Employment Trajectories: Exploring Gender Differences and Impacts of Drug Use

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Abstract

This study investigated the impact of drug use on employment over 20 years among men and women, utilizing data on 7,661 participants in the National Longitudinal Survey of Youth. Growth mixture modeling was applied, and five distinct employment trajectory groups were identified for both men and women. The identified patterns were largely similar for men and women except that a U-shape employment trajectory was uniquely identified for women. Early-initiation drug users, users of "hard" drugs, and frequent drug users were more likely to demonstrate consistently low levels of employment, and the negative relationship between drug use and employment was more apparent among men than women. Also, positive associations between employment and marriage became more salient for men over time, as did negative associations between employment and childrearing among women. Processes are dynamic and complex, suggesting that throughout the life course, protective factors that reduce the risk of employment problems emerge and change, as do critical periods for maximizing the impact of drug prevention and intervention efforts.

Keywords

Employment; drug use; gender differences; growth mixture modeling; life course

Introduction

Employment is an essential component of healthy social development. Critical to identity formation (Leufstadius, Eklund, & Erlansson, 2009; Luyckx, Schwartz, Goossens, &

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Pollock, 2008), the accumulation of social capital (Hall & Kramer, 2009; Hardaway & McLoyd, 2009; Mares & Rosenheck, 2006; Sampson & Laub, 2005), and perceived quality of life (Nordt, Muller, Rossler, & Lauber, 2007; Zaninotto, Falaschetti, & Sacker, 2009), employment can enhance physical and mental well-being and overall quality of life (Falba, Sindelar, & Gallo, 2009; Mossakowski, 2008; Silver, 2010; Virtanen et al., 2008; Weden, Astone, & Bishai, 2006; Zabkiewicz, 2010; Zabkiewicz & Schmidt, 2009).

Distinct and heterogeneous employment patterns have been identified (Hynes & Clarkberg, 2005; Stewart, 2008; Virtanen et al., 2008; Wu, Cancian, & Meyer, 2008). Over the life course, some individuals remain stably employed, others show varying levels of employment, and yet others exhibit low or very sporadic employment histories. Well-established determinants of employment pathways include educational attainment (Naccarato, Brophy, & Courtney, 2010; Wiesner, Vondracek, Capaldi, & Porfeli, 2003), race (Braun, Hannan, Wolfson, Jones-Webb, & Sidney, 2000; Kmec & Fustenberg, 2002), marital status and family structure (Drobnic, Blossfeld, & Rohwer, 1999; Percheski & Wildeman, 2008), socio-economic status (Charles & DeCicca, 2008; Stewart, 2008; Willson, 2003), and general health status (García-Gómez, Jones, & Rice, 2010). Gender, and its attendant social roles, is an especially important determinate of lifetime employment patterns.

Gender and Work Patterns

Participation in the labor force is shaped by enduring social roles, particularly in relation to partnering and childrearing. Changes have occurred in childrearing trends, the division of household labor, and gender role attitudes (Barnett & Hyde, 2001; Fan & Marini, 2000; Presser, 1994; Rindfuss, Brewster, & Kavee, 1996), yet gendered patterns of employment persist. Childcare responsibilities, especially for preschool-aged children, impact women's employment status (Drobnic et al., 1999; Rindfuss et al., 1996; Sharpiro & Mott, 1994; Stewart, 2008), and throughout early parenthood, women exhibit significant movement into and out of the labor force (Hynes & Clarkberg, 2005). Variation exists, for example by race and socio-economic status, in the impact these kinds of significant life events have on employment patterns (Downey & Hawkins, 2008; Hogan, 1978; Lundquist, 2004; Percheski & Wildeman, 2008; Royster, 2007; Semyonov & Lewin-Epstein, 2009; Western & Pettit, 2005); however, among men, full-time workforce participation is typically initiated in early adulthood and, compared to women, remains relatively uninterrupted by marriage and childrearing throughout the prime income-earning years.

Drug Use and Employment

The transition into adulthood is a critical period for determining employability (Skorikov & Vondracek, 2007), but adolescence and early adulthood are also at-risk periods for behaviors such as drug use, alcohol abuse, and crime (Arnett, 1999; Chen & Kandel, 1995), which can adversely impact lifetime employment patterns. Moreover, drug and alcohol use in adolescence is associated with continued use and dependence (Hser & Anglin, 2010; Schulenberg, O'Malley, Bachman, Wadsworth, & Johnston, 1996), in addition to alterations in the timing of important life events (e.g., early parenthood, delayed education), which also have significant lifelong consequences (Boden, Fergusson, & Horwood, 2008; Krohn, Lizotte, & Perez, 1997; Lee, 2009; Sampson & Laub, 1993).

Many studies have examined the effects of drug use on employment, and the evidence indicates that drug use, especially chronic or "hard" drug use (Alexandre & French, 2004; French, Roebuck, & Alexandre, 2001; Newcomb & Bentler, 1986), has a negative impact on work performance, labor force participation, job retention, and earnings (Baldwin, Marcus, & De Simone, 2010; Braun et al., 2000; Bryant, Jayawardhana, Samaranayake, & Wilhite,

1996; Gill & Michaels, 1992; Hoffmann, Dufur, & Huang, 2007; Kandel & Davies, 1990; Marie, Fergusson, & Boden, 2008; Mink et al., 2008; Naccarato et al., 2010; Ringel, Ellickson, & Collins, 2006; Wiesner, Capaldi, & Kim, 2010; Wu, Schlenger, & Galvin, 2003). Similarly, alcohol abuse has significant impact on employment, especially for the transition from adolescence to young adulthood. Considerable research has shown that alcohol abuse results in reduced employment and work performance and imposes substantial costs on the economy (Mullahy & Sindelar, 1996; Schulenberg et al., 1996; Terza, 2002; Zarkin, Mroz, Bray & French, 1998). In comparison to the amount of research concerning the associations between alcohol drinking and employment, there are relatively fewer studies on the impact of drug use on employment. This study devoted particular attention toward understanding the associations between drug use and employment from adolescence to young adulthood.

