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J Correct Health Care. 2018 July ; 24(3): 295–308. doi:10.1177/1078345818782440.**Depression, executive dysfunction, and prior economic and social vulnerability associations in incarcerated African American men****Faith A. Scanlon,**

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Abstract

Low executive function (EF) and depression are each determinants of health. We examined the synergy between deficits in EF (impaired cognitive flexibility; >75th percentile on the Wisconsin Card Sorting Test perseverative error score) and depressive symptoms (modified CES-D) and pre-incarceration well-being among incarcerated African American men (N=189). In adjusted

analyses, having impaired EF and depression was strongly associated with pre-incarceration food insecurity (OR=3.81, 95% CI: 1.35, 10.77), homelessness (OR=3.00, 95% CI: 1.02, 8.80), concern about bills (OR=3.76, 95% CI: 1.42, 9.95); low significant other support (OR=4.63, 95% CI: 1.62, 13.24), low friend support (OR=3.47, 95% CI: 1.30, 9.26), relationship difficulties (OR=2.86, 95% CI: 1.05, 7.80); and binge drinking (OR=3.62, 95% CI: 1.22, 10.80). Prison-based programs to treat depression and improve problem-solving may improve post-release success.

Keywords

Depression; Executive Function; Incarceration; African Americans; Males

The number of men and women incarcerated in December 2014 reached over 1.5 million (Carson, 2015). Of the over 600,000 prison inmates released annually, half will be re-incarcerated within the following three years, and three quarters within five years (Freeman, 2003). Underlying determinants of incarceration and recidivism include poverty, substance abuse, and lack of social support (Meijers, Harte, Jonker, & Meynen, 2015). In order to develop effective reentry and correctional facility-based programs that decrease post-release recidivism and improve community re-entry outcomes, research regarding modifiable factors linked to poverty, substance use, and low pro-social support among justice-involved persons is needed. This research is especially important among justice-involved persons of color who are over-represented in the criminal justice system.

Executive function (EF) is responsible for planning, organizing behaviors, problem solving, inhibiting impulsive behavior, and working memory (Kavanaugh & Holler, 2014; Meijers et al., 2015) and it may play an important role in the economic and social vulnerability of incarcerated individuals prior to and after release. The ability to plan effectively is critical to successful community re-entry following prison release. Without strategies for effective planning, released inmates will struggle to adapt to re-entry challenges such as finding a job and housing, re-establishing social ties, and avoiding risky behaviors including substance abuse. In community samples, EF has been linked to improved socioeconomic status, reduced risk-taking behaviors, and improved social relationships (Arentoft et al., 2015; Crook & Evans, 2014; Golub, Starks, Kowalczyk, Thompson, & Parsons, 2012; Hackman, Gallop, Evans, & Farah, 2015; Khurana et al., 2015; Noel, 2014; Panwar et al., 2014; Pentz & Riggs, 2013; Romer et al., 2009; Shimp, Mitchell, Beas, Bizon, & Setlow, 2015; Spokes, Hine, Marks, Quain, & Lykins, 2014; Ursache, Noble, & Blair, 2015).

Moreover, in community settings depression is a strong risk factor for poverty, weaker pro-social support networks, and substance use (Davidson, Dowrick, & Gunn, 2016; Lorant et al., 2003; Martins & Gorelick, 2011) and hence also may contribute to economic and social well-being of those cycling through jails and prisons. Impaired EF and depression co-occur; there is evidence that depression is a contributing factor to the development of executive dysfunction and diminished planning ability, and patients in periods of remission from chronic depression have improvements in cognitive function compared to patients with fewer or no periods of remission (Roca et al., 2015; Wagner, Müller, Helmreich, Huss, & Tadi, 2015; Wang et al., 2008). The directionality of the relationship has not yet been

established and impaired EF and depression are likely mutually reinforcing (Davidson et al., 2016; Porter, Gallagher, Thompson, & Young, 2003; Snyder, 2013).

Despite extant evidence of the associations among EF, depression, and well-being outcomes such as improved socio-economic status, social support, and reduced substance use, no prior study to our knowledge has examined the independent and joint relationships between EF and depression and indicators of well-being among those involved in the criminal justice system. We lack the understanding of the joint effect of depression and impaired executive function needed to develop effective programs focused on improving community re-entry outcomes among persons released from our nation's prisons and jails.

