understanding the impact of unemployment for this specific age group.

Empirical evidence has consistently suggested that unemployment may lead to psychiatric problems including substance use (Catalano et al., 2011; Henkel, 2011), which has provoked a decades-long and unresolved debate on the nature of this association (Catalano et al., 2011; Dooley, Catalano, & Hough, 1992; Henkel, 2011; Mossakowski, 2008). From this debate, three compelling lines of thought have emerged: the stress hypothesis, the income loss hypothesis, and the social selection/drift hypothesis (Catalano et al., 2011; Henkel, 2011). The stress hypothesis suggests a countercyclical association, i.e., loss of employment is associated with increased substance use. Specifically, the stress hypothesis posits that stressors, particularly salient stressors like unemployment and its associated stressors like economic hardship (Ross & Huber, 1985), might result in increased substance use, with people using substances as a coping mechanism (Boden, Fergusson, & Horwood, 2014; Catalano et al., 2011; Henkel, 2011; Mossakowski, 2008). In contrast, the income loss hypothesis argues for a procyclical association—where loss of employment decreases substance use. Specifically, the income loss hypothesis suggests that unemployment reduces

the money available to an unemployed individual and thus this person cuts back on non-necessity items, such as substances (Catalano et al., 2011; Henkel, 2011). While the first two hypotheses argue that changes in employment predict changes in one's substance use, the social selection hypothesis argues for a reverse causality—it posits that preexisting substance use problems prohibit individuals from retaining their current job (Bowes, Chollet, Fombonne, Galera, & Melchior, 2013; Sareen, Afifi, McMillan, & Asmundson, 2011). The literature has not reached a conclusion about whether or not social selection processes also contribute to the association between unemployment and substance use (Catalano et al., 2011; Henkel, 2011; Sareen et al., 2011). Thus, it is important to evaluate whether a young adult's unemployment influences his/her substance use, net of the social selection possibility.

These hypotheses have been invoked in studies investigating the possible impact of unemployment on substance use among young adults, most of which have focused on alcohol use (Fergusson, Horwood, & Woodward, 2001; Kestila et al., 2008; Merline, O'Malley, Schulenberg, Bachman, & Johnston, 2004; Mossakowski, 2008), with very few exceptions (Aitken, DeSantis, Harford, & Caces, 2000; Merline et al., 2004; Reine, Novo, & Hammarström, 2004; Melchior, Chollet, Elidemir, Galera, & Younes, 2015).

Overall, existing empirical evidence is mixed and inconclusive (Catalano et al., 2011; Mossakowski, 2008). Supporting the stress hypothesis, in one New Zealand longitudinal study the duration of unemployment in each year from age 16 to 21 years was predictive of increased odds of meeting DSM-IV criteria for alcohol abuse or dependence from age 17 to 21 years (Fergusson et al., 2001). Similarly, using data from the National Longitudinal Survey of Youth (NLSY), Mossakowski (2008) reported that duration of unemployment from the 1979 wave to the 1991 wave was associated with increased frequency of heavy drinking at the 1992 wave when respondents were ages 27 – 35. On the other hand, although fewer in number and relying on data from a wide range of age groups, some studies have provided some evidence supporting the procyclical income loss hypothesis. In a U.S. cross-sectional study by Ettner and colleagues, unemployment was associated with decreased alcohol dependence symptoms among working-age adults (Ettner, 1997). In another study, Khan, Murray, and Barnes (2002) also reported that recent unemployment was associated with a decrease in alcohol use among a sample of working-age adults. However, supporting neither hypothesis, in a U.S. study using data from the Monitoring the Future study, unemployment was not associated with heavy drinking at 35 years of age (Merline et al., 2004).

Such mixed findings call for further inquiries in this topic area. With few exceptions (Fergusson et al., 2001; Merline et al., 2004; Melchior et al., 2015), most prior studies have focused on one substance at a time (predominantly alcohol) (Catalano et al., 2011). This limits our ability to draw a more definite conclusion about the relationship between unemployment and substance use problems (Catalano et al., 2011; Reine et al., 2004), particularly when differential findings arise between varying substances across studies. The present study examines the association between unemployment and multiple types of substance use in order to minimize the possibility that differential association might arise simply due to differences in study samples or chosen analysis approach.

In addition, the present study is guided by a life course perspective (Elder, 1994; McLeod & Almazan, 2003). A life course perspective encourages researchers to consider the unique characteristics of each developmental stage to disentangle the complex processes of labor market activity and substance use career (Adler & Rehkopf, 2008; Berkman, 2009; Braveman & Barclay, 2009; Elder, 1994; Kawachi, Adler, & Dow, 2010; McLeod & Almazan, 2003). Young adulthood is a period of constant transition in various aspects of life, including labor market activity and substance use. Young adults go through a “churning” period of short-lived employment as they navigate different career paths and employers (Edwards & Hertel-Fernandez, 2010). One longitudinal panel study showed that 69% of respondents’ jobs ended in less than a year when respondents were age 18 – 24 compared to only 33% when respondents were 40 – 46 years old (Bureau of Labor Statistics, 2012). There are also dynamic changes in substance use as adulthood progresses (Bachman et al., 2002; Substance Abuse and Mental Health Services Administration [SAMHSA], 2009; Windle & Wiesner, 2004). For example, on average, harmful drinking reaches its peak at the outset of young adulthood (ages 21 – 24) and then gradually decreases with age (Bachman et al., 2002; SAMHSA, 2009; Windle, Mun, & Windle, 2005).