Drug use behaviors are often shaped by key life events, or turning points, (Sampson & Laub, 1993; Teruya & Hser, in press), and patterns of drug use and dependence unfold and change over time (Hser, Longshore, & Anglin, 2007). Cessation and abstinence can occur and there is variation in the timing and frequency of events by type of drug used (Hser, Evans, Huang, Brecht, & Li, 2008). While substance use and dependence can alter the course of employment, employment can be a critical life event that changes substance abuse and criminal trajectories (Apel et al., 2007; Laudet & White, 2010; Sampson & Laub, 2005; Uggen, 2000). Early employment experience may have positive effects on the development of vocational identity and on overall adjustment (e.g., Bynner, 1998; Mortimer, 2003; Vondracek & Skorikov, 1997; Zimmer-Gembeck & Mortimer, 2006), but employment at a young age may also place adolescents at risk for drug use or other negative experiences (Fineran & Gruber, 2009; Wu et al., 2003), which can adversely impact educational attainment, social relationships, and life outcomes. The adverse impact of drug use on employment is well-established, but significant gaps in the literature remain.

Gaps in the Literature

Little is known about how employment patterns are impacted by drug use over longer periods of time and as drug-using behaviors change. Most studies on drug use and employment have been cross-sectional (e.g., Braun et al., 2000; Newcomb & Bentler, 1986; Wu et al., 2003; Zarkin et al., 1998), a research design poorly suited for detecting longitudinal dynamics. Furthermore, work done to date has examined at-risk populations (e.g., Alexandre & French, 2004; French et al., 2001; Wiesner et al., 2003) or focused on the transition from adolescence to early adulthood, tracking behaviors for no more than 10 years (e.g., Bryant et al., 1996; Christie-Mizell & Peralta, 2009; Ringel et al., 2006).

Much less is known about drug use and employment patterns among the general population and over longer periods of time, as individuals transition from adolescence, through early adulthood, and enter middle adulthood, and how these processes are different for men and women. A few studies have indicated that the impacts of drug use on employment are most apparent in the short-term, but relationships are inconsistent or nonsignificant when examined over longer periods of time (Bryant et al., 1996; Gill & Michaels, 1992; Kaestner, 1994; Zarkin et al., 1998). Findings such as these provide further evidence of the need for detailed analyses of trajectories of employment and health (McDonough & Amick, 2001).

Life Course Conceptual Framework

A life course perspective (Elder, 1998) conceptualizes human development as a lifelong process in which individual lives are influenced by their ever-changing historical context. Individuals construct their own life course through their choices and actions within the opportunities and constraints of history and social circumstance. Embeddedness in a

particular place and time shapes the way in which individual lives are lived. Behavioral patterns are dynamic and interactive, changing and influencing one another over time, and they are impacted by age differentiated, socially marked sequences of transitions. The developmental antecedents and consequences of life transitions, events, and behavioral patterns vary according to their timing in a person's life.

Early and middle adulthood are marked by the simultaneous emergence of several critical life experiences. During this time, choices and actions take place that are likely to have lifelong consequences, including educational attainment, employment opportunities, marital relationships, and familial commitments. Risky health behaviors, such as drug use, also emerge during this time and can impact or be impacted by the course of behaviors in other life domains.

Research Questions and Hypotheses

We aimed to investigate associations between employment patterns and drug use over 20 years from early to middle adulthood among a nationally representative sample of women and men. Working within a life course framework, the following research questions were examined: (1) Are there distinctive and heterogeneous employment trajectories for men and women? (2) What are the associations between distinctive employment trajectories and drug use behaviors for men and women? and (3) What associations exist between employment trajectories and marital status and childrearing over time for men and women? It was hypothesized that employment patterns would be heterogeneous for both men and women, that characteristics and drug use behaviors would be associated with employment patterns, and that gender differences in the factors that underlie employment patterns would be evident.

Method

Sample

The National Longitudinal Survey of Youth 1979 (NLSY79) is a nationally representative sample of 12,686 individuals who were 14-22 years old when first surveyed in 1979 (Center for Human Resource Research, 2006; see http://www.bls.gov/nls/ for more detailed information). Data were collected annually from 1979 to 1994 and biennially from 1996 to the present. Extensive information was gathered on labor market behaviors, educational experiences, and training investments over time. NLSY79 also contains information on family background, household composition, marital and fertility histories, number of children and their ages, childcare, criminal behavior, and substance use. Data from the 21 waves of the survey (1979-2004) are examined in the present study.

To ensure that each individual had sufficient observations needed to appropriately estimate employment trajectories over a 20-year period, this study includes 7,661 individuals (3,677 men and 3,984 women) who were followed up in 2004. Average age at Wave 1 (1979) was 17.5 among men and 17.6 among women. Race/ethnic distribution was similar by gender: approximately 50% white, 31% African American, and 19% Hispanic. At Wave 1 (1979), most had not yet completed high school (68.4% of men, 64.4% of women; average years of education was 10 for both groups) or ever married (94.9% of men, 85.3% of women).

Measures

The current study utilized data from 21 waves of the survey (1979-2004) to examine patterns of employment across ages and associated factors. Measures of employment, marital status, and number of children under age 5 across the 21 waves of the survey were temporally arranged based upon the participant's age at each interview. For instance, a

participant's measures of employment for age 23 were obtained from a corresponding interview wave at which the respondent was age 23. For a participant who was age 22 in 1979, the employment trajectory was estimated using the data obtained in years 1980 to 2000. Employment measures obtained before age 23 and after age 43 were not utilized for construction of employment trajectories. Participants who were missing a few time points were not dropped from the statistical modeling. Instead, assuming data were missing completely at random, their employment trajectories were estimated using all available data points from age 23 to age 43. Participants' gender and race/ethnicity were based on data from the first wave of the survey (1979). The following variables were repeatedly measured with multiple waves.