The purpose of the current study was to examine co-occurring depressive symptoms and impairment in EF domains of abstract thinking/cognitive flexibility and associations with economic and social well-being prior to incarceration among African American men incarcerated in North Carolina. We sought to control for other mood disorders (e.g., anxiety/stress) and personality factors with the aim of isolating the potential influence of depression and impaired cognition from other mental disorders. We hypothesized that those with either impaired EF or depressive symptoms would have elevated risk of economic and social adversity, but that those who had co-occurring depressive symptoms and EF would have even greater than those with only depressive symptoms, those with only impaired EF, or those with neither depressive symptoms nor EF.

Methods

Sample and Study Design

We used baseline data from Project DISRUPT, a longitudinal cohort study conducted among African American men soon to be released from prison in North Carolina who were in committed heterosexual partnerships at prison entry (Khan et al., 2015a). Eligible participants were HIV-negative African American males at least 18 years of age currently incarcerated for a non-rape/murder offense in the North Carolina Department of Public Safety (NCDPS) for three years or less and who were scheduled to be released within three months. Of the 477 eligible male inmates, 207 agreed to participate in the study. Upon enrollment during incarceration, participants completed surveys and reported on socio-demographics, substance use and sexual risk behaviors, relationship characteristics, and mental health symptoms and completed the Wisconsin Card Sorting Test (WCST). The analytic sample includes 189 participants with valid survey and WCST data.

Measures

Executive Function—We measured EF using the Wisconsin Card Sorting Test (Heaton, 1960), a task meant to assess one's ability to shift and use concepts (Lezak, 2012). We dichotomized the raw perseverative error score at the highest quartile of errors (score = 14) to measure impaired EF.

Depressive Symptoms and Other Mental Health Indicators—We used a version of the Centers for Epidemiologic Studies-Depression (CES-D) (Radloff, 1977) scale that demonstrated factor invariance across race/ethnicity groups. Positive items were reverse-

coded, responses were summed (range 0–15), and scores dichotomized at 4, the calibrated cut-point indicative of depressive symptoms based on the original 20-item CES-D scale (Lincoln, Mehl, Kesting, & Rief, 2011). We measured trait anxiety in a sub-sample of 133 participants using the 20-item State-Trait Anxiety Inventory. Positive items were reverse-coded and all responses were summed (range 20–80), which was then dichotomized at 40 to capture clinical anxiety (31). Antisocial personality disorder (ASPD) was measured using the Structured Clinical Interview for DSM-IV (SCID-II) module (First et al., 1995) and borderline personality disorder symptom severity was measured using the Borderline Evaluation of Severity over Time (BEST) scale (Pfohl et al., 2009) with a five-item version (see Scheidell et al., 2016 for details). Participants reported their levels of stress felt while living in the community six months before incarceration for a number of domains, such as housing, employment, community violence. Each of the seven items in this researcher-created measure used a 10-point response scale with a score of 1 indicating very low stress and 10 indicating high stress. Scores on this scale ranged from 7 to 70.

Socio-economic Factors, Network and Relationship Factors, Substance Use—

Participants reported socio-economic difficulties in the six months before incarceration. Food insecurity was defined as concern about having enough food for oneself and/or family. Participants reported if they considered themselves to be homeless and whether they were concerned about having enough money to pay housing/utility bills. Joblessness was defined as lack of full/part-time employment. Using the Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988), we measured low (median) perceived social support from one's significant other, family, and friends. Participants reported characteristics and quality of the relationship with their committed partner in the six months before incarceration, including if they rarely/never thought the relationship was going well and if they were less than very happy with the relationship. Lifetime substance use indicators included frequent (at least multiple times per week or 100 times) marijuana use and having ever used crack/cocaine and ecstasy.

Socio-demographics

Participants reported their current age and educational attainment, which was categorized as less than high school versus high school or more.

Data Analysis

We used SAS software (version 9.4) to conduct all analyses. In addition to separate indicators of impaired EF and depressive symptoms, we created a four-level categorical variable defined as having neither depressive symptoms or impaired EF; impaired EF only; depressive symptoms only; and both impaired EF and depressive symptoms. We conducted bivariable analyses to examine the prevalence of socio-demographics, traumatic experiences, and mental health by impaired EF and depressive symptoms. Using logistic regression, we measured associations between the four-level exposure indicator of having impaired EF and/or depressive symptoms and dichotomous socio-economic, network and relationship, criminal justice involvement, and substance use outcomes. When examining socio-economic factors, we controlled for age, ASPD, stress score, borderline personality symptom severity score, and educational attainment. Models for network and relationship factors, criminal

justice involvement, and substance use outcomes additionally controlled for food insecurity. We did not include anxiety in our fully-adjusted models as it was measured in a sub-sample.

