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## The Association between Social Stressors and Drug Use/ Hazardous Drinking among Former Prison Inmates

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### Abstract

Social stressors are associated with relapse to substance use among people receiving addiction treatment and people with substance use risk behaviors. The relationship between social stressors and drug use/hazardous drinking in former prisoners has not been studied. We interviewed former prisoners at baseline, 1 to 3 weeks post prison release, and follow up, between 2 and 9 months following the baseline interview. Social stressors were characterized by unemployment, homelessness, unstable housing, problems with family, friends, and/or significant others, being single, or major symptoms of depression. Associations between baseline social stressors and follow-up drug use and hazardous drinking were analyzed using multivariable logistic regression. Problems with family, friends, and/or significant others were associated with reported drug use (AOR 3.01, 95% CI 1.18–7.67) and hazardous drinking (AOR 2.69, 95% CI 1.05–6.87) post release. Further research may determine whether interventions and policies targeting social stressors can reduce relapse among former inmates.

### Keywords

social support; drug use; hazardous drinking; former prisoners; former inmates

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## 1. Introduction

### 1.1. Drug Use among Incarcerated Populations

Drug and alcohol use disorders are substantially more prevalent among the incarcerated population as compared to the general population (Mumola and Karberg, 2006; Karberg and James, 2005). Availability of drugs and alcohol in the prison setting is limited. This may lead to elective or unintentional abstinence among inmates and a reduced physiological tolerance, increasing the risk of a drug or alcohol related overdose death (Binswanger et al., 2007; Farrell and Marsden, 2008; White and Irving, 1999; Zlodre and Fazel, 2012). Former prison inmates face the highest risk of death due to drug overdose in the immediate post release period (Binswanger et al., 2007; Farrell and Marsden, 2008; Kariminia et al., 2007; Merrall, et al., 2010). Previous qualitative work has identified themes which lead to drug and alcohol relapse among recently released prison inmates. A lack of social support, medical co-morbidities, and limited economic resources were identified as stressors contributing to relapse. Family support, drug treatment programs, spirituality or religiousness, and access to community resources were identified as protective factors in avoiding drug and alcohol relapse (Binswanger et al., 2012). Using quantitative data, we aimed to examine factors associated with drug use and hazardous drinking among former prison inmates during the first 2 to 9 months following prison release.

### 1.2. Homelessness and Unstable Housing

Social stress is characterized by an acute negative life event, chronic life strains, or trauma (Thoits, 2010). Social stressors, such as homelessness and unstable housing, are associated with alcohol and drug use. Homelessness and drug use have been shown to be highly correlated and are often concurrent (Rachlis et al., 2009). Studies that examined behaviors of at-risk youth demonstrated that crack cocaine use and injection drug use were associated with homelessness (Kerr et al., 2009; Wenzel et al., 2004). Among runaway and homeless youth, increased duration of homelessness was shown to be associated with a higher risk for a substance use disorder (Kipke et al., 1997). Women living in homeless shelters have a greater prevalence of binge drinking, alcohol dependence, drug use, and drug dependence as compared to women in low income housing (Henkel, 2011). Conversely, alcohol and drug use can contribute to unstable housing or homelessness. Among recently homeless adults in Amsterdam, homelessness due to an eviction was associated with having more extreme alcohol problems, while homelessness due to relationship conflicts was associated with having a drug problem (Van Laere et al., 2009).

### 1.3. Unemployment

Social stress in the form of unemployment also plays an important role in drug and alcohol relapse. A systematic review of the literature shows higher rates of substance abuse among the unemployed as compared to the employed (Henkel, 2011). Unemployed individuals were more likely to consume excessive amounts of alcohol, use illicit and prescription drugs, and develop a dependence on alcohol and illicit drugs, as compared to employed individuals (Henkel, 2011). National survey data spanning 15 years demonstrated that unemployment was associated with increased frequency of heavy drinking, described as consuming 5 or more drinks at a time (Lo and Cheng, 2013). A Russian study found that

working-age men who were unemployed and seeking work had higher levels of both alcohol consumption and alcohol related problems than men in regular paid employment (Cook et al., 2011). Abstinence from drugs is associated with employment and, among drug users, unemployment is common (McCoy, 2007; Platt, 1995). Former inmates have a variety of characteristics which limit their employability, including little education and minimal work experience (Travis et al., 2001; Hirsch et al., 2002). Moreover, ex-prisoners are legally barred from working in certain occupations and many employers are reluctant to hire former inmates with past criminal records (Hahn, 1991; Holzer et al., 2003). Due to these factors, inability to find employment among recently released prison inmates may further increase their risk of drug and alcohol relapse in the post-release period.

#### 1.4. Marital Status

Relationship status among women with children is associated with the perception of one's social support and mental health. A secondary data analysis of a National US Population Health Survey showed that single mothers report higher levels of chronic stress, more negative life events, less perceived social support, fewer contacts with friends and family, and lower levels of social involvement than married mothers (Cairney et al., 2003). Additionally, rates of depression were more than double among single mothers as compared to married mothers (Cairney et al., 2003). Data from the British National Survey of Psychiatric Morbidity showed that social stress, poverty, and depressive disorders clustered in single mothers (Targosz et al., 2003). In a cohort of >10,000 subjects, single mothers were significantly more likely to report psychological distress, in the form of financial hardship, lack of social support, and lack of employment, than married mothers (Hope et al., 1999). Results from a Canadian community health survey revealed that single mothers, when compared to married or cohabitating mothers, had a higher prevalence of substance dependence and mood disorders, including major depressive disorder, mood and anxiety disorders (Wade et al, 2011). Similarly, single fathers had a higher prevalence of mood disorders and substance dependence when compared to married or cohabitating fathers (Wade et al, 2011).

#### 1.5. Interpersonal Relationships

Social networks, in the form of negative or positive interactions, play an important role in drug and alcohol use behaviors. Associating with family and friends who use substances increases the risk of drug and alcohol misuse (Tiffany et al., 2012). An analysis of a large social network of individuals followed for over thirty years found that people are 50% more likely to drink heavily (>1 drink/day for women and >2 drinks/day for men) when they are surrounded by friends or relatives who drink heavily (Rosenquist et al., 2010). In a longitudinal study of current and former injection drug users, having peers who use drugs in one's social network was strongly associated with continued drug use (Schroeder et al., 2001). Former inmates may be at a higher risk of future drug use/hazardous drinking when compared to non incarcerated individuals because incarceration can introduce inmates into high-risk networks characterized by drug trade and use (Freudenberg, 2001; Moore, 1996). The lack of positive social support during the transition period of prison release has been associated with substance use relapse (Andrews and Dowden, 2006; Mooney et al., 2008; Schroeder et al., 2007). In former inmates, we examined the relationship between feeling

bothered by relationship problems, a proxy for a lack of social support and social stress, and drug and alcohol use following prison release.

Among non incarcerated populations, problems with functioning in marital, parental, and family roles, also described as “impaired psychosocial functioning”, have been associated with a range of drug and alcohol use disorders (Ghitza et al., 2007; Hasin et al., 2007; Compton et al., 2007; Grant et al., 2004; Fergusson et al., 2002). Patients who report more stressful relationships with their spouses or partner at the time of substance abuse treatment entry are more likely to continue to drink and experience substance use problems following treatment completion (Tracy et al., 2005). Supportive social networks, such as low conflict relationships with family and friends, healthy partnerships with significant others, and strong family cohesion is protective for continued abstinence in substance users (Beattie and Longabaugh, 1999; Bond et al., 2003; Walitzer and Dearing, 2006; Heinz et al., 2009; Scott et al., 2010). Higher levels of marital satisfaction are associated with longer drug and alcohol free periods (Beattie, 2001; McCrady et al., 2002, 2004). In a study of men with past alcohol abuse, marriage was protective against alcohol relapse (Heinz et al., 2009). Similarly, among men and women with past heroin and cocaine use, marriage and close personal relationships predicted a greater decrease in drug use over time, relative to being single or separated (Dearing, 2006). Among patients who completed short-term inpatient drug and alcohol treatment, abstinence support at home was protective in maintaining sobriety (Broome et al., 2002). Perceived problems with family, friends, or significant others may lead to an increased risk of drug and alcohol use among former prison inmates recently released from prison due to a lack of positive social support networks.