Not taking into account the age-specific nature of labor market activity and substance use may potentially be a source of mixed findings in studies of the association between these two phenomena. The absence or presence of a relationship between unemployment and substance use may simply be a function of where a young adult stands developmentally with respect to his/her labor market activity and substance use trajectory. For example, Reine et al. (2004) reported a statistically significant association between unemployment and daily cigarette smoking at age 21 (the normative peak age for substance use). In the same study, unemployment was not associated with daily cigarette smoking at age 30 (beyond the normative peak age for substance use). This suggests that the relationship between unemployment and substance use should consider the developmental nature of substance use unique to young adults. Yet, very few relevant studies to date have made such considerations. This calls for a longitudinal analytic approach, such as linear mixed modeling, which can take into account the development of substance in each individual, as well as their unemployment status across young adulthood (Mossakowski, 2008). Such a longitudinal analytic approach can also provide a rigorous test of the effects of unemployment on substance use in that each individual’s own history of substance use will function as his/her own control (Shaw, Agahi, & Krause, 2011), and can help diminish the potential for social selection in the association between unemployment and substance use.

It is also possible that changes in unemployment and substance use in adulthood are the result of common determinants. A life course perspective not only underscores the salience of the unique characteristics of each developmental period, it also suggests that each developmental period should be understood in tandem with the events and circumstances of an individual’s prior development (Elder, 1994; McLeod & Almazan, 2003). Specifically, child/adolescent socioeconomic status has been widely reported as casting long-lasting effects on adult labor market activity (Duncan & Magnuson, 2011; Lee, Hill, & Hawkins, 2012). In contrast, the relationship between child and adolescent low SES and later substance use is not straightforward. Some studies have documented that early low SES function as risk factors for adult substance use (Gilman, Abrams, & Buka, 2003; Patrick,

Wightman, Schoeni, & Schulenberg, 2012), while some have reported early SES to be a protective factor (Humensky, 2010; Kestila et al., 2008; Schulenberg et al., 2005). Other studies have reported no relationship between child or adolescent SES and substance use (Reine et al., 2004).

More importantly, less is known about whether child/adolescent SES conditions the association between unemployment and adult substance use (Catalano et al., 2011; Henkel, 2011), although a potential interplay between child/adolescent SES and adult employment with regard to adult health has been consistently noted in the literature (for example, Adler & Rehkopf, 2008; Berkman, 2009; Bowes et al., 2013; Braveman & Barclay, 2009; Kawachi et al., 2010). In particular, in their resource substitution hypothesis, Ross and Mirowsky (2011) suggest that negative change in an individual's own socioeconomic status attained during adulthood might have a more detrimental impact on health outcomes for those from low SES families of origin. Given that these individuals are initially equipped with fewer resources, their own attained SES and its accompanying resources are the primary source for maintaining and/or improving health. Following this logic, it is plausible that the impact of unemployment, an indicator of attained SES, on varying substance use problems might be exacerbated among those from lower SES families of origin. To date, no empirical study has evaluated this hypothesis longitudinally.

Present study

Using a prospective longitudinal design, this study seeks to evaluate the link between unemployment and multiple types of substance use, including heavy episodic drinking, cigarette smoking, and cannabis use among young adults from ages 22 to 33. In line with life course perspective, developmental features unique to young adults' labor market activity and substance use were taken into account by estimating a series of generalized linear mixed models, permitting modeling of a young adult's developmental trajectory for each substance and the frequent fluctuations in unemployment status typical of this age group. This strategy helps to minimize the chance of social selection/drift in the association between unemployment and substance use. Furthermore, guided by a life course perspective, the proposed study seeks to examine explicitly the role of childhood/adolescent SES in the link between young adults' unemployment and substance use. The central research questions addressed are: 1) Is unemployment associated with heavy episodic drinking, cigarette smoking, and cannabis use among young adults, even after taking into account individual developmental patterns in young adults' changes in employment and substance use from ages 22 to 33 and childhood and adolescent involvement in substance use? and 2) Does the relationship between unemployment and substance use from ages 22 to 33 depend upon childhood SES and other potential common determinants?

Methods

Participants

Data for the present study came from the Seattle Social Development Project (SSDP), a panel study examining a broad range of developmental outcomes including employment history and substance use. In September 1985, 18 Seattle elementary schools were chosen

that overrepresented children from high-crime neighborhoods. All fifth-grade students ($N = 1053$) in these schools were invited to join the panel study. From this initial sampling pool, 808 students (77%) consented to be a part of the SSDP longitudinal study. Trained interviewers conducted face-to-face structured interviews at private places of participants' choice for the childhood and adolescent data collection. For young adulthood, Computer Assisted Personal Interviewing was also used, particularly for participants who were not easily accessible geographically. More details about the sample are provided in prior published papers (for example, Hawkins et al., 2003). Analyses presented here utilize all available data points, including late childhood (age 10), adolescence (ages 11, 12, 13, 14, 15, 16, and 18), and young adulthood (ages 21, 24, 27, 30, and 33).

Fifty-one percent of these participants are male. The sample is ethnically diverse (47% European American, 26% African American, 22% Asian American, and 5% Native American). Fifty-two percent of study participants were eligible for the National School Lunch/School Breakfast program between the ages of 10 and 13. Missingness has been evaluated for the SSDP panel (Hawkins et al., 2003). Panel retention rates have been consistently high; out of those still living (23 participants were deceased by age 33), 92% ($n = 721$) of respondents participated in the age 33 interview. Nonparticipation at each wave was not systematically related to gender, ethnicity, or drug use at age 10 (alcohol, tobacco, marijuana, or other illicit drug use) (Hawkins et al., 2003), or childhood low-income status at age 10.