Employment the was behavior of interest. Percent of weeks worked per year was calculated by computing number of weeks worked each year divided by number of weeks in the year (52 weeks). Values ranged from 0% to 100%. To exclude periods characterized by part-time work, employment was examined over a 20-year period starting from age 23 and extending through age 43. It was expected that after age 23, individuals would engage in regular labor force participation. Most participants in NLSY79 had a 20-year observational period starting at age 23 based on data collected from 1979 to 2004.

Marital status—Subjects reported their marital status (yes or no) at each interview. Corresponding to the observation period of employment, marital status from ages 23 to 43 was examined.

Number of children—At each interview, subjects were asked to report number of biological and non-biological children, age of each child, as well as whether s/he was living in the household. Using a combination of information across the multiple waves of the survey, a measure of number of children under age 5 in each year was created. Corresponding to the observation period of employment, number of children under age 5 from ages 23 to 43 was examined.

Drug use—Subjects first recalled months of marijuana use from 1979 through 1983, and then reported drug use activities in years 1984, 1988, 1992, 1994, and 1998, respectively. Respondents reported detailed information on drug-use activities, including age of first drug use, frequency of drug use over the lifetime, number of times of drug use in the past 30 days, and whether the subject used a drug at work, and, if so, the number of times it was used at work. Measures of drug use activities varied across surveys. Based upon measures of drug use across the multiple waves, four measures were created to characterize lifetime drug use history (ever used drug, age at first drug use, drug use before age 15, and frequency of drug use) for marijuana, cocaine, crack, amphetamine, and heroin. Age at first drug use for each type of drug was only examined among subjects who ever used the specific drug.

Analyses

Growth mixture modeling (Muthén, 2004; Muthén et al., 2002; Nagin, 1999; Nagin & Land, 1993) was used to identify longitudinal patterns of employment over 20 years.1 Using Mplus 5.1 (Muthén & Muthén, 2007), separate models were estimated for women and men. Model selection was based on a reasonably low Bayesian Information Criterion (BIC) value (Schwartz, 1978), coupled with substantive considerations of interpretability and implications of distinguishable trajectories. Next, comparisons by trajectory group were conducted on education level, marital status, and number of children under age 5 as recorded by age 23, and lifetime drug use behaviors. Group differences were tested at $p < 0.05$ with Chi-square statistics for categorical variables and ANOVA or multivariate analysis (SAS PROC GLM) for continuous variables.

Results

Distinct Employment Trajectories among Women and Men

Five distinct employment trajectory groups were identified among men and five among women. Among men (Figure 1a): (1) 76.5% maintained a high level of employment (worked more than 80% of each year) over the entire 20-year time period (the "High" group); (2) 7.9% worked at low levels initially, but after age 25 employment steadily increased and a high level of employment was apparent after age 30 (the "Increase Early" group); (3) 4.2% had a relatively low level of employment for the first 10 years of observation followed by a significant increase in employment after age 32 (the "Increase Late" group); (4) 6.2% worked more than 60% per year during the first 10 years of observation and thereafter experienced a significantly decreased level of employment (the "Decrease" group); (5) 5.1% maintained a low level of employment, mostly working less than 20% of each year throughout the entire observation period (the "Low" group).

Among women, five employment trajectory groups were also identified and of these, four were similar to those identified among men and one was not. Using the definitions of trajectory groups noted above, 58.5% of women were included in the "High" employment group, 13.2% in the "Increase Early" group, 12.8% in the "Increase Late" group, and 7.3% in the "Decrease" group. Unique to women, a consistently "Low" group did not emerge and instead, 7.9% of women exhibited a "U-shaped" employment pattern. This group started with a high level of employment that continued through age 25, but then employment drastically decreased through age 33, followed by increasing levels of employment thereafter.

Participant Characteristics by Employment Trajectories

Characteristics of participants by employment trajectory group were analyzed for men and women (Table 1). Ethnic composition was significantly different by trajectory group for both genders. Among men, more whites than African Americans and Hispanics were in the High group (55.5% vs. 25.2%, 19.3%) and more African Americans were in the Increase Late (52.3%), Decrease (43.2%), and Low (55.6%) groups. Among women, whites accounted for the majority of all but one of the trajectory groups, i.e., more African Americans were in the Increase Late group (41.7%). Also, more African American and Hispanic women were members of the Increase Late or Increase Early groups than other trajectory groups.

Education level by age 23 was also different by employment trajectories for both genders. For men, the High or Increase Early employment trajectories were overrepresented by men

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[1]Growth mixture modeling consists of two major components: (1) an estimated trajectory given membership in each latent group and (2) an estimated posterior probability of each latent group membership given a pre-specified number of latent groups. In this analysis, employment at each age was measured by percent of weeks worked during each year. Employment trajectories were indicated by a curvilinear curve with intercept, slope, and quadratic parameters (latent growth factors) and were estimated with a mixture-censored normal model. The mixture-censored normal model assumed the target population was composed of a mixture of j trajectory groups with discrete censored normal distributions on percent of weeks worked during a year. The polynomial function was $y_{ijt} = I_{ij} + S_{ij}*age_{it} + Q_{ij}*age_{it}^2 + \varepsilon_{it}$; where i, j, t indicated subjects, trajectory group, and time, respectively. ε_{it} was a disturbance assumed to be normally distributed with zero mean and constant variance σ^2. y_{ijt} indicated the percent of week worked for subject i in group j at time t, respectively. y_{ijt} was censored by the minimum of 0 and maximum of 100. If estimate of y_{ijt} was less than zero, it assumed that observed y_{ijt} equaled to 0. Likewise, if estimate of y_{ijt} was greater than 100, it assumed that observed y_{ijt} equaled to 100. Age_{it} was age of subject i at time t. age_{it}^2 was the quadratic term of age_{it} . The latent growth factors I_j , S_j and Q_j estimated the shape of the trajectory for group j. The coefficient I_j indicated initial level of employment with variation among subjects. The coefficients S_j and Q_j indicated continuity of employment over time with an assumption of zero variance among subjects in group j. Probability of latent group variable (C) was estimated in a multinomial distribution. A posterior probability of membership in each group was computed for each subject. Comparing the posterior probability in each group, a subject was assigned to the group with the largest probability.

with higher educational attainment by age 23 and, in contrast, women with High and U-shape employment patterns showed higher educational attainment by age 23.