## 1.6. Mental Health Problems

Depression and drug and alcohol use are often comorbid conditions. The results of a large epidemiological survey showed that the lifetime odds of alcohol dependence was 3 times higher for men and 4 times higher for women with major depression as compared to non depressed adults (Kessler, 1997). A national longitudinal study demonstrated that, among individuals with major depression, 32.5% met criteria for a lifetime diagnosis of alcohol dependence (Grant and Harford, 1995). Similarly, a national survey of the US adult population found that drug use disorders and major depressive disorders were highly associated (AOR 2.2) (Compton et al., 2007). Among patients who completed alcohol treatment, having ongoing depressive symptoms was associated with subsequent alcohol relapse (Radloff, 1997; McDowell and Newell, 1996). The association between depression and relapse to drugs, including cocaine and opioids, is less clearly defined. A study which examined the impact of depression on relapse to illicit drug use, including cocaine, heroin, or benzodiazepines, found no significant effect of depression on relapse at a 3-month follow up as compared to non drug users (Miller et al., 1999). Another study which examined relapse to opioid use among individuals with and without a current major depressive episode found no significant association between opioid relapse and the depressive episode during the follow up period (Kosten et al., 1986). Mood disorders, including current or past major depressive disorder, are highly prevalent among incarcerated persons (Schnittker et al., 2012). A nationwide survey of US prisons and jails found that 26% of jail inmates in 2002 had at least one previously diagnosed mental health condition before being incarcerated

(Wilper et al., 2009). A systematic review of the literature estimated 10% of male prisoners and 12% of female prisoners were diagnosed with major depression (Fazel and Danesh, 2002). Given the high prevalence of mood disorders among prisoners, we sought to assess the association of major depressive symptoms with relapse to drugs and alcohol.

Recently released prison inmates are at high risk of a death related to drug overdose upon prison release (Binswanger et al., 2007; Farrell and Marsden, 2008; Kariminia et al., 2007; Merrall et al., 2010). Our study extends the current literature by examining factors that were associated with drug use and hazardous drinking among former prison inmates. Hazardous drinking was determined by using questions taken from the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) questionnaire, a 3-item alcohol screen that reliably identifies hazardous drinking behaviors (Bradley et al., 2007). Various social stressors have been shown to be associated with drug and alcohol relapse among individuals with past substance use disorders. We used proxies of social stressors to identify factors associated with drug use and an active alcohol use disorder among recently released prison inmates. These proxies included homelessness, unstable housing, unemployment, negative interactions with family, friends, or significant others in the form of perceived problems in relationships, and being single (not married or part of a relationship). Lastly, we sought to identify the relationship between depressive symptoms and drug and alcohol use among former prisoners following prison release because symptoms of depression are likely exacerbated by the social stressors identified in this study. Understanding risk factors associated with drug use and hazardous drinking among former prisoners may inform programs and policies to protect future inmates at risk of relapse following prison release.

## 2. Materials and Methods

### 2.1. Study Design

This prospective cohort study involved in-person, structured interviews with 200 former inmates recruited between 1 and 3 weeks post prison release. Participants could complete the follow-up interview between two and nine months following the baseline interview, but follow-up was scheduled as closely as possible to three months post baseline interview. Our follow-up included 155 participants (78% retention). The study was approved by the Colorado Multiple Institutional Review Board. A Federal Certificate of Confidentiality was obtained.

### 2.2. Study Participants

The study included inmates released from the Colorado Department of Corrections (CDOC) to the Denver area. Recently released prison inmates were recruited between November 2010 and February 2012 from correctional facilities, a parole office, a community re-entry program, the offices of Treatment Accountability for Safer Communities (TASC), from social service providers in the Denver area, and by word of mouth. Eligibility criteria were 1) released from prison within the last 1 week to 3 weeks, 2) age 18 years and older, 3) able to speak and comprehend English, and 4) no plans to leave the Denver area in the subsequent 3 months. Former inmates who 1) were paroled, 2) were not paroled, and 3)

were under intense supervision, *i.e.*, were required to wear an electronic tracking device, were included.

Exclusion criteria included 1) less than 18 years of age, 2) former inmates released from county jail rather than prison, and 3) former inmates who were on “current inmate status”. “Current inmate status” refers to individuals who were released into community corrections under locked confinement during part of the day or night.

### 2.3. Independent variables

*Socio-demographic information* (race/ethnicity, age, marital status) was assessed using questions from the Behavioral Risk Factor Surveillance System, 2010 (Centers for Disease Control and Prevention, 2010). Participants reported their gender.

Questions about *depressive symptoms* were assessed using the Patient Health Questionnaire-9 © (PHQ-9), a validated depression scale (Patient Health Questionnaire-9, 1999; Kroenke et al., 2001). The PHQ-9 queries the following: 1) level of interest or pleasure in doing things, 2) feelings of depression or hopelessness, 3) sleep hygiene, energy level, and appetite, 4) feeling down on oneself, feeling like a failure to oneself or to one’s family, 5) (in)ability to concentrate, 6) feelings of restless, and 7) thoughts of hurting oneself. Questions are scored on a scale of 1–27. Minimal depression is scored 1–4, mild depression is scored 5–9, moderate depression is scored 10–14, moderately severe depression is scored 15–19, and severe depression is scored 20–27 (Patient Health Questionnaire-9, 1999). The association between mental health disorders and drug use is well established, thus we also assessed depressive symptoms as a proxy for mental health disorders.

*Social stressors* were defined as 1) being bothered by perceived problems with family, friends and/or significant others, 2) being unemployed, 3) being single, 4) being homeless, 5) having unstable housing and 6) having symptoms of major depression. Questions addressing the number of problems a participant had with family, friends and/or significant others, how bothered they were by these problems in the past 30 days, and the number of paid days worked in the past 30 days (employment status) were taken from the Addiction Severity Index (ASI) questionnaire (McLellan et al., 1992). The ASI is a widely used instrument to assess the severity of problems related to substance use. The index assesses problems in six potential problem areas: medical, employment/support, alcohol and other drug use, legal, family/social, and psychiatric (Butler et al., 2001). Specific questions regarding the potential problem areas can be answered by addressing “how bothered” the participant is on a scale which ranges from 0 (not at all) to 4 (extremely bothered). We dichotomized our results as being moderately, considerably or extremely bothered by family problems versus being not at all bothered or slightly bothered by family problems (see Table 1) (McLellan et al., 1992). The combination of scores taken from each of the problem areas resulted in a general measure of patient status in each area (ASI: Composite Score Manual, 1986).

*Employment status* was assessed using the question, “How many days were you paid for working in the past 30 days, including work ‘under the table’, paid sick days, and vacation

days?”. If the former inmate worked 1 or more days, we considered them to have been employed. We dichotomized number of problems experienced with family members, sexual partners, or spouses in the past 30 days as zero problems versus one or more problems.