Measures

Substance use (ages 21 – 33)—A life history calendar (LHC), a method for obtaining detailed information about life course events and activities (Axinn, Pearce, & Ghimire, 1999; Caspi et al., 1996), was administered at ages 24, 27, 30, and 33. The LHC covered the 3 years prior to each wave of data collection. The LHC first queried salient events, such as marriage and childbirth, in order to establish a base timeline and facilitate more accurate recall of other events. Building on this framework, participants reported whether they engaged in three substance use behaviors in each month during the LHC period: whether they consumed 5+ drinks in a 2-hour period (referred to as “heavy episodic drinking”), smoked 1 or more cigarettes per day, or used cannabis. Using month-by-month data from the LHC, a yearly composite variable was created for each year of a given 3-year recall period, assessing whether participants were involved in each substance use for 6 or more months (coded 1) or for fewer than 6 months (coded 0). We used this cutoff to assess substantial involvement in each substance rather than an occasional, socially conditioned, or situational substance use. In a study examining the LHC method and various biologic specimens, including meconium, newborn urine, and maternal hair samples, Eyster, Behnke, Wobie, Garvan, and Tebbett (2005) concluded that the LHC method was “the single method that maximally identified users” (p. 677). As a longitudinal method, the LHC can provide more detailed and nuanced information about within-person changes in a given life course event (Bailey, Hill, Hawkins, Catalano, & Abbott, 2008).

Unemployment status (ages 21 – 33)—On the LHC, respondents also reported changes in their employment status for each month during the 3 years prior to each wave of

data collection. Using this information, a yearly composite variable was created for each year of a given 3-year recall period, summarizing the number of months when a respondent was unemployed but was not “out of the labor force” for voluntary reasons (e.g., being a full-time homemaker or student) in a given year.

Low child and adolescent SES (ages 10 – 16)—Child and adolescent low SES measures included low parental education and low annual income during late childhood (age 10) and adolescence (ages 11, 12, 13, 14, 15, and 16), which was assessed using parent-report data. In line with the cumulative risk literature (Appleyard, Egeland, Van Dulmen, & Sroufe, 2005), respondents who were ever in the lowest 25% of household income (adjusted for household size) [n = 353, 43.7%] and/or lived with parents who had less than 12 years of education were coded 1 [n = 153, 19%] and otherwise 0. If there was only one parent in the household at a particular wave, then the educational attainment of that parent was used.

Covariates—Covariates included baseline symptoms of psychopathology as measured by the internalizing (affective disorder and anxiety problems) and externalizing (attention deficit and hyperactivity, oppositional defiant, and conduct problems) scales of the teacher report Achenbach Child Behavior Checklist measured when SSDP participants were ages 10 – 12 (Achenbach, 1991; Achenbach & Edelbrock, 1983); and baseline use of alcohol, tobacco, and cannabis in the past month which were prospectively measured by child self-report at ages 13 – 14. Gender and ethnicity were added to adjust for demographic factors: participants’ gender (male = 1 and female = 0), and three dummy variables representing each of three ethnic minority groups (African American, Asian American, and Native American, with Caucasian American as the referent). Finally, adult educational attainment was added to adjust for respondents’ attained SES during young adulthood. The educational attainment variable, measured at age 21 [n = 622, 81.3%], was dichotomized (having a high school diploma = 1 and otherwise = 0). We focus specifically on education as a proxy for respondents’ attained SES, which is a developmentally appropriate and important indicator of socioeconomic status in young adulthood considering that many young adults experience constant changes in other SES indicators such as income (Adler & Stewart, 2010). The education variable was dichotomized since it has been shown that completion of a degree, rather than an additional year of schooling, is associated with improvement in health (Kawachi et al., 2010), and the majority of participants at the age 21 survey had not completed a postsecondary degree.

Analysis

Because the outcome variables were dichotomous, these analyses relied on generalized linear mixed modeling (GLMM). GLMM is an extension of linear mixed modeling, which is appropriate for clustered data that are not normally distributed (Rabe-Hesketh & Skrondal, 2012). The specific link function used for GLMM is determined by the distributional properties of a given outcome (Rabe-Hesketh & Skrondal, 2012). Given that all the outcome measures in the present study were dichotomous, a logit link was used throughout the analyses.

Main effects models tested for changes in the log-odds of substance use associated with within-person changes in unemployment status in adulthood after ruling out a possibility of social selection, which is related to our research question 1. A separate model was run for each of the three substance use outcomes. These models were adjusted for baseline symptoms of psychopathology and baseline use of alcohol, tobacco, and cannabis to evaluate the impact of unemployment on young adults' substance use net of their earlier use of each substance, increasing the rigor of this investigation. Equation 1 below shows the model specifications, where $(p/1-p)$ is the measure of substance use for each participant i at time t (heavy episodic alcohol use, cannabis use, cigarette smoking); B_0 is the intercept term; B_1X_{it} is the measure of unemployment for each participant i at time t ; B_2X_i is the measure of childhood socioeconomic status; ΣB_jX_j is the set of fixed covariate factors; and u_i is the individual-specific error term. The model also included a term representing time (not shown).

$$\text{Logit}(p/1 - p)_{it} = B_0 + B_1X_{it} + B_2X_i + \Sigma B_jX_j + u_i \quad (\text{Equation 1})$$

Finally, to examine research question 2, an interaction term between the time-varying adult unemployment status and time-fixed child and adolescent low SES measures in each model tested whether the association between unemployment status and substance use varied according to child and adolescent low SES. Final models were adjusted for a range of covariates including sociodemographics such as gender, ethnicity, and high school graduation by age 21. All the models were estimated using STATA v.12.

Results

A majority of study participants (60.4%; $n = 469$) reported that they were unemployed at least once from ages 22 to 33, as shown in Table 1. The unemployment rate in the SSDP sample ranged from 12.5% to 21.1% for that period. Longitudinally, the unemployment rate appeared to assume a steady downward trend until age 32 and then appeared to increase at age 33, although the slope in the linear mixed model was not statistically significant ($b = -.01$, $p\text{-value} = .22$). The increase at age 33 could reflect the onset of the Great Recession, which coincided with the 2008 (age 33) data collection.