Most men and women had never been married by age 23. Nevertheless, marital status was different by distinct employment trajectory groups and the nature of these differences varied by gender. Percentage married was higher among men with Increase Late (26.5%) and High (21.9%) employment patterns and among women with Increase Early (49.9%) and Increase Late (38.5%) patterns. Never having been married was higher among men with Low (79.7%) and Increase Early (79.6%) employment patterns and among women in the Decrease (67.8%) and U-shape (62.8%) groups.

Similar to marital status, number of children under age 5 as recorded by age 23 was significantly different by employment trajectories for men and women. Overall, more women than men had young children (43.8% vs. 27.1%) and women had a greater number of children (0.7 vs. 0.4 children). Higher percentages of men with Increase Early (75.7%) and High (74.9%) employment trajectories and of women with U-shape (68.4%), High (65.2%), and Decrease (64.8%) employment trajectories had no young children (e.g., aged ≤ 5) by age 23.

Lifetime Drug Use History by Employment Trajectories

Prevalence of any drug use over the lifetime varied by employment group for men, but not for women. Among men, any drug use was higher in the Low (88.4%), Increase Late (88.2%), and Decrease (86.9%) employment trajectory groups.

When drug use was analyzed by type of drug used, marijuana was the most commonly used drug among both men and women and few other drug types had ever been used. For men, marijuana use was high across all employment trajectory groups, although the Increase Early group was characterized by a lower percentage of marijuana users (77.1%). Among women, there were no statistically significant relationships between marijuana use and employment patterns.

As for the other drug types, inconsistencies between use and employment patterns were observed, but, in general, lower levels of employment among men were associated with use of cocaine, crack, and heroin, whereas higher employment levels were associated with use of amphetamine. Similarly, use of these drugs among women was associated with the U-shape, Decrease, or Increase Late employment trajectories, and no use was associated with the High or Increase Early groups.

Notable percentages of men and women had used any drugs before age 15 (28.8% and 18.7%, respectively). Percentages of subjects with early drug use experiences were significantly different by employment group for men, but not for women. Men with Low or Decrease employment trajectories were more likely to report an early use of any drugs or of marijuana, cocaine, and crack. Fewer men in the High and Increase Early employment groups reported early drug use.

Significant percentages of men and women had used drugs 100 times or more (53.7% and 38.0%, respectively). Analysis focused on frequency of any drug use and of marijuana use since, as noted previously, few individuals had ever used drugs other than marijuana. Frequent use (100+times) of any drug was less likely to occur among men with High and Increase Early employment patterns, but more likely to occur among men with Decrease, Increase Late, and Low employment patterns. A similar pattern was evident among men for marijuana use. Among women, there were no statistically significant relationships between drug use frequency and employment trajectories.

Longitudinal Associations between Employment, Marriage, and Childrearing

Supplemental analyses were conducted to further explore long-term associations between employment, marriage, and childrearing. Marriage and number of children under age 5 were examined for each year corresponding to the 20-year observation period of interest. Analyses were conducted by employment trajectory group, for men and women separately.

Employment was positively associated with marriage among men (Figure 2a). The marriage rate was highest among men in the High employment trajectory group and it was lowest among men in the Low employment trajectory group, and this difference expanded as men aged. Based on estimates from the mixed model for marriage, parameters representing intercept and slope difference across the five employment groups were significant. High to Low group difference was 0.13 in intercept ($SE = 0.03$, $p < 0.01$) and 0.02 in slope ($SE = 0.003$, $p < 0.01$). Among women, patterns were also significantly different across employment groups ($p < 0.01$); the patterns generally indicated that as women aged and married, employment decreased (Figure 2b).

A negative association between childrearing and employment was also observed for women (Figure 3b), but not for men (Figure 3a). Trends of number of children under age 5 for women were significantly different across the five employment groups ($p < 0.01$). As best exemplified by the U-shape employment trajectory group unique to women, when number of young children increased, employment level decreased. A similar inverse relationship between employment and presence of young children was observed among the other trajectory groups for women.

Discussion

Summary of Findings

Several key findings resulted from this study. First, as hypothesized, distinctive 20-year employment trajectory groups were identified among men and women. Although most maintained a consistently high level of employment over time (76.5% of men and 58.8% of women) and employment patterns were often similar by gender, noteworthy gender differences were observed. In particular, more men worked at consistently high levels over the entire 20-year period, employment levels increased earlier in the life course of men, and a small but notable group maintained a low employment level. A significant proportion of women also had consistently high levels of employment, but, in contrast to men, more women increased employment later in life or returned to work after a period of no work during their prime childbearing years.

A second key finding is that significant relationships were evident between participant characteristics and 20-year employment patterns, and the nature of the relationships varied by gender. Of note, positive associations between employment and marriage became more salient for men over time, as did negative associations between employment and childrearing among women.

Finally, drug use behaviors were different by long-term employment patterns. In general, early-initiation drug users (before age 15), users of "hard" drugs, and frequent drug users were more likely to demonstrate persistent low levels of employment, and the negative relationship between drug use and employment was more apparent among men than women.

Implications

The diversity of employment patterns revealed by this study provides further evidence that employment status is often dynamic and mutable over time. There is significant

heterogeneity in life course employment patterns (Hynes & Clarkberg, 2005; Vandenheuvel, 1997) and this is evident for men and women and at entry into middle adulthood. A life course conceptual framework is useful for exploring the interactive and long-term effects of key life events (e.g., educational attainment, employment opportunities, marital relationships, and familial commitments) and their association with drug use and other risky health behaviors.