Former inmates' *living situation* was assessed using two different questions resulting in two separate variables. Self-reported homelessness was dichotomized yes/no based on the participant's response to “Do you consider yourself to be homeless.” Based on the response to that question, the former inmates were asked to describe their current housing situation. If the former inmate lived in their own house or an apartment, or someone else's house or apartment, their living situation was described as housed. If the former inmate lived in a motel, hotel, halfway house, or a boarding or rooming house, their living situation was described as unstable. If the former inmate lived in a shelter, on the streets, in an abandoned building, vacant lot or car, their living situation was described as homeless. All information describing baseline sociodemographic and clinical characteristics, including gender, age, race/ethnicity, and depressive symptoms, with the intent to identify major depressive symptoms as compared to none, minimal, or mild depressive symptoms, was obtained during the initial post release survey administered between 1 week and 3 weeks following prison release.

#### 2.4. Dependent Variables

Data for our dependent variables, 1) *any past 30 day drug use* (cocaine/crack, heroin, methamphetamines, or illicit use of pharmaceutical opioids, benzodiazepines, stimulants) or 2) *hazardous drinking in the past 30 days*, were obtained from a second survey taken approximately three months post baseline interview. Drug use and hazardous drinking were not mutually exclusive; participants could exhibit both drug use and hazardous drinking behaviors. Questions about drug use in the past 30 days were taken from the ASI (McLellan et al., 1992). Information about hazardous drinking was determined by using questions taken from the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) questionnaire, a 3-item alcohol screen that reliably identifies hazardous drinking behaviors (Bradley et al., 2007). Three questions were asked, “How often do you have a drink containing alcohol?”, “How many standard drinks containing alcohol do you have on a typical day?”, and “How often do you have six or more drinks on one occasion?” Questions were scored on a scale of 0–12. In men, a score of 4 or more was considered positive to identify hazardous drinking or active alcohol use disorders; in women, 3 or more was considered positive (AUDIT-C). This questionnaire was validated against the full AUDIT questionnaire in incarcerated women and in three different racial/ethnic groups, including Whites, African Americans, and Hispanics (Caviness et al., 2009; Frank et al., 2008).

#### 2.5. Statistical Analyses

Univariable analyses were conducted using chi-square tests or Fisher's exact tests for categorical variables and Wilcoxon tests for continuous variables. We examined differences in the following characteristics between participants who used drugs or demonstrated hazardous drinking as compared to participants who did not: 1) sociodemographic characteristics, 2) the presence of depressive symptoms, 3) homelessness, 4) insecure

housing, 5) the presence and number of problems with family, friends, and/or significant others, and 6) how bothered they were by the presence or absence of these problems.

Variables were included in the multivariable analyses if the  $p$ -value on univariable testing was  $<0.25$  (Hosmer and Lemeshow, 2000). To derive the final multiple logistic regression models for 1) *drug use* or 2) *hazardous drinking*, variables were removed using backward elimination until all  $p$ -values were  $<0.05$ . Backward elimination is an iterative variable-selection procedure in which the least significant predictor in the model is eliminated sequentially (Tanaka and Kodake, 1981). At each step, estimates were checked to make sure other variables were not largely affected by dropping the least significant variable. We removed each variable with the smallest F-statistic until our model only contained those variables that reached statistical significance. The advantage of using the backward elimination method is that each independent variable can be assessed in the model before removing significant variables which are not significant (Hocking, 1976; Miller, 2002). Our final models included 1) the dichotomized family problems variable as the independent variable and past 30 day drug use as the dependent variable and 2) the dichotomized family problems variable as the independent variable and hazardous drinking as the dependent variable. Analyses were performed using SAS software, version 9.1 (SAS Institute, Cary, NC).

### 3. Results

Baseline characteristics obtained between 1 week and 3 weeks post prison release for the 155 participants with 2 to 9 month follow-up interviews are given in Table 1. The majority were men ( $n=114$ ; 73.6%). The mean age of the sample was 42.3 (Standard Deviation [SD] 8.4) years and the majority of the respondents were both non Hispanic Blacks ( $n=58$ ; 37.4%) or non Hispanic Whites ( $n=51$ ; 32.9%). Most respondents had never been married ( $n=73$ ; 47.1%) or were divorced, widowed, or separated ( $n=58$ ; 37.4%). At the baseline interview, in the 1 week to 3 weeks post prison release, the majority of survey respondents reported that they were currently living in a location considered “housing secure” ( $n=100$ ; 64.5%), but 55.5% ( $n=86$ ) considered themselves homeless. Symptoms of major depression were present at baseline in 12.3% ( $n=19$ ) of the former inmates. In the initial survey, less than a third of participants felt they had one or more problems with their family, friends, and/or significant others in the past 30 days ( $n=44$ ; 28.4%). Even fewer were moderately, considerably, or extremely bothered by their perceived family problems ( $n=34$ ; 21.9%). Table 1 also describes baseline characteristics stratified by the results of the follow-up survey which described drug use or hazardous drinking.

#### Comparative Findings between Former Inmates with and without Past 30 Day Drug Use

Among both groups, those with and without past 30 day drug use, the majority was male (63.0% vs. 75.8%). Distribution of race/ethnicity did not vary significantly between people who reported past 30 day drug use as compared to those who did not report drug use. Having one or more problems with family, friends, and/or significant others was noted to be significantly different between those who did and did not use drugs in the past 30 days (51.9% vs. 23.4%;  $p=0.003$ ), as was being moderately, considerably, or extremely (vs. not at all or slightly) bothered by problems with family, friends, and/or significant others (44.4%



vs. 17.2%;  $p=0.002$ ). Having symptoms of major (vs. no, minimal, or minor) depression was significantly different between people who did and did not use drugs in the past 30 days (29.6% vs. 8.6%;  $p=0.006$ ). Three of our main predictors, being married or part of a couple, being employed, and being housed during the baseline interview were not found to be significantly different between people who did and did not use drugs in the past 30 days at the follow-up interview.

### **Comparative Findings between Former Inmates with and without Past 30 Day Hazardous Drinking**

Participants with hazardous drinking, as compared to those without hazardous drinking, had a lower mean age (39.5 [SD 7.8] years vs. 43.0 [SD 8.4] years;  $p=0.03$ ), were more likely to be non Hispanic White (46.9% vs. 29.3%;  $p=0.01$ ), and tended to be bothered by problems with friends, family, and/or significant others (34.4% vs. 18.7%;  $p=0.056$  [NS]) at the baseline survey. There were no differences in being married or part of a couple, employment status, or housing status between the two groups at baseline.

### **Association between Baseline Factors and Past 30 Day Drug Use**

Baseline factors associated with subsequent drug use at the follow-up survey are given in Table 2. Unadjusted odds ratios for those variables with  $p<0.25$  in univariable testing are presented. Backward elimination procedure was applied to the initial multiple logistic regression model including these variables as predictors to identify significant variables and adjusted odds ratios. In the final model for past 30 day drug use including the dichotomized family problems variable and the dichotomized depression screen variable as the independent variables, participants who felt moderately, considerably, or extremely bothered by problems with family members, friends, and/or significant others during the baseline interview were more likely to report drug use in the follow-up survey as compared to participants who were not bothered or slightly bothered by problems with family members, friends, and/or significant others (AOR=3.01; 95% CI 1.18–7.67). Former inmates who expressed symptoms of major depression at the baseline interview were more likely to report past 30 day drug use when compared to former inmates who expressed no symptoms of depression or minimal/minor symptoms of depression at the baseline survey (AOR=3.18; 95% CI 1.06–9.50).