Table 2 shows rates of involvement in each of three substances for 6 or more months by employment status at each age. Two things are particularly noteworthy. First, when examined longitudinally, a gradual decrease in use of all three substances was observed for both those employed and unemployed except for daily cigarette smoking among those who were unemployed. Secondly, the prevalence in use of each substance in a given year was higher among those unemployed compared to those employed. When examined cross-sectionally in a given year, the magnitude of the differences across these two groups varied across the three substances. Overall, at the descriptive statistic level, unemployment seems to be more strongly related to cigarette smoking and cannabis use than to heavy episodic drinking.

Importantly, the descriptive statistics presented in Table 2 do not take into account developmental characteristics unique to this age group and thus could obscure the impact of

unemployment on young adults' substance use. To address this concern, we estimated a series of generalized linear mixed models where each individual's developmental trend in substance use was explicitly incorporated and unemployment status was modeled as a time-varying covariate (see Table 3). Of note, a possible quadratic term in the time measure has been also examined. The substantive conclusions remained the same and thus estimates from linear models are presented for simplicity and consistency.

As shown in column M2, the coefficients corresponding to the effects of unemployment on heavy episodic drinking remained statistically significant when earlier symptoms of psychopathology and early adolescent use of the three substances were included to account for social selection/drift ($b = .04$, p -value = .03). Interestingly, for smoking, when childhood symptoms of psychopathology and early adolescent use of alcohol, tobacco, and cannabis were controlled, there was a trend-level negative association between within-person change in unemployment status and daily smoking of one or more cigarettes for more than 6 months in a given year (column M5; $b = -.04$, p -value = .08). The association between unemployment status and marijuana use was not statistically significant (column M8).

The life course perspective suggests that the relationship between unemployment and substance use from ages 22 to 33 might depend upon child/adolescent SES (Elder, 1994; McLeod & Almazan, 2003). To examine this question, an interaction term between unemployment and child/adolescent SES was created and added to the model, along with the additional demographic factors. Of import is the sign and significance of the interaction term. As shown in column M3, the interaction between child/adolescent SES and adult unemployment was statistically significant in the model predicting heavy episodic drinking for 6 or more months in a given year ($b = .17$, p -value < .001). To facilitate interpretation, the parameter estimates from M3 of Table 3 were converted to predicted probabilities and presented visually in Figure 1. As this figure shows, while holding all the other covariates constant, unemployment in adulthood more strongly predicted heavy episodic drinking for participants from low SES families of origin than it did among those not from low childhood SES.

In Table 3, column M6 indicates that the interaction between child/adolescent low SES and adult unemployment status is statistically significant for cigarette smoking ($b = .19$, p -value = .001). Again, to facilitate interpretation, predicted probabilities were calculated using a linear combination of the parameter estimates from column M6 (see Figure 2). While holding all covariates constant, unemployment predicted less subsequent smoking for those not from low childhood SES, but more subsequent smoking for those who came from families of lower SES.

Finally, the interaction term between child/adolescent low SES and adult unemployment status with respect to marijuana use was also statistically significant ($b = .13$, p -value = .02), as shown in column M9. Predicted probabilities were displayed visually in Figure 3. While holding all covariates constant, unemployment was associated with increased cannabis use among young adults who were exposed to child/adolescent SES disadvantage, but with decreased use of cannabis among those not from low childhood SES families.

In supplementary analyses, we re-ran the final models with dummy education variables (less than high school, high school, some college, and college degree) and substantive findings remained the same. We also examined potential gender differences in the interaction between child/adolescent low SES and adult unemployment status by including three 2-way interaction terms and one 3-way interaction term in the final model (not tabled). Of import is the sign and significance of the 3-way interaction term. The 3-way interaction terms were not statistically significant for all three substances ($b = -.04$, $p\text{-value} = .72$ for heavy episodic drinking; $b = .07$, $p\text{-value} = .55$ for smoking; and $b = .09$, $p\text{-value} = .45$ for cannabis), suggesting that the interaction between child/adolescent low SES and adult unemployment status does not vary across two genders.

Discussion

Using prospective longitudinal data from a community sample, the current study examined whether unemployment predicted young adults' heavy episodic drinking, cigarette smoking, and cannabis use after taking into account individual development in substance use. Furthermore, the present study tested whether the link between unemployment and substance use among young adults differed for those who experienced low childhood SES compared to those who did not.

Results from the models without the interaction term between unemployment and child/adolescent low SES (refer to columns M2, M5, and M8) provide evidence that unemployment predicts young adults' heavy episodic drinking and possibly cigarette use, but not cannabis use. Consistent with the stress/tension reduction hypothesis supported in some prior studies (for example, Fergusson et al., 2001; Mossakowski, 2008), unemployment is related to increased odds of heavy episodic drinking for 6 or more months across ages 21 – 33 years, even after adjusting for developmental change in heavy episodic drinking, baseline symptoms of psychopathology during late childhood, and use of alcohol, tobacco, and cannabis during adolescence.