The gender differences in work patterns that this study identified are consistent with the literature. As women age and transition through their childbearing years, they are less likely than men to maintain uninterrupted levels of full-time employment. Some women delay or interrupt their working career to care for families and young children (Budig, 2003). Upon return to work, mothers are less likely than their male counterparts to attain equal employment or pay and this "motherhood penalty" is a testament to enduring gender inequities regarding social roles and labor participation (Budig & England, 2001; Dempsey, 2002; Gash, 2009; Hogan, Perrucci, Carolyn, & Behringer, 2005; Li & Currie, 1992; Lips & Lawson, 2009). Findings underscore the value of examining employment patterns, not just over a long period of time but also by gender.

The negative impact of drug use behaviors on employment patterns was most salient among men. This finding may be the result of men's higher levels of involvement with drugs and associated elevated risks of adverse employment consequences. Alternatively, differences in drug use and employment may be the result of gendered variations in social expectations. Men are more likely to be in the workplace and are thus subject to a greater risk of detection of drug use, whereas women are often subject to greater informal social control and may be more skilled at hiding drug use or regulating the impact of deviant behaviors on employment. More research is needed to understand why there are gender differences in the impacts of drug use on employment over the life course.

It may be that drug use at an early age is akin to a "fundamental cause" of adverse life outcomes, i.e., one that puts people "at risk of being at risk" (Link & Phelan, 1995) for a range of unhealthy behaviors, including poorer employment trajectories. Developmental neuroscience research has revealed that by about age 15, cognitive functioning is fully developed but the area of the brain that controls socio-emotional regulation continues to mature for approximately another 10 years (Steinberg, 2007; 2010). Processes are complex and heterogeneous, however, and are best understood within a longitudinal framework. For example, recent research on marijuana as a gateway drug that facilitates use of other drugs reported that any causal influence of teen marijuana use on other illicit substance use is contingent upon employment status and is short-term (Van Gundy & Rebellon, 2010). More research is needed on the short- and long-term effects of drug use, particularly early drug use, on brain development and functioning as well as on educational attainment and employment. In the meantime, findings from the current study support the need for the broadening of policy and practice efforts beyond drug use prevention to include focus on delaying the onset of first drug use.

It is also important to note that findings are situated in a particular socio-historical context. As subsequent generations enter the workforce, drug use behaviors that delay, interrupt, or otherwise impact transitions to adult social roles are likely to be of enduring salience. However, as there are changes in the context in which drug use behaviors play out, their impacts on employment may also change. For example, as changes occur in gendered roles regarding employment and childrearing or in educational attainment by race/ethnicity, it can be expected that differences in associations between drug use and employment patterns will also change. Similarly, drug use behaviors themselves vary across generations (e.g., the recent increased use among youth of drugs other than marijuana including

methamphetamine, club drugs, prescription opioids), perhaps resulting in differential impacts on longitudinal employment patterns. As a final example, emerging adulthood (age 18-25) has been recognized as a distinct period in the life course among recent generations (Arnett, 2000). Between adolescence and adulthood, emerging adults are characterized by continued identity exploration and the assumption of adult social roles at an older age. A society populated by individuals who experience a period of emerging adulthood may be one in which, due to drug use or other experiences, it is more commonplace for persons to experience employment transitions or to settle into a career later in life. In this sense, future generations may be better able to "recover" from unhealthy choices made in youth and minimize the impact of such choices on lifelong employment patterns.

The current study examined patterns through age 43, leaving approximately 20 more years of employment until typical retirement age. Middle to late adulthood is a time when health behaviors tend to "catch up" with individuals and impacts on daily functioning begin to occur. It is also a time when individuals may mature out of particular behaviors (e.g., drug use) or experience turning points (e.g., "mid-life crisis," children attaining adulthood and the arrival of grandchildren, divorce and remarriage, death of loved ones) that can dramatically alter the course of multiple behavioral trajectories. As for employment patterns, changes in these later years may be associated with accumulated wealth and capacity to provide for oneself after retirement. Within this context, one might expect individuals with adequate accumulated wealth to exhibit decreasing patterns of employment, whereas patterns would be revered among those with insufficient resources. Future research would benefit from examining not just weeks worked or personal income but also other indicators of wealth and its relative meaning in changing economic times, such as household resources, home ownership, economic hardship, job insecurity, and cost of living.

To our knowledge, this study is the first to examine the impact of drug use on employment among a general population sample and over an unprecedented 20-year period of time. Findings support and extend current knowledge regarding longitudinal relationships between drug use and employment as individuals transition from school graduation or commencement of work career (i.e., the prime years for employment preparation but also for risk behaviors) into the early- and middle-work career (i.e., the prime income-earning and childrearing years). Despite the strengths of the study, there are some notable limitations. First, the study utilized the subset of the NLSY79 cohort with 2004 follow-up data. As a result of this selection, the study sample, in contrast to the NLSY79 cohort, consisted of more females (52% vs. 49.5%), more minorities (31% African American and 19% Hispanic vs. 25% African American and 16% Hispanic), and younger subjects (17.6 vs. 17.9 years old in 1979). The over-representation of African Americans and Hispanics groups may thus limit the generalizability of findings; however, differences between the 1979 and 2004 cohort were slight and thus potential limitations are expected to be minor. Second, measures of drug use were collected from self-report of participants. The reliability of measures may be undermined due to recall bias on drug use over a long time period. However, an examination of the self-report stability of adolescent substance use in the NLSY79 data (Shillington & Clapp, 2000) showed that report agreement was over 80% for lifetime use for each substance. Furthermore, the application of the computed-assisted personal interview system (CAPI) to inquire about sensitive questions starting in the 1993 survey also significantly improved the reliability of the self-report measures. Third, repeated measures of some drug types, including cocaine, crack, methamphetamine, and heroin were incomplete across the multiple waves of data collection. Thus, correlations between longitudinal trajectories of each type of drug use and employment were not examined and constitute an area for future research. Also not examined were the quality and meaningfulness of social relationships or attitudes toward the integration of work with familial responsibilities. For example, one study reported that although marriage reduced the

odds of drug use for men, it was the importance or strength of a relationship that altered illicit drug use for women (Thompson & Petrovic, 2009). Other studies have reported that egalitarian family roles for women and men are positively linked to women's full-time employment and independent living (e.g., Cunningham, Beutel, Barber, & Thornton, 2005). Finally, additional research is needed to determine whether findings endure with other data sets, different drug types, and over time.