### **Association between Baseline Factors and Past 30 Day Hazardous Drinking**

Baseline factors associated with past 30 day hazardous drinking at the follow-up survey are given in Table 3. Unadjusted odds ratios for variables considered in multiple logistic regression models, and adjusted odds ratios for identified significant variables are presented. In the final model for past 30 day hazardous drinking including the dichotomized family problems variable and the multi-category race/ethnicity variable as the independent variables, participants who described feeling moderately, considerably, or extremely bothered by problems with family members, friends, and/or significant others during the initial interview were more likely to meet criteria for hazardous drinking at the follow-up interview when compared to participants who were not or were slightly bothered by problems with family members, friends, and/or significant others (AOR=2.69; 95% CI 1.05–

6.87). The odds of hazardous drinking for non Hispanic Blacks was significantly lower than the odds of hazardous drinking for non Hispanic Whites (AOR=0.17; 95% CI 0.05–0.57).

#### 4. Discussion

In our cohort of recently released prison inmates, we found that feeling significantly bothered by problems with family, friends, and/or significant others in the 1 week to 3 weeks following prison release was associated with past 30 days drug use and hazardous drinking in the 2 to 9 months following prison release. We also found that having symptoms of major depression was associated with past 30 day drug use among former inmates. Finally, non Hispanic Blacks were less likely to exhibit hazardous drinking behaviors in the 30 days following prison release as compared to non Hispanic Whites.

Having a supportive network of family, friends, and significant others helps to maintain sobriety (Beattie and Longabaugh, 1999; Bond et al., 2003; Walitzer and Dearing, 2006; Heinz et al., 2009; Scott et al., 2010). Our findings show that when former inmates feel bothered by relationship problems, they are more likely to use drugs or engage in hazardous drinking behaviors following prison release. Disruption of relationships with family, friends, and/or significant others during incarceration weakens social support and social cohesion and may lead to an increase in relationship problems (Khan et al., 2011). Approximately half of incarcerated men consider themselves to be in a committed heterosexual relationship and intend to return to their partners upon release from custody (Carlson and Cervera, 1991; Grinstead et al., 1999; Jorgensen et al., 1986; NACRO, 1994). Incarceration can aggravate underlying pre existing problems that may have strained family life before imprisonment, such as, financial hardships, social isolation, poor self-esteem, childcare problems, relationship difficulties, domestic violence, substance misuse and the threat of homelessness (Comfort, 2002). Relationships between the inmates and their families, friends, and significant others are further strained by the consequences of having an incarcerated family member (Comfort, 2003; Loucks, 2004). Families often experience restricted rights through limited contact with their significant other, logistically challenging social visits, diminished financial and emotional resources, and social marginalization (Comfort, 2003; Loucks, 2004). These complicating factors can weaken existing social support networks the inmate may be relying upon for emotional and financial support following release, further contributing to a former prisoner's ability to prevent relapse to drug and alcohol use.

Our study showed an association between endorsed symptoms of major depression at baseline (1 week to 3 weeks post prison release) and subsequent drug use. The association between mental health disorders and drug use is well established. Our findings support the literature that describes this relationship (Brook et al., 2002; Henry and Maurizo, 1999; Grant, 1995). In 2011, the National Survey on Drug Use and Health (NSDUH) demonstrated that adults, aged 18 years or older with major depressive episode in the past year, were more likely than those without a major depressive episode to have past year illicit drugs use (28.5% vs. 13.4 %) (Substance Abuse and Mental Health Services Administration, 2012). This was also noted for past year use of marijuana, cocaine, hallucinogens, inhalants, or heroin, and the non medical use of pharmaceutical psychotropic medications (Substance Abuse and Mental Health Services Administration, 2012). The prevalence of depression

among prison inmates is approximately 10% (Fazel and Danesh, 2002). Former inmates with mental illness are more likely to experience homelessness and less likely to find employment than other released inmates which may further exacerbate symptoms of depression (Roman and Travis, 2004; Solomon et al., 2004). Obtaining community-based mental health services can be formidable, often resulting in fragmented, episodic care (Hoge, 2007; Mallik-Kane and Visher, 2008; Baillargeon et al., 2010). Many prison inmates with pre-incarceration drug use and hazardous drinking are often ill-equipped for reintegration into society following release (Binswanger et al., 2012). This transitional period can be stressful due to a lack of a social support network, a feeling of social isolation, and inadequate economic resources to support integration into the community, further exacerbating symptoms of depression (Binswanger et al., 2012). With an insufficient availability of mental health services, recently released inmates with major depression are at an increased risk of relapse to drug and alcohol use, especially during the transition period from incarceration to release.

Among this cohort of recently released inmates, being employed, or being paid for working one or more days in the past 30 days, was not inversely associated with drug use/hazardous drinking. Prior work demonstrated that, among heroin users, employment was predictive of longer periods of abstinence (Nosyk et al., 2013). Similarly, in a cohort of patients treated for alcohol dependence, employment was associated with lower consumption of alcohol over time (Bravo et al., 2012). In each of these studies, the cohorts were followed for two or more decades. We attribute the lack of an observed association between employment status and drug use and hazardous drinking in our cohort to be due to the relatively short time period between the baseline and follow-up surveys (approximately 3 months).

Our study has implications for both future research and clinical practice. Ensuring that former inmates have access to, or are directed to, positive social support networks may reduce relapse to drug and alcohol use following prison release. Developing relationships with system “navigators”, people who help inmates reintegrate from incarceration to society, would allow former inmates to have access to a positive social network for ongoing support in the post release period (Spaulding et al., 2009). Formal social support navigators include lay navigators or community health workers, physicians, nurses, counselors, educators, drug counselors or other clinicians. Informal social support navigators include people who are not financially compensated, and may include clergy, volunteers, or mentors (Bradford et al., 2007; Dohan and Schrag, 2005; Wells et al., 2008; Haideri and Moormeier, 2011). Naturally occurring relationships, such as support from parents, siblings, partners, or friends, can help ease the difficult transition from incarceration to freedom (McCamish-Svensson et al., 1999; Maxwell et al., 2010). Former inmates who were bothered by problems with family, friends, and/or significant others following prison release may have benefited from being paired with a navigator at the time of prison discharge. Being paired with a “neutral party” navigator, rather than a significant other, friend, or family member, may be beneficial for former inmates who have a strained personal relationships

Employment, in the form of work-release treatment programs, has been shown to be protective in preventing relapse in a cohort of drug involved prisoners who were followed for five years post release (Butzin et al., 2005). Post release employment may also facilitate

community reentry and decrease exposure to mortality risk factors (World Health Organization, 2010; Freudenberg, 2001). Increasing opportunities for work release program participation, both by providing more opportunities for participation and by actively encouraging inmates to participate, can yield positive post release employment outcomes, which may lead to lower rates of substance use relapse and should be supported. Among former inmates, successful post release employment would be enhanced by greater access to general educational development (GED) programs and greater availability of job training and job readiness programs. Higher quality jobs lead to higher wages and a reduced likelihood of return to criminal activity and recidivism (Visher et al., 2004).

This study had several limitations. With these data we cannot assume causality, *i.e.*, we do not know if perceived problems with friends, family, and/or significant others preceded drug use/hazardous drinking among former inmates, or a prior history of drug use/drinking led to perceived problems. Although we had a relatively high retention rate (78%), we were unable to follow-up with some participants because they were reincarcerated. Some of these participants may have higher rates of drug use and hazardous drinking and lower rates of social support than the cohort analyzed in this study. The study was conducted in Denver, Colorado, an urban environment, which may not be representative of the United States as a whole. Participants were not recruited directly from prison so the sample was non random and may not be representative of all former inmates. Finally, participants may have felt uncomfortable accurately answering sensitive questions (drug use) for fear of criminal repercussions.