Interestingly, supporting an income loss hypothesis, study results indicate that unemployment is associated with decreased odds of cigarette use at a trend level. Varying price elasticity—consumer's responsiveness to a price change in a given product—across alcoholic beverages and cigarettes might explain such differential association between unemployment and the two types of substance use. For alcoholic beverages, a price inelastic option (e.g., cheap beer) is readily available (Gallet, 2007) and thus young adults might resort to alcohol use as a way to deal with stress related to unemployment (de Visser & Smith, 2007). In contrast, cigarettes are more price elastic, suggesting that affordability of cigarettes might be an important factor contributing to a change in cigarette use (Farrelly & Bray, 1998; Hyland et al., 2005; Zhang, Cohen, Ferrence, & Rehm, 2006). Given that unemployment entails income loss, young adults might decrease their cigarette use subsequent to unemployment. A question remains, however, why the income loss hypothesis appears to be more evident for cigarette use, considering that a price inelastic option might be also available for cigarettes (e.g., rolling up a cigarette or buying a single cigarette). Future studies that disentangle the nature of such differential association across two widely used substances are warranted. Of note, these study findings appear to be in contrast to prior

studies examining the effects of unemployment on substance use problems (Arcaya, Glymour, Christakis, Kawachi, & Subramanian, 2014; Melchior et al., 2015). However, prior studies have focused on a much older or mixed age group (Arcaya et al., 2014) or have been conducted under social and economic systems that are different from the present study (Melchior et al., 2015). The difference in findings may stem from the difference in sample characteristics and contexts. Thus, the current findings might not necessarily conflict with prior findings concerning other age groups and socio, economic, and historical contexts.

It is noteworthy that unemployment did not predict any change in cannabis use. Limited availability of cannabis use due to its associated legal restrictions might explain this finding. Cannabis use was illegal when the last wave of the data collection was completed in the state where most respondents lived. Considering the positive association among legal restrictions on a drug, its availability, and substance use (Hawkins, Catalano, & Miller, 1992), cannabis might not be an easily available option for the respondents and such restricted availability might explain the absence of the association between unemployment and cannabis use. Washington State recently legalized the use and possession of small amounts of cannabis for adults age 21 and older. Future research should focus on how such change in legal restrictions on cannabis use might affect the association between unemployment and cannabis use among young adults.

Importantly, our research findings suggest that the detrimental impact of unemployment on substance use is exacerbated among young adults who spent their childhood and adolescence in a lower SES household. This disproportionate concentration of the negative effects of unemployment for this subgroup remained consistent across all three substances studied in the present paper. These findings underscore the importance of examining the association between unemployment and substance use in the context of an individual's prior developmental experiences, as suggested by the life course perspective (Elder, 1994; McLeod & Almazan, 2003) and the health disparity literature (Adler & Rehkopf, 2008; Berkman, 2009; Braveman & Barclay, 2009; Kawachi et al., 2010).

It is interesting that the main effect of income loss on cigarette use was moderated by the SES of family of origin. Future studies clarifying factors contributing to such seemingly counterintuitive behavior—spending money on substances when unemployed—are needed. For example, as Ross and Mirowsky's (2011) resource substitution hypothesis suggests, other stress-relief alternatives, such as psychiatric treatment or counseling, might be available to them only through their own employment, since their initially equipped resources are limited and thus cannot compensate for the loss of resources triggered by recent unemployment. Future research should focus on how expanded affordability of health insurance covering behavioral and mental health services under the recent implementation of the Patient Protection and Affordable Care Act may change this disproportionate concentration of negative effects of unemployment on substance use among those from low SES backgrounds.

Our findings should be interpreted in the context of a few methodological limitations. First, measures were based on participants' self-reports, potentially raising concerns about response bias. Second, the influence of unemployment and substance use could vary across

historical periods. The SSDP cohort experienced the most recent recession in 2008, which could have conditioned the association between unemployment and substance use among young adults. Replicating the present analysis with a data set with multiple observation points before and after the most recent recession will be important to further disentangle this complex association between unemployment and substance use. Third, although we have diminished the potential for social selection (i.e., substance use leads to unemployment) by controlling for each participant's own history of substance use, it is not our intention to claim that a possibility of the reverse causality has been explicitly tested and/or has been completely ruled out. Further research that explicitly tests the potential for social selection will be fruitful. Fourth, our measures of cigarette use and cannabis use assess presence or absence of young adults' involvement in each substance and do not focus on frequency of each substance use per day. Potentially, unemployment might increase daily frequency of cigarette use and cannabis use rather than trigger young adults' prolonged involvement in each substance. Future studies with alternative measures for cigarette use and cannabis use will be needed to clarify the effects of unemployment on these two substances even further. Finally, the SSDP sample is a Seattle-based community sample. Generalization of study findings should be conducted with caution and replication of study findings in other data sets conducted under other contexts will be a fruitful future research direction.

The current study makes significant contributions to the existing literature in at least three important ways: 1) It examines in a single study not only alcohol use but also cigarette and cannabis use, the two other most widely used substances among young adults (Substance Abuse and Mental Health Services Administration, 2014). This enhances our ability to draw conclusions about effects of unemployment on varying types of substance use by minimizing the chance that associations of interest might arise simply due to other factors, for instance differences in study samples. 2) By capitalizing on prospective longitudinal data, the current study explicitly models the developmental nature of labor market activity and substance use among young adults. This approach, coupled with having child/adolescent substance use as an additional covariate, helps to minimize the chance of social selection (e.g., preexisting substance use problems result in job loss) as a competing explanation for the association between unemployment and substance use. 3) The current study examines how the link between unemployment status and substance use differs for those who experienced child/adolescent low SES compared to those who did not. We are aware of no other studies incorporating all of these strengths.

In conclusion, the current study illustrated that unemployment status influences substance use among young adults. Current findings suggest that a different hypothesis is supported for varying kinds of substance use. However, importantly, the stress/tension reduction hypothesis seems to be more evident among those who spent their childhood and adolescence in a low SES household—the negative effect of unemployment on substance use is disproportionately concentrated within this subgroup. Substance use problems triggered by unemployment among young adults are of substantial public health importance across a wide range of health domains. Substance use has been linked to mental and physical health outcomes such as depression, obesity, high blood pressure, and several types of cancer (Compton, Thomas, Stinson, & Grant, 2007; McCarty et al., 2009; Oesterle et al., 2004). Thus, the concentration of the negative impact of unemployment on substance use

among those who grew up in low SES households may contribute to disparities in other health outcomes. Public health efforts that provide other viable and affordable options to cope with unemployment among young adults from low SES backgrounds are needed to address this disproportionate concentration of adverse impacts of unemployment on behavioral health.