Conclusion

As people age and transition through different life stages, changes occur in behaviors that significantly impact employment. Clearly, drug use behaviors and employment experiences shape one another in a reciprocal manner. Processes are dynamic and complex, suggesting that throughout the life course, protective factors that reduce the risk of employment problems emerge and change, as do critical periods for maximizing the impact of drug prevention and intervention efforts.

Acknowledgments

Biographical Sketches

David Y. C. Huang, Dr.P.H., is a Senior Statistician at the UCLA Integrated Substance Abuse Programs. He provides statistical support on several longitudinal studies examining risk behaviors of drug abusers. He is responsible for planning and conducting all data management and statistical analysis, especially in choosing appropriate methods for multivariate analysis.

Elizabeth Evans, M.A., is a Project Director at the UCLA Integrated Substance Abuse Programs, where she currently directs a longitudinal follow-up study of substance-abusing mothers and their children and contributes to the Center for Advancing Longitudinal Drug Abuse Research (CALDAR). Her interests include health services utilization and outcomes among substance-abusing offenders and longitudinal substance abuse research.

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Robert E. Weiss, Ph.D., is Professor of Biostatistics in the UCLA School of Public Health. His biostatistical research areas include Bayesian methods and longitudinal data. He is author of *Modeling Longitudinal Data* (Springer-Verlag, 2005). He has substantial experience analyzing longitudinal self-reported behavior data, particularly from studies of people living with HIV.

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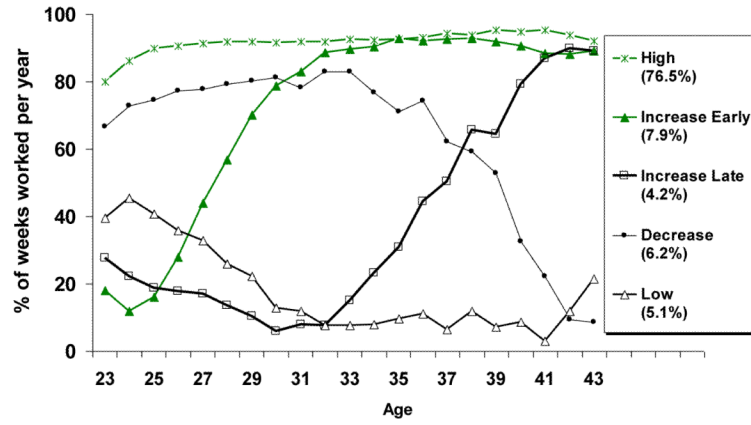
Fig. 1a.
Employment Trajectories Over 20 Years Among Men (n=3,677)
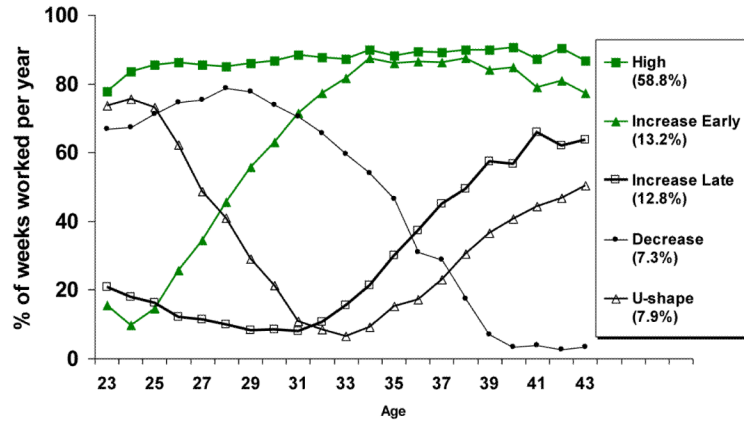
Fig. 1b.
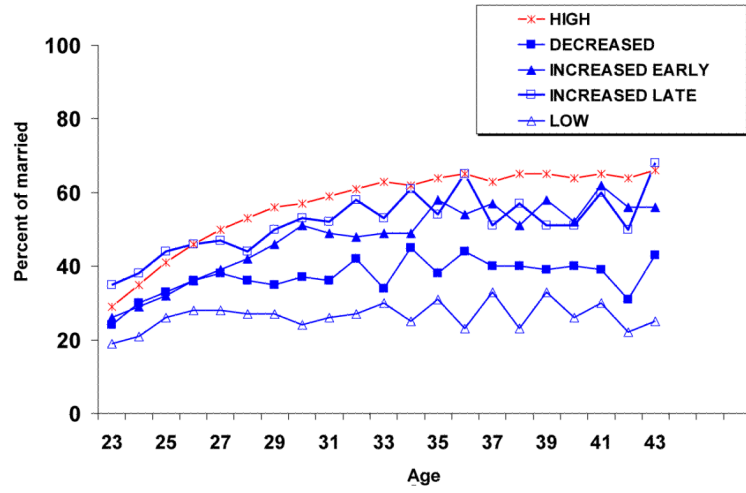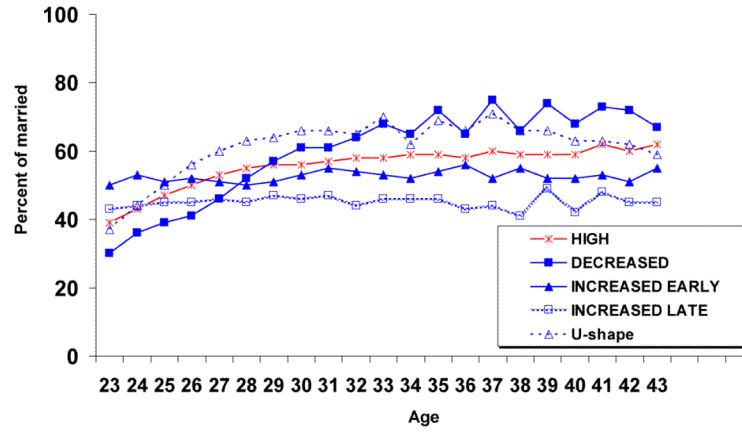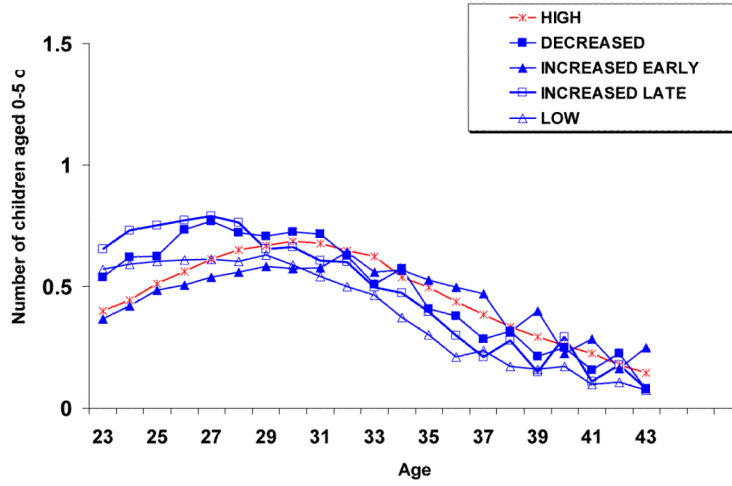Employment Trajectories Over 20 Years Among Women (n=3,984)
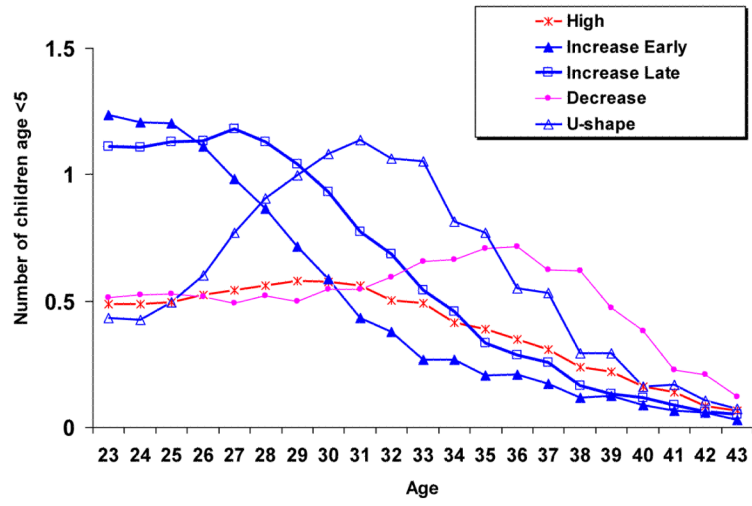
Fig. 2a.
Marriage among men by 20-year employment trajectory group