This study demonstrates that former inmates with perceived relationship problems have a higher risk of relapse to drug and alcohol use as compared to former inmates without perceived relationship problems. Reintegration from prison to society is a difficult and stressful time for many recently released inmates. Positive social support networks may help to prevent relapse to drug use and hazardous drinking. Supporting and (re)establishing healthy relationships between former inmates and non drug or alcohol involved family members, significant others, and friends through group therapy sessions, inclusion in meetings with parole officers, and social support groups, may reduce risk behaviors in the post prison release period. In situations where former inmates feel problems with family, friends, and/or significant others may impede their desired drug and alcohol abstinence, they could be connected with informal social support groups in the form of community organizations, religious organizations, and other resources, such as Alcoholic Anonymous and Narcotics Anonymous, that are best suited to the inmates' goals and beliefs. Substance-free relationships with peers can be beneficial for former inmates who prefer sources of support that are not associated with the correctional system. Formerly incarcerated peers may have more insightful and realistic ideas about how to maintain sobriety once released from prison (Devilly et al., 2005; Parkin and McKeganey, 2000). Peer networks comprised of successfully integrated former inmates can offer encouragement and support for recently released inmates who are struggling to maintain drug and alcohol abstinence. The establishment of programs which involve former inmates with peer networks aimed at making reintegration from prison to society a positive transition, and the inclusion of family

members, friends, and/or significant others in the transitional experience may reduce drug and alcohol relapse among recently released prisoners.

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## References

- Andrews DA, Dowden C. Risk principle of case classification in correctional treatment: A meta-analytic investigation. *International Journal of Offender Therapy and Comparative Criminology*. 2006; 50:88–100. [PubMed: 16397124]
- AUDIT-C. [Accessed 8/2013] [www.integration.samhsa.gov/images/res/tool\\_auditc.pdf](http://www.integration.samhsa.gov/images/res/tool_auditc.pdf)
- Baillargeon J, Hoge SK, Penn JV. Addressing the challenge of community reentry among released inmates with serious mental illness. *American Journal of Community Psychology*. 2010; 46:361–375. [PubMed: 20865315]
- Beattie MC. Meta-analysis of social relationships and posttreatment drinking outcomes: comparison of relationship structure, function and quality. *Journal of Studies on Alcohol*. 2001; 62:518–527. [PubMed: 11513230]
- Beattie MC, Longabaugh R. General and alcohol-specific social support following treatment. *Addictive Behaviors*. 1999; 24:593–606. [PubMed: 10574299]
- Binswanger IA, Nowels C, Corsi KF, Glanz J, Long J, Booth RE, Steiner JF. Return to drug use and overdose after release from prison: a qualitative study of risk and protective factors. *Addiction Science and Clinical Practice*. 2012; 7:3. [PubMed: 22966409]
- Binswanger IA, Stern MF, Deyo RA, Heagerty PJ, Cheadle A, Elmore JG, Koepsell TD. Release from prison—a high risk of death for former inmates. *The New England Journal of Medicine*. 2007; 356:157–165. [PubMed: 17215533]
- Bond J, Kaskutas LA, Weisner C. The persistent influence of social networks and Alcoholics Anonymous on abstinence. *Journal of Studies on Alcohol*. 2003; 64:579–588. [PubMed: 12921201]
- Bradford JB, Coleman S, Cunningham W. HIV System Navigation: an emerging model to improve HIV care access. *AIDS Patient Care and STDs*. 2007; 21:S49–58. [PubMed: 17563290]
- Bradley KA, DeBenedetti AD, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a brief screen for alcohol misuse in primary care. *Alcoholism: Clinical and Experimental Research*. 2007; 31:1207–1217.
- Bravo F, Gual A, Lligoña A, Colom J. Gender differences in the long-term outcome of alcohol dependence treatments: An analysis of twenty-year prospective follow up. *Drug and Alcohol Review*. 2012; 4:381–388. [PubMed: 23240781]
- Brook DW, Brook JS, Zhang C, Cohen P, Whiteman M. Drug use and the risk of major depressive disorder, alcohol dependence, and substance use disorders. *Archives of General Psychiatry*. 2002; 59:1039–1044. [PubMed: 12418937]
- Broome KM, Simpson DD, Joe GW. The role of social support following short-term inpatient treatment. *American Journal on Addictions*. 2002; 11:57–65. [PubMed: 11876584]
- Bush K, Kivlahan D, McDonnell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (Audit-C). An effective brief screening test for problem drinking. *Archives of Internal Medicine*. 1998; 158:1789–1795. [PubMed: 9738608]
- Butler SF, Budman SH, Goldman RJ, Newman FL, Beckley KE, Trottier D, Cacciola JS. Initial validation of a computer-administered Addiction Severity Index ASI-MV. *Psychology of Addictive Behaviors: Journal of the Society of Psychologist in Addictive Behaviors*. 2001; 1:4–12.

- Butzin CA, Martin SS, Inciardi JA. Treatment during transition from prison to community and subsequent illicit drug use. *Journal of Substance Abuse Treatment*. 2005; 28:351–558. [PubMed: 15925269]
- Cairney J, Boyle M, Offord DR, Racine Y. Stress, social support and depression in single and married mothers. *Social Psychiatry and Psychiatric Epidemiology*. 2003; 38:442–449. [PubMed: 12910340]
- Carlson BE, Cervera N. Inmates and their families: conjugal visits, family contact, and family functioning. *Criminal Justice and Behavior*. 1991; 18:318–331.
- Caviness CM, Hatgis C, Anderson BJ, Rosengard C, Kiene SM, Friedmann PD, Stein MD. Three brief alcohol screens for detecting hazardous drinking in incarcerated women. *Journal of Studies on Alcohol and Drugs*. 2009; 70:50–54. [PubMed: 19118391]
- Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Questionnaire. Atlanta, Georgia: US Department of Health and Human Services; 2010. <http://www.cdc.gov/brfss/> [Accessed 3/2013]
- Comfort ML. Papa's House: The prison as domestic and social satellite. *Ethnography*. 2002; 3:467–499.
- Comfort ML. In the tube at San Quentin: The 'secondary prisonization' of women visiting inmates. *Journal of Contemporary Ethnography*. 2003; 30:77–107.
- Compton WM, Thomas YF, Stinson FS, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV drug abuse and dependence in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Archives of General Psychiatry*. 2007; 64:566–576. [PubMed: 17485608]
- Cook S, De Stavola B, Saburova L, Kiryanov N, Vasiljev M, McCambridge J, McKee M, Polikina O, Gil A, Leon DA. Socio-demographic predictors of dimensions of the AUDIT score in a population sample of working-age men in Izhevsk, Russia. *Alcohol and Alcoholism*. 2011; 46:702–208. [PubMed: 21727097]
- Dearing RL. Gender differences in alcohol and substance use relapse. *Clinical Psychology Review*. 2006; 26:128–148. [PubMed: 16412541]
- Devilly GJ, Sorbello L, Eccleston L, Ward T. Prison-based peer-education schemes. *Aggression and Violent Behavior*. 2005; 10:219–240.
- Dohan D, Schrag D. Using navigators to improve care of underserved patients: current practices and approaches. *Cancer*. 2005; 104:848–855. [PubMed: 16010658]
- Farrell M, Marsden J. Acute risk of drug-related death among newly released prisoners in England and Wales. *Addiction*. 2008; 103:251–255. [PubMed: 18199304]
- Fazel S, Danesh J. Serious mental disorder in 23,000 prisoners: a systematic review of 62 surveys. *Lancet*. 2002; 359:545–550. [PubMed: 11867106]
- Fergusson DM, Horwood LJ, Swain-Campbell NR. Cannabis use and psychosocial adjustment in adolescence and young adulthood. *Addiction*. 2002; 97:1123–1135. [PubMed: 12199828]
- Frank D, DeBenedetti BA, Volk RJ, Williams EC, Kivlahan DR, Bradley KA. Effectiveness of the AUDIT-C as a screening test for alcohol misuse in three race/ethnic groups. *Journal of General Internal Medicine*. 2008; 23:781–787. [PubMed: 18421511]
- Freudenberg N. Jails, prisons, and the health of urban populations: a review of the impact of the correctional system on community health. *Journal of Urban Health*. 2001; 78:214–235. [PubMed: 11419576]
- Ghitza UE, Epstein DH, Preston KL. Psychosocial functioning and cocaine use during treatment: strength of relationship depends on type of urine-testing method. *Drug and Alcohol Dependence*. 2007; 91:169–177. [PubMed: 17624688]
- Grant BF. Comorbidity between DSM-IV drug use disorders and major depression: results of a national survey of adults. *Journal of Substance Abuse*. 1995; 7:481–497. [PubMed: 8838629]
- Grant BF, Harford TC. Comorbidity between DSM-IV alcohol use disorders and major depression: results of a national survey. *Drug and Alcohol Dependence*. 1995; 39:197–206. [PubMed: 8556968]