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Research highlights

- Unemployment increases young adults' heavy episodic drinking.
- Unemployment is also associated with possibly cigarette use, but not cannabis use.
- The effect of unemployment on drug use varies by the SES of family of origin.
- Unemployment disproportionately affects those with lower ascribed SES.
- Such disproportionate concentration remained consistent across all three drugs.

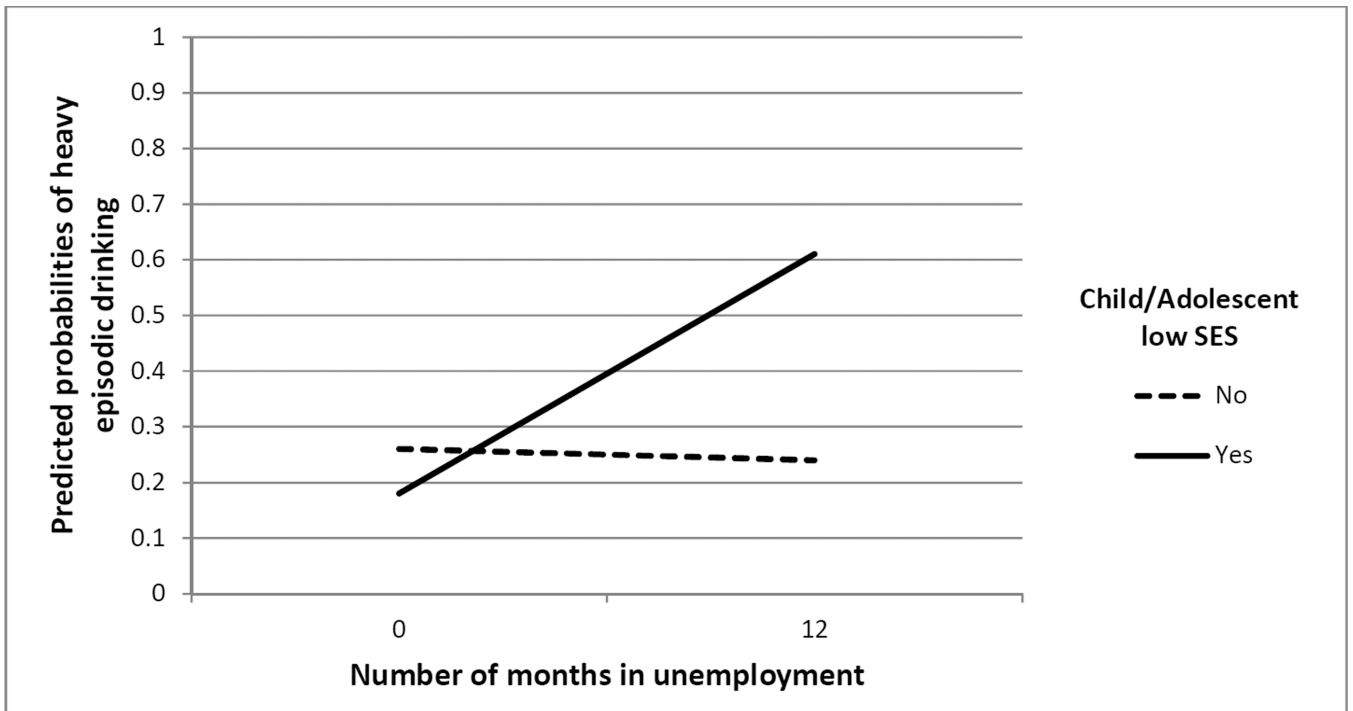


Figure 1. Association between unemployment and heavy episodic drinking for 6 or more months in a given year, by childhood/adolescence low SES status.