Fig. 2b.
Marriage among women by 20-year employment trajectory group

Fig. 3a.
Childrearing among men by 20-year employment trajectory group

Fig. 3b.
Childrearing among women by 20-year employment trajectory group

Table 1

Participant characteristics by employment trajectory group.

	Male						Female					
	High N=2,814 (76.5%)	Increase Early N=292 (7.9%)	Increase Late N=153 (4.2%)	Decrease N=229 (6.2%)	Low N=189 (5.1%)	Total N=3,677	High N=2,342 (58.8%)	Increase Early N=525 (13.2%)	Increase Late N=511 (12.8%)	Decrease N=290 (7.3%)	U-shape N=316 (7.9%)	Total N=3,984
Race/Ethnicity (%)	$\chi^2_8 = 181.4$ p < 0.001						$\chi^2_8 = 106.1$ p < 0.001					
White[1]	55.5	42.1	31.4	39.3	21.7	50.7	53.7	41.0	33.1	57.6	57.3	49.9
African American	25.2	41.4	52.3	43.2	55.6	30.3	28.9	36.8	41.7	26.6	22.5	30.9
Hispanic	19.3	16.4	16.3	17.5	22.8	19.0	17.5	22.3	25.2	15.9	20.3	19.2
Highest education by age 23 (%)	$\chi^2_8 = 118.0$ p < 0.001						$\chi^2_8 = 375.4$ p < 0.001					
Less than high school	11.0	5.1	11.1	23.6	27.5	12.2	4.2	12.0	26.8	10.3	11.7	9.2
High school/GED	45.5	44.9	43.8	52.8	48.2	45.9	37.3	50.3	47.2	40.7	41.1	40.8
Some college	43.5	50.0	45.1	23.6	24.3	41.9	58.5	37.8	26.0	49.0	47.2	50.0
Years of education, Mean (SD)	13.2 (2.5)	13.8 (2.8)	12.9 (2.5)	12.0 (2.1)	12.1 (2.1)	13.1 (2.5)	13.9 (2.4)	12.7 (2.3)	11.8 (2.5)	13.4 (2.5)	13.2 (2.5)	13.4 (2.5)
Marital status by age 23 (%)	$\chi^2_8 = 23.4$ p = 0.003						$\chi^2_8 = 105.8$ p < 0.001					
Married	21.9	15.9	26.5	18.7	15.8	21.1	32.5	49.9	38.5	26.9	28.5	34.8
Never married	74.9	79.6	66.0	75.6	79.7	75.2	61.3	39.9	51.9	67.8	62.8	57.9
Divorced/separated/widowed	3.2	4.6	7.5	5.8	4.5	3.7	6.1	10.2	9.6	5.3	8.7	7.3
Children aged ≤5 by age 23 (%)	$\chi^2_8 = 45.3$ p < 0.001						$\chi^2_8 = 439.8$ p < 0.001					
0	74.9	75.7	60.1	62.5	61.4	72.9	65.2	24.8	34.5	64.8	68.4	56.2
1-2	23.9	23.0	38.6	35.8	37.0	25.9	33.0	66.9	57.9	32.1	29.1	40.3
3+	1.2	1.4	1.3	1.7	1.6	1.2	1.8	8.3	7.6	3.1	2.5	3.5
Mean (SD)	0.3 (0.7)	0.3 (0.7)	0.6 (0.8)	0.5 (0.9)	0.6 (0.8)	0.4 (0.7)	0.5 (0.8)	1.2 (0.9)	1.1 (1.0)	0.5 (0.8)	0.4 (0.7)	0.7 (0.9)

[1] Includes mixed ethnicity

Table 2

Drug use behaviors by employment trajectory group.