- Grant BF, Hasin DS, Chou SP, Stinson FS, Dawson DA. Nicotine dependence and psychiatric disorders in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Archives of General Psychiatry*. 2004; 61:1107–1115. [PubMed: 15520358]
- Grinstead O, Zack B, Faigeles B, Grossman N, Blea L. Reducing post release HIV risk among male prison inmates: the health promotion program. *AIDS Education and Prevention*. 1999; 13:109–119. [PubMed: 11398956]
- Hahn JM. Pre-employment information services: employers beware. *Employee Relations Law Journal*. 1991; 17:45–69.
- Haideri NA, Moormeier JA. Impact of patient navigation from diagnosis to treatment in an urban safety net breast cancer population. *Journal of Cancer*. 2011; 2:467–473. [PubMed: 21915191]
- Hasin DS, Stinson FS, Ogburn E, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*. 2007; 64:830–842. [PubMed: 17606817]
- Heinz AJ, Wu J, Witkiewitz K, Epstein DH, Preston KL. Marriage and relationship closeness as predictors of cocaine and heroin use. *Addictive Behaviors*. 2009; 34:258–263. [PubMed: 19008050]
- Henkel D. Unemployment and substance use: a review of the literature (1990–2010). *Current Drug Abuse Reviews*. 2011; 4:4–27. [PubMed: 21466502]
- Hirsch, A.; Dietrich, S.; Landau, R.; Schneider, PD.; Ackelsberg, I.; Bernstein-Baker, J.; Hohenstein, J. Every door closed: barriers facing parents with criminal records. Washington, D.C: Center for Law and Social Policy and Community Legal Services; 2002.
- Hocking RR. The analysis and selection of variables in linear regression. *Biometrics*. 1976; 32:1–49.
- Hoge, SK. Providing transition and outpatient services to the mentally ill released from correctional institutions. In: Greifinger, RB., editor. *Public health behind bars: from prison to communities*. New York: Springer; 2007. p. 461-477.
- Holzer, HJ.; Raphael, S.; Stoll, M. The Urban Institute Reentry Roundtable Discussion Paper: 23. New York: University Law School; 2003. Employment dimensions of reentry: understanding the nexus between prisoner reentry and work employment barriers facing ex-offenders.
- Hope S, Power C, Rodgers B. Does financial hardship account for elevated psychological distress in lone mothers? *Social Science & Medicine*. 1999; 49:1637–1649. [PubMed: 10574235]
- Hosmer, DW.; Lemeshow, S. *Applied logistic regression*. 2. New York: Wiley; 2000.
- Jorgensen JD, Hernandez SH, Warren RC. Addressing the social needs of families of prisoners: a tool for inmate rehabilitation. *Federal Probation*. 1986; 50:47–52.
- Karberg, J.; James, D. Bureau of Justice Statistics special report. NJC 209588. Washington, D.C: 2005. Substance dependence, abuse, and treatment of jail inmates: 2002.
- Kariminia A, Law MG, Butler TG, Corben SP, Levy MH, Kaldor JM, Grant L. Factors associated with mortality in a cohort of Australian prisoners. *European Journal of Epidemiology*. 2007; 22:417–428. [PubMed: 17668280]
- Kerr T, Marshall B, Miller C, Shannon K, Zhang R, Montaner J, Wood E. Injection drug use among street-involved youth in a Canadian setting. *BMC Public Health*. 2009; 9:171. [PubMed: 19493353]
- Kessler RC, Crum RM, Warner LA, Nelson CB, Schulenberg J, Anthony JC. Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the national Comorbidity Survey. *Archives of General Psychiatry*. 1997; 54:313–324. [PubMed: 9107147]
- Khan MR, Epperson MW, Mateu-Gelabert P, Bolyard M, Sandoval M, Friedman SR. Incarceration, sex with an STI- or HIV-infected partner, and infection with an STI or HIV in Bushwick, Brooklyn, NY: a social network perspective. *American Journal of Public Health*. 2011; 101:1110–1117. [PubMed: 21233443]
- Kipke MD, Montgomery SB, Simon TR, Iverson EF. “Substance abuse” disorders among runaway and homeless youth. *Substance Use and Misuse*. 1997; 32:969–986. [PubMed: 9220564]
- Kosten T, Rounsaville BJ, Kleber HD. A 2.5 follow-up of depression, life crises, and treatment effects on abstinence among opioid addicts. *Archives of General Psychiatry*. 1986; 43:733–738. [PubMed: 3729667]