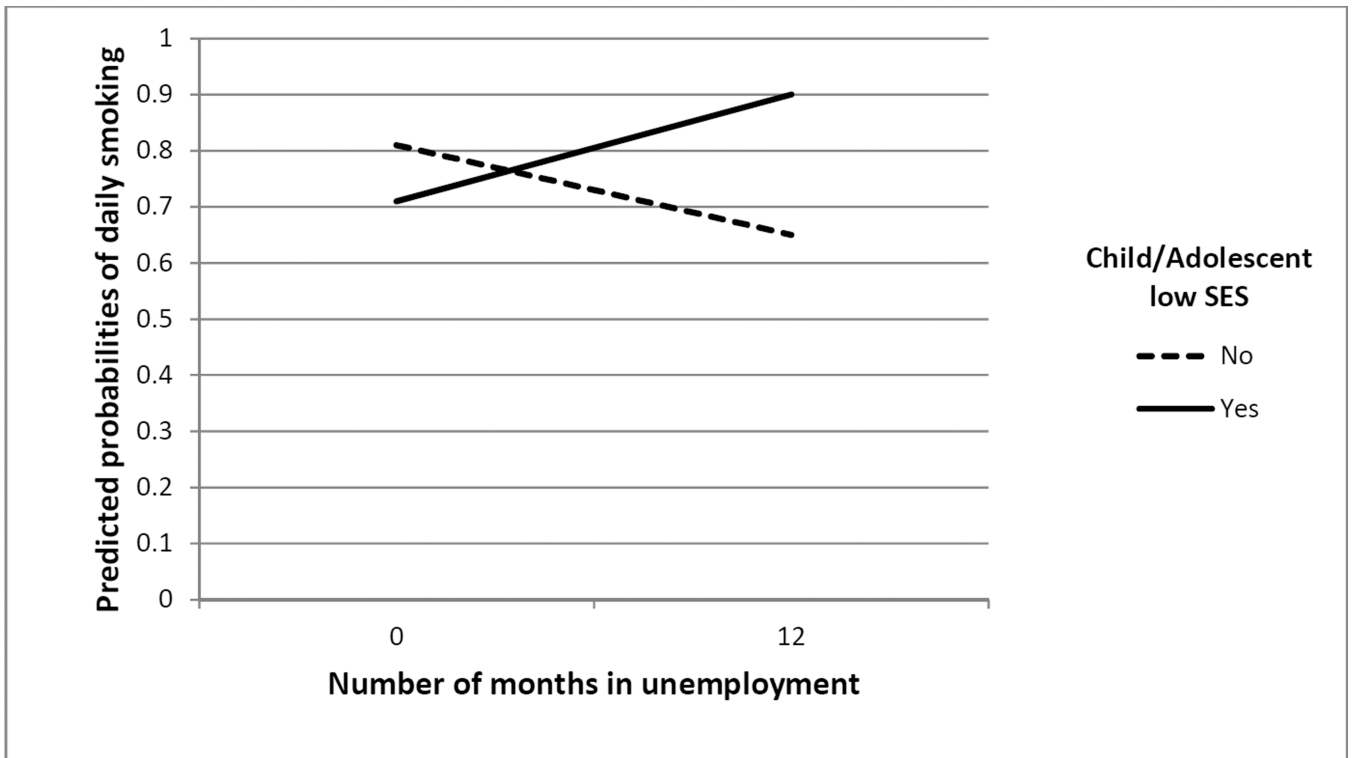


Figure 2. Association between unemployment and daily smoking for 6 or more months in a given year, by childhood/adolescence low SES status.

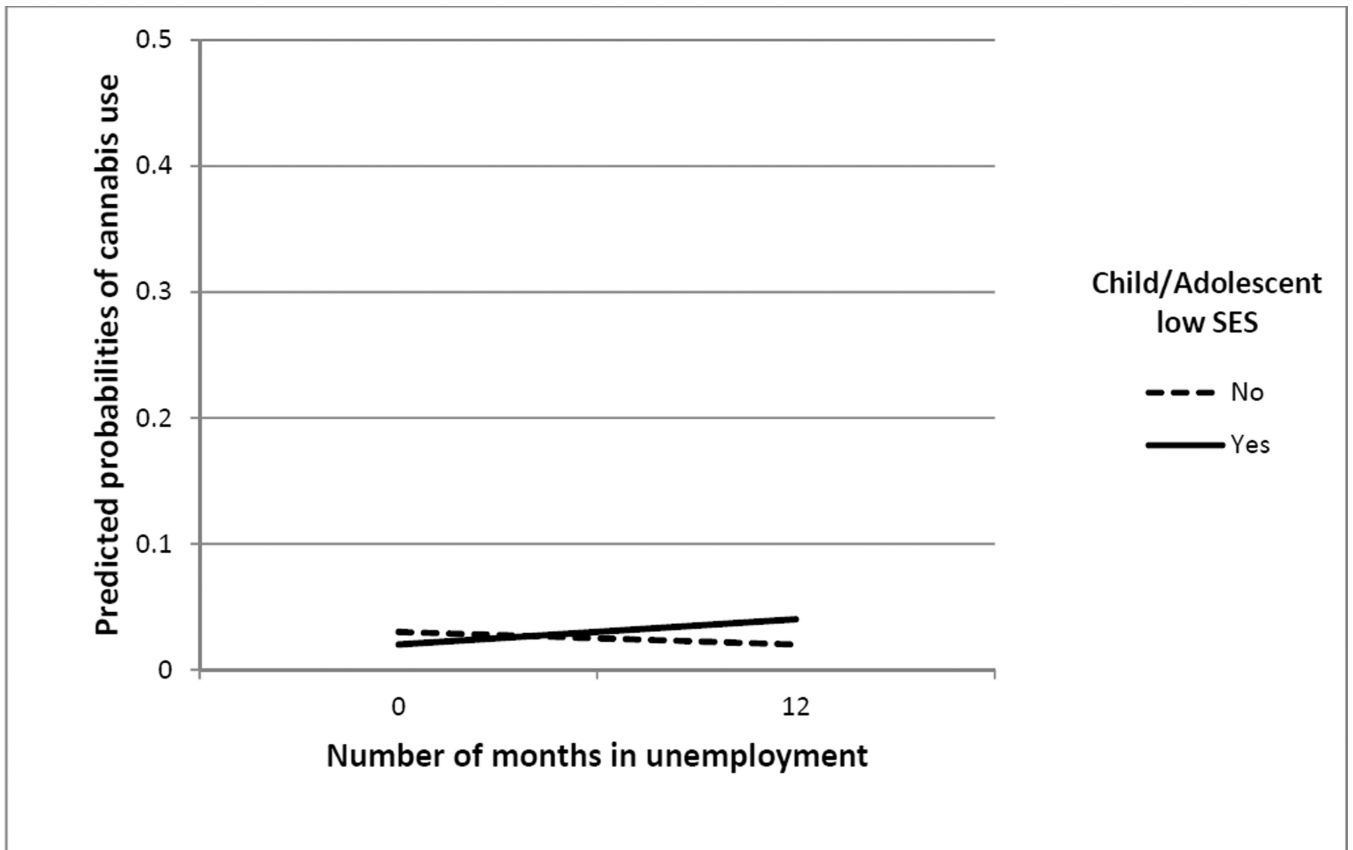


Figure 3. Association between unemployment and cannabis use for 6 or more months in a given year, by childhood/adolescence low SES status.