	Men						Women					
	High N=2,814 (76.5%)	**Increase Early** N=292 (7.9%)	**Increase Late** N=153 (4.2%)	**Decrease** N=229 (6.2%)	**Low** N=189 (5.1%)	**Total** N=3,677	**High** N=2,342 (58.8%)	**Increase Early** N=525 (13.2%)	**Increase Late** N=511 (12.8%)	**Decrease** N=290 (7.3%)	**U-shape** N=316 (7.9%)	**Total** N=3,984
Ever use, %												
Any drug	$\chi^2_4 = 13.4$ p = 0.009						$\chi^2_4 = 4.9$ p = 0.29					
	82.3	79.1	88.2	86.9	88.4	82.9	71.4	69.9	67.1	73.1	72.2	70.8
Marijuana	$\chi^2_4 = 13.8$ p = 0.008						$\chi^2_4 = 7.6$ p = 0.11					
	81.6	77.1	87.6	86.0	86.8	82.0	70.3	69.0	64.4	71.4	70.3	69.4
Cocaine	$\chi^2_4 = 23.5$ p < 0.001						$\chi^2_4 = 23.9$ p < 0.001					
	45.6	42.5	47.1	60.7	51.9	46.7	30.4	23.8	27.2	37.2	35.8	30.0
Crack	$\chi^2_4 = 132.1$ p < 0.001						$\chi^2_4 = 14.8$ p = 0.005					
	11.7	13.4	19.0	30.1	35.5	14.5	6.6	8.0	12.1	7.9	12.3	8.1
Amphetamine	$\chi^2_4 = 12.2$ p = 0.02						$\chi^2_4 = 25.8$ p < 0.001					
	20.3	21.9	19.0	17.5	10.6	19.7	17.1	13.5	12.5	19.7	19.9	16.5
Heroin	$\chi^2_4 = 33.3$ p < 0.001						$\chi^2_4 = 12.9$ p = 0.011					
	8.1	8.6	13.1	11.8	19.6	9.2	4.1	5.0	6.1	5.5	8.2	4.9
Drug use before age 15, %												
Any drug	$\chi^2_4 = 42.8$ p < 0.001						$\chi^2_4 = 4.3$ p = 0.37					
	26.6	28.8	38.6	41.1	40.2	28.8	17.8	20.6	19.4	18.3	21.5	18.7
Marijuana	$\chi^2_4 = 39.4$ p < 0.001						$\chi^2_4 = 3.5$ p = 0.48					
	26.1	27.7	37.9	39.3	39.7	28.3	17.5	20.4	19.4	17.9	19.9	18.4
Cocaine	$\chi^2_4 = 13.9$ p = 0.008						$\chi^2_4 = 2.5$ p = 0.64					
	1.6	2.7	2.6	3.5	4.8	2.0	0.9	1.5	1.0	1.0	1.6	1.1

	Men						Women					
	High N=2,814 (76.5%)	Increase Early N=292 (7.9%)	Increase Late N=153 (4.2%)	Decrease N=229 (6.2%)	Low N=189 (5.1%)	Total N=3,677	High N=2,342 (58.8%)	Increase Early N=525 (13.2%)	Increase Late N=511 (12.8%)	Decrease N=290 (7.3%)	U-shape N=316 (7.9%)	Total N=3,984
Crack	$\chi^2_4 = 3.9$ p $= 0.42$						$\chi^2_4 = 3.7$ p $= 0.45$					
	0.3	0.7	0.0	0.4	1.1	0.4	0.1	0.2	0.4	0.0	0.3	0.2
Amphetamine	$\chi^2_4 = 1.8$ p $= 0.77$						$\chi^2_4 = 2.8$ p $= 0.58$					
	1.7	2.7	2.0	2.2	2.1	1.9	1.4	1.7	1.0	1.0	2.2	1.4
Heroin	$\chi^2_4 = 1.9$ p $= 0.76$						$\chi^2_4 = 3.1$ p $= 0.53$					
	0.5	0.7	0.7	0.9	1.1	0.5	0.2	0.6	0.2	0.0	0.3	0.3
Frequency of use in lifetime												
Any drug, %	$\chi^2_{12} = 23.4$ p $= 0.02$						$\chi^2_{12} = 17.9$ p $= 0.12$					
Never	17.0	19.9	11.8	11.8	11.7	16.4	27.8	29.3	31.7	26.2	26.6	28.3
1-39 times	16.4	15.4	17.6	17.0	14.8	16.3	20.2	22.3	21.0	17.6	20.6	20.6
40-99 times	14.0	13.4	11.1	8.3	14.8	13.5	14.3	13.7	9.8	12.1	12.0	13.3
100+ times	52.6	51.4	59.5	62.9	58.7	53.7	37.8	34.7	37.6	44.1	40.8	38.0
Marijuana, %	$\chi^2_{12} = 27.0$ p $= 0.007$						$\chi^2_{12} = 16.1$ p $= 0.19$					
Never	17.0	19.9	11.8	11.8	11.7	16.4	27.8	29.3	31.7	26.2	26.6	28.3
1-39 times	18.1	18.1	20.3	19.7	16.9	18.2	22.3	23.4	24.5	20.3	22.8	22.6
40-99 times	15.6	15.4	11.1	9.2	14.3	15.0	16.1	15.8	11.0	14.8	14.6	15.2
100+ times	49.3	46.6	56.9	59.4	57.1	50.4	33.8	31.4	32.9	38.6	36.1	33.9