- Kroenke K, Spitzer RL, Williams JB. Validity of a brief depression severity measure. *Journal of General Internal Medicine*. 2001; 16:606–613. [PubMed: 11556941]
- Lo CC, Cheng TC. Heavy drinking during periods of high unemployment: 15-Year trend study of the role of race/ethnicity. *Drug and Alcohol Dependence*. 2013 pii: S0376-8716(13)00237–8. Epub ahead of print. 10.1016/j.drugalcdep.2013.06.018
- Loucks, N. [Accessed 6/2013.] Prison without bars: needs, support, and good practice for work with prisoners' families. Tayside Criminal Justice Partnership and Families Outside. 2004. [www.familiesoutside.org.uk/content/uploads/2011/02/PrisonWithoutBarsExecReview.pdf](http://www.familiesoutside.org.uk/content/uploads/2011/02/PrisonWithoutBarsExecReview.pdf)
- Mallik-Kane, K.; Visher, C. Health and prisoner reentry: how physical, mental, and substance abuse conditions shape the process of reintegration. Washington D.C: The Urban Institute; 2008.
- Maxwell AE, Jo AM, Crespi CM, Sudan M, Bastani R. Peer navigation improves diagnostic follow-up after breast cancer screening among Korean American women: results of a randomized trial. *Cancer Causes and Control*. 2010; 61:237–249.
- McCamish-Svensson C, Samuelsson G, Hagberg B, Svensson T, Dehlin O. Informal and formal support from a multidisciplinary perspective: a Swedish follow-up between 80 and 82 years of age. *Health & Social Care in the Community*. 1999; 7:163–176. [PubMed: 11560631]
- McCoy CB, Comerford M, Metsch LR. Employment among chronic drug users at baseline and 6-month follow-up. *Substance Use and Misuse*. 2007; 42:1055–1067. [PubMed: 17668325]
- McCrary BS, Epstein EE, Kahler CW. Alcoholics Anonymous and relapse prevention maintenance strategies after conjoint behavioral alcohol treatment for men: 18-month outcomes. *Journal of Consulting and Clinical Psychology*. 2004; 72:870–878. [PubMed: 15482044]
- McCrary BS, Hayaki J, Epstein EE, Hirsch LS. Testing hypothesized predictors of change in conjoint behavioral alcoholism treatment for men. *Alcoholism: Clinical and Experimental Research*. 2002; 26:463–470.
- McDowell, I.; Newell, C. Measuring health: A guide to rating scales and questionnaires. New York: Oxford University Press; 1996.
- McGahan PL, Griffith JA, Parente R, McLellan AT. Addiction severity index. composite scores manual. The University of Pennsylvania/Veterans Administration Center for Studies of Addiction. Treatment Research Institute. 1986
- McLellan TA, Kushner H, Metzger D, Peters R, Smith I, Grissom G, Pettinati H, Argeriou M. The 5th edition of the addiction severity index. *Journal of Substance Abuse Treatment*. 1992; 9:199–213. [PubMed: 1334156]
- Merrall EL, Kariminia A, Binswanger IA, Hobbs MS, Farrell M, Marsden J, Hutchinson SJ, Bird SM. Meta-analysis of drug-related deaths soon after release from prison. *Addiction*. 2010; 105:1545–54. [PubMed: 20579009]
- Miller, A. Subset selection in regression. 2. Boca Raton: Chapman and Hall; 2002.
- Miller NS, Ninonuevo F, Hoffmann NG, Astrachan BM. Prediction of treatment outcomes: lifetime depression versus the continuum of care. *American Journal of Addictions*. 1999; 8:243–253.
- Mooney JL, Minor KI, Wells JB, Leukefeld C, Oser CB, Tindall SM. The relationship of stress, impulsivity, and beliefs to drug use severity in a sample of women prison inmates. *International Journal of Offender Therapy and Comparative Criminology*. 2008; 52:686–697. [PubMed: 18040061]
- Moore J. Bearing the burden: how incarceration weakens inner-city communities. *Journal of the Oklahoma criminal justice research consortium*. 1996; 3:43–54.
- Mumola, CJ.; Karberg, JC. Bureau of Justice Statistics special report. NJC 213530. Washington, D.C: 2006. Drug use and dependence. State and federal prisoners, 2004.
- NACRO. Opening the doors: Prisoners' families. London: National Association for the Care and Rehabilitation of Offenders; 1994.
- Nosyk B, Anglin MD, Brecht ML, Lima VD, Hser YI. Characterizing durations of heroin abstinence in the California Civil Addict Program: results from a 33-year observational cohort study. *American Journal of Epidemiology*. 2013; 177:675–682. [PubMed: 23445901]
- Parkin S, McKeganey N. The rise and rise of peer education approaches. *Drugs: Education, Prevention, and Policy*. 2000; 7:293–310.



- Patient Health Questionnaire-9. Pfizer Inc; 1999. Copyright ©<http://www.integration.samhsa.gov/images/res/PHQ%20-%20Questions.pdf> [Accessed 3/2013]
- Platt JJ. *Psychological Bulletin*. 1995; 177:416–437. [PubMed: 7777647]
- Rachlis BS, Wood E, Zhang R, Montaner JS, Kerr T. High rates of homelessness among a cohort of street-involved youth. *Health Place*. 2009; 15:10–17. [PubMed: 18358759]
- Radloff LS. The CES-D scale: A self report depression scale for research in the general population. *Applied Psychological Measurements*. 1977; 1:385–401.
- Roman, CG.; Travis, J. *Taking stock: housing, homelessness, and prisoner*. Washington D.C: The Urban Institute; 2004.
- Rosenquist JN, Murabito J, Fowler JH, Christakis NA. The spread of alcohol consumption behavior in a large social network. *Annals of Internal Medicine*. 2010; 152:426–433. [PubMed: 20368648]
- Schnittker J, Massoglia M, Uggen C. Out and down: incarceration and psychiatric disorders. *Journal of health and social behaviors*. 2012; 53:448–464.
- Schroeder JR, Latkin CA, Hoover DR, Curry AD, Knowlton AR, Celentano DD. Illicit drug use in one's social network and in one's neighborhood predicts individual heroin and cocaine use. *Annals of Epidemiology*. 2001; 6:389–394. [PubMed: 11454498]
- Schroeder RD, Giordano PC, Cernkovich SA. Drug use and desistance processes. *Criminology*. 2007; 45:191–222.
- Scott KM, Wells JE, Angermeyer M, Brugha TS, Bromet E, Demyttenaere K, de Girolamo G, Gureje O, Haro JM, Jin R, Karam AN, Kovess V, Lara C, Levinson D, Ormel J, Posada-Villa J, Sampson N, Takeshima T, Zhang M, Kessler RC. Gender and the relationship between marital status and first onset of mood, anxiety and substance use disorders. *Psychological Medicine*. 2010; 40:1495–1505. [PubMed: 19939327]
- Solomon, AL.; Johnson, KD.; Travis, J.; McBride, EC. *From prison to work: the employment dimensions of prisoner reentry*. Washington D.C: The Urban Institute; 2004.
- Spaulding AC, Sumbry AR, Brzozowski AK, Ramos KL, Perez SD, Maggio DM, Seals RM, Wingood GM. Pairing HIV-positive prisoners with volunteer life coaches to maintain health-promoting behavior upon release: a mixed-methods needs analysis and pilot study. *AIDS Education and Prevention*. 2009; 21:552–569. [PubMed: 20030499]
- Substance Abuse and Mental Health Services Administration. *Results from the 2011 National Survey on Drug Use and Health: Mental Health Findings, NSDUH Series H-45, HHS Publication No. (SMA) 12-4725*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2012.
- Tanaka, Y.; Kodake, K. *Representative Research and Development*. Vol. I. Okayama University Computer Center; 1981. Variable selection in factor analysis—a backward elimination procedure and its computer program; p. 1-34.
- Targosz S, Bebbington P, Lewis G, Brugha T, Jenkins R, Farrell M, Meltzer H. Lone mothers, social exclusion and depression. *Psychological Medicine*. 2003; 4:715–722. [PubMed: 12785473]
- Thoits PA. Stress and health: major findings and policy implications. *Journal of Health and Social Behavior*. 2010; 51:S41–53. [PubMed: 20943582]
- Tiffany ST, Friedman L, Greenfield SF, Hasin DS, Jackson R. Beyond drug use: a systematic consideration of other outcomes in evaluations of treatments for substance use disorders. *Addiction*. 2012; 107:709–718. [PubMed: 21981638]
- Tracy SW, Kelly JF, Moos RH. The influence of partner status, relationship quality, and relationship stability on outcomes following intensive substance-use disorder treatment. *Journal of Studies on Alcohol*. 2005; 66:497–505. [PubMed: 16240557]
- Travis, J.; Solomon, A.; Waul, M. *From Prison to Home: The dimensions and consequences of prisoner reentry*. Washington D.C: The Urban Institute; 2001.
- van Laere IR, de Wit MA, Klazinga NS. Pathways into homelessness: recently homeless adults problems and service use before and after becoming homeless in Amsterdam. *BMC Public Health*. 2009; 9:3. 10.1186.1471-2458-9-3. [PubMed: 19128448]
- Visher, C.; LaVigne, N.; Travis, J. *Maryland Pilot Study: Findings from Baltimore*. Washington D.C: The Urban Institute; 2004. *Returning home: Understanding the Challenges of Prisoner Reentry*.