Table 1

Descriptive statistics, unemployment

Age	Unemployed (%)	Duration of unemployment (Mean, in months)
22	20.59%	4.82
23	18.72%	4.71
24	21.12%	4.33
25	13.65%	5.41
26	14.73%	5.06
27	20.75%	4.82
28	15.41%	6.16
29	13.52%	6.51
30	15.99%	5.60
31	12.81%	6.29
32	12.50%	6.17
33	16.02%	5.03

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Table 2

Descriptive statistics, more than 6 months of substance use, %

Age	Heavy episodic drinking (more than 6 months of use)		Daily cigarette smoking (more than 6 months of use)		Marijuana use (more than 6 months of use)		
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed	
22	16.7	29.4	12.7 ^{***}	38.3	9.2 ^{**}	26.3	7.6 ^{**}
23	17.6	21.7	4.1	42.1	14.3 ^{***}	17.7	11.8 ^{***}
24	16.7	22.9	6.3 [*]	43.0	13.7 ^{***}	16.8	23.6
25	15.1	23.0	7.9 ^{**}	29.9	12.7 ^{**}	17.3	17.0 ^{***}
26	14.5	22.7	8.2 ^{**}	30.1	10.5 ^{**}	17.5	28.0
27	14.0	19.6	5.6 [*]	27.6	12.0 ^{***}	16.4	25.8
28	11.3	20.4	9.0 ^{***}	29.9	5.3	14.1	26.9
29	12.3	20.0	7.7 ^{**}	29.1	10.9 ^{**}	13.9	27.4
30	11.9	11.6	-0.3	27.7	10.7 ^{**}	12.3	22.3
31	11.2	18.1	6.9	26.9	6.5	14.4	19.3
32	10.2	19.8	9.5 ^{**}	25.7	7.2	15.6	15.0
33	9.6	17.0	7.4 [*]	23.0	17.8 ^{***}	11.9	19.4

Note:

*** < 0.01,

** < 0.05,

* < 0.10

Generalized linear mixed models of unemployment predicting heavy episodic drinking, cigarette smoking, and cannabis use for 6 or more months in a given year, respectively

Table 3

Variables	Heavy drinking			Smoking			Cannabis		
	Coeff (SE)	Odds Ratio [95% CI]		Coeff (SE)	Odds Ratio [95% CI]		Coeff (SE)	Odds Ratio [95% CI]	
	M1	M2	M3	M4	M5	M6	M7	M8	M9
Age	-0.12*** (0.01)	-0.12*** (0.01)	-0.12*** (0.01)	-0.08*** (0.01)	-0.07*** (0.02)	-0.07*** (0.02)	-0.13*** (0.01)	-0.15*** (0.02)	-0.16*** (0.02)
Unemployment (a time-varying predictor)	0.89[.87,.92]	0.89[.86,.91]	0.89[.86,.91]	0.93[.90,.95]	0.93[.90,.96]	0.93[.91,.96]	0.88[.86,.91]	0.86[.83,.89]	0.85[.82,.88]
Unemployment (a time-varying predictor)	0.04** (0.02)	0.04** (0.02)	-0.01(0.02)	-0.02(0.02)	-0.04* (0.02)	-0.07*** (0.03)	-0.01(0.02)	-0.01 (0.02)	-0.04(0.03)
Baseline substance use, ages 13–14	1.04[1.00,1.08]	1.04[1.01,1.09]	0.99[.95,1.04]	0.98[.95,1.02]	0.96[.92,1.00]	0.93[.88,.98]	0.99[.96,1.03]	0.99[.95,1.03]	0.96[.91,1.01]
Baseline symptoms of psychopathology, ages 10–12	0.39** (0.18)	0.39** (0.18)	0.28(0.19)		1.82*** (0.52)	0.96*** (0.37)		0.83*** (0.25)	0.77*** (0.26)
Internalizing problems	1.47[1.03,2.10]	1.47[1.03,2.10]	1.33[.92,1.91]		6.19[2.23,17.19]	2.62[1.27,5.43]		2.29[1.41,3.72]	2.16[1.30,3.59]
Externalizing problems	-0.45 (0.34)	-0.45 (0.34)	-0.45(0.33)		0.95* (0.53)	0.61(0.46)		-0.89* (0.46)	-0.92* (0.52)
Childhood low SES	0.64[.33,1.24]	0.64[.33,1.24]	0.64[.33,1.23]		2.60[.91,7.38]	1.85[.74,4.58]		0.41[.17,1.02]	0.40[.15,1.10]
Unemployment × childhood SES	0.90*** (0.27)	0.90*** (0.27)	0.37(0.29)		1.78*** (0.55)	1.27*** (0.49)		1.62*** (0.35)	0.70* (0.39)
Gender (Male = 1)	2.46[1.46,4.16]	2.46[1.46,4.16]	1.45[.82,2.57]		5.94[2.01,17.55]	3.56[1.37,9.27]		5.06[2.53,10.12]	2.02[.94,4.36]
Ethnic minority group African American			-0.46(0.42)			-0.61(0.62)			-0.75(0.57)
			0.63[.28,1.45]			0.55[.16,1.83]			0.47[.16,1.44]
			0.17*** (0.05)			0.19*** (0.05)			0.13** (0.55)
			1.19[1.08,1.31]			1.2[1.09,1.34]			1.14[1.02,1.27]
			3.14*** (0.33)			0.60(0.44)			2.67*** (0.41)
			23.08[12.12,43.95]			1.83[.77,4.33]			14.50[6.50,32.31]
			-0.88** (0.38)			-1.46** (0.58)			0.68(0.49)
			0.42[.20,.88]			0.23[.07,.72]			1.98[.76,5.15]