- Wade TJ, Veldhuizen S, Cairney J. Prevalence of psychiatric disorder in lone fathers and mothers: examining the intersection of gender and family structure on mental health. *Canadian Journal of Psychiatry*. 2011; 56:567–573.
- White JM, Irvine RJ. Mechanisms of fatal opioid overdose. *Addiction*. 1999; 94:961–972. [PubMed: 10707430]
- Wilper AP, Woolhandler S, Boyd JW, Lasser KE, McCormick D, Bor DH, Himmelstein DU. The health and health care of US prisoners: results of a nationwide survey. *The American Journal of Public Health*. 2009; 4:666–672.
- World Health Organization. Prevention of acute drug-related mortality in prison populations during the immediate post-release period: 2010. Geneva, Switzerland: World Health Organization; 2010. [http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0020/114914/E93993.pdf](http://www.euro.who.int/__data/assets/pdf_file/0020/114914/E93993.pdf) [Accessed 3, 2013]
- Zlodre J, Fazel S. All-cause and external mortality in released prisoners: systematic review and meta-analysis. *American Journal of Public Health*. 2012; 102:e67–75. [PubMed: 23078476]

**Table 1**

Baseline characteristics of participants with follow-up interviews, overall and by drug use and hazardous drinking at follow-up

	Overall		Drug Use Past 30 Days		Hazardous Drinking Past 30 Days	
	Yes	No	Yes	No	Yes	No
<b>Total, n (%)</b>	155	27 (17.4)	128 (82.6)	32 (20.7)	123 (79.4)	
<b>Gender, n (%)</b>						
Male	114 (73.6)	17 (63.0)	97 (75.8)	24 (75.0)	90 (73.2)	
Female	41 (26.5)	10 (37.0)	31 (24.2)	8 (25.0)	33 (26.8)	
<b>Mean (SD) Age (yrs)</b>	42.3 (8.4)	43.4 (8.9)	42.1 (8.2)	<b>39.5 (7.8)</b>	<b>43.0 (8.4)</b>	
<b>Race/Ethnicity, n (%)</b>						
Non Hispanic White	51 (32.9)	9 (33.3)	42 (32.8)	<b>15 (46.9)</b>	<b>36 (29.3)</b>	
Non Hispanic Black	58 (37.4)	11 (40.7)	47 (36.7)	<b>4 (12.5)</b>	<b>54 (43.9)</b>	
Hispanic	38 (24.5)	6 (22.2)	32 (25.0)	<b>11 (34.4)</b>	<b>27 (22.0)</b>	
Other or Unknown	8 (5.2)	1 (3.7)	7 (5.5)	<b>2 (6.3)</b>	<b>6 (4.9)</b>	
<b>Marital Status, n (%)</b>						
Married/Part of a Couple	24 (15.5)	5 (18.5)	19 (14.8)	6 (18.8)	18 (14.6)	
Divorced/Widowed/Separated	58 (37.4)	9 (33.3)	49 (38.3)	11 (34.4)	47 (38.2)	
Never Married	73 (47.1)	13 (48.2)	60 (46.9)	15 (46.9)	58 (47.2)	
<b>Paid for Working Any Days in the Past 30 Days, n (%)</b>						
Yes	78 (50.3)	11 (40.7)	67 (52.3)	15 (46.9)	63 (51.2)	
No	77 (49.7)	16 (59.3)	61 (47.7)	17 (53.1)	60 (48.8)	
<b>Current Housing Situation, n (%)</b>						
Housed	100 (64.5)	15 (55.6)	85 (66.4)	22 (68.8)	78 (63.4)	
Housing Insecure	27 (17.4)	3 (11.1)	24 (18.8)	4 (12.5)	23 (18.7)	
Homeless	28 (18.1)	9 (33.3)	19 (14.8)	6 (18.8)	22 (17.9)	
<b>Consider Self Homeless, n (%)</b>						
Yes	86 (55.5)	16 (59.3)	70 (54.7)	20 (62.5)	66 (53.7)	
No	69 (44.5)	11 (40.7)	58 (45.3)	12 (37.5)	57 (46.3)	
<b>Depression Screen (PHQ 9), n (%)</b>						

	Overall	Drug Use Past 30 Days		Hazardous Drinking Past 30 Days	
		Yes	No	Yes	No
None/Minimal/Minor Symptoms	136 (87.7)	<b>19 (70.4)</b>	<b>117 (91.4)</b>	25 (78.1)	111 (90.2)
Major Depression	19 (12.3)	<b>8 (29.6)</b>	<b>11 (8.6)</b>	7 (21.9)	12 (9.8)
<b>Number of Problems Experienced with Family/Sexual Partner/Spouse, n (%)</b>					
None	111 (71.6)	<b>13 (48.2)</b>	<b>98 (76.6)</b>	19 (59.4)	92 (74.8)
<b>1 or More</b>	44 (28.4)	<b>14 (51.9)</b>	<b>30 (23.4)</b>	13 (40.6)	31 (25.2)
<b>How Bothered by Family Problems, n (%)</b>					
<b>Not At All/Slightly</b>	121 (78.1)	<b>15 (55.6)</b>	<b>106 (82.8)</b>	21 (65.6)	100 (81.3)
<b>Moderately/Considerably/Extremely</b>	34 (21.9)	<b>12 (44.4)</b>	<b>22 (17.2)</b>	11 (34.4)	23 (18.7)

Statistically significant group differences in **bold**,  $p < 0.05$

**Table 2**

Unadjusted and Adjusted Odds Ratios and 95% confidence intervals for baseline factors associated with past 30 day drug use at follow-up

Past 30 Day Drug Use (95% CI)		
	Unadjusted <sup>a</sup>	Adjusted <sup>b</sup>
<b>Gender</b>		
Male	Reference	
Female	1.84 (0.76–4.44)	
<b>Current Housing Situation</b>		
Housed	Reference	
Housing Insecure	0.71 (0.19–2.65)	
Homeless	2.68 (1.02–7.04)	
<b>Depression Screen (PHQ-9)</b>		
None/Minimal/Minor Symptoms	Reference	Reference
Major Depression	4.48 (1.60–12.56)	3.18 (1.06–9.50)
<b>Number of Problems Experienced with Family/Sexual Partners/Spouse</b>		
None	Reference	
1 or More	3.52 (1.49–8.30)	
<b>How Bothered by Family Problems</b>		
Not At All/Slightly	Reference	Reference
Moderately/Considerably/Extremely	3.86 (1.59–9.36)	3.01 (1.18–7.67)

<sup>a</sup>Variables with univariable testing  $p < 0.25$ , which were considered for regression

<sup>b</sup>Final variables in regression with  $p < 0.05$

**Table 3**

Unadjusted and Adjusted Odds Ratios and 95% confidence intervals for baseline factors associated with past 30 day hazardous drinking at follow-up

<b>Past 30 Day Hazardous Drinking</b>		
	<b>Unadjusted<sup>a</sup></b>	<b>Adjusted<sup>b</sup></b>
<b>Age in Years (per 10 yr increase)</b>	0.59 (0.37–0.96)	
<b>Race/Ethnicity</b>		
<b>Non Hispanic White</b>	Reference	Reference
<b>Non Hispanic Black</b>	0.18 (0.06–0.58)	0.17 (0.05–0.57)
<b>Hispanic</b>	0.98 (0.39–2.46)	1.10 (0.43–2.83)
<b>Other or Unknown</b>	0.80 (0.15–4.42)	0.60 (0.10–3.53)
<b>Depression Screen (PHQ-9)</b>		
<b>None/Minimal/Minor Symptoms</b>	Reference	
<b>Major Depression</b>	2.59 (0.93–7.24)	
<b>Number of Problems Experienced with Family/Sexual Partners/Spouse</b>		
<b>None</b>	Reference	
<b>1 or More</b>	2.03 (0.90–4.59)	
<b>How Bothered by Family Problems</b>		
<b>Not at all/Slightly</b>	Reference	Reference
<b>Moderately/Considerably/Extremely</b>	2.28 (0.97–5.38)	2.69 (1.05–6.87)

<sup>a</sup>Variables with univariable testing  $p < 0.25$ , which were considered for regression

<sup>b</sup>Final variables in regression with  $p < 0.05$