Results

Participant Characteristics

Approximately 47% of participants had neither impaired EF or depressive symptoms, 13% had impaired EF only, 23% had depressive symptoms only, and 14% had both impaired EF and depressive symptoms. Participants with impaired EF versus those with intact EF were significantly more likely to endorse symptoms of depression (Odds Ratio (OR) 2.30, 95% CI 1.19–4.44) and anxiety (OR 2.58, 95% CI 1.17–5.70) and to report elevated stress scores (OR 1.03 95% CI 1.01–1.05).

Depression was not associated with age or high school attainment. Depression was strongly associated with anxiety (OR 6.88, 95% CI 3.21–14.75), ASPD (OR 3.34, 95% CI 1.45–7.73), and BPD symptom severity in which each unit increase in BPD symptom severity was associated with a 17% increase in the odds of depressive symptoms; and stress with each unit increase in stress was associated with a 7% increase (BPD OR 1.17, 95% CI 1.08–1.26; stress OR: 1.07, 95% CI 1.04–1.10).

Depressive Symptoms, EF, and Group Differences in Correlations

Socioeconomic Status—In unadjusted models and in models adjusting for age and education, the group with high levels of depression and impaired EF had a greater odds of reporting food insecurity (adjusted OR (AOR) 3.81, 95% CI 1.35–10.77), concern about the ability to pay bills (AOR 3.76, 95% CI 1.42–9.95), and homelessness (AOR 3.00, 95% CI 1.02–8.80) in the six months prior to incarceration than every other group (Table 2). High levels of depression and impaired EF also appeared to be linked to joblessness, although they did not reach statistical significance (AOR 2.44, 95% CI 0.96–6.19; Table 2).

The group with high levels of depression but who had intact EF also had higher odds than those with no depressive symptoms and intact EF to report food insecurity (AOR 3.59, 95% CI 1.47–8.75) and concern about the ability to pay bills (AOR 3.22, 95% CI 1.42–7.27) in the six months before incarceration.

Having impaired EF in the absence of depressive symptoms was not associated with any of the poverty indicators in adjusted models.

In fully-adjusted models that additionally controlled for ASPD diagnosis, BPD symptom severity score, and stress score, all associations between the depression and EF group and socioeconomic factors were further attenuated. However, some estimates remained quite high despite loss of precision. For example, although not statistically significant in the fully-adjusted model, those with depressive symptoms and intact EF had over twice the odds of food security (fully-adjusted OR 2.36, 95% CI 0.89–6.29).

Social Network Stability—In unadjusted models and models adjusting for age, education, and food insecurity, the group with depressive symptoms and impaired EF had

greater odds of relationship instability, including low perceived support from a committed partner (AOR 4.63, 95% CI 1.62–13.24), report that the relationship with the committed partner was not going well (AOR 2.86, 95% CI 1.05–7.80), and report of being unhappy in the relationship with the committed partner (AOR 3.59, 95% CI 1.15–11.19). In addition, depressive symptoms and impaired EF was associated with low friend support (AOR 3.47, 95% CI 1.30–9.26) but not with low family support (AOR 1.87, 95% CI 0.72–4.85).

Depressive symptoms with intact EF were also associated with relationship instability. Specifically, low perceived support from a committed partner (AOR 2.37, 95% CI 1.08–5.17), report that the relationship with the committed partner was not going well (AOR 2.90, 95% CI 1.96–6.66), and report of being unhappy in the relationship with the committed partner (AOR 4.40, 95% CI 1.72–11.23) were all associated with depressive symptoms with intact EF. Low family support (AOR 2.22, 95% CI 1.01–4.86) was associated with depressive symptoms with intact EF, but not with low friend support (AOR 1.68, 95% CI 0.78–3.64).

Impaired EF in the absence of depressive symptoms was not associated with reports of relationship stability in adjusted models.

In fully-adjusted models that additionally controlled for ASPD, BPD symptom severity score, and stress score, some of the associations between depressive symptoms and EF group and relationship factors were attenuated, though not all. Depressive symptoms with impaired EF remained strongly associated with perceiving low significant other support (fully-AOR 6.37, 95% CI 2.15–18.91) and low friend support (fully-AOR 3.28, 95% CI 1.16–9.28). Participants with depressive symptoms and intact EF continued to have higher odds of perceiving low significant other support (fully-AOR 3.15, 95% CI 1.33–7.45), not thinking the relationship was going well (fully-AOR 2.49, 95% CI 1.02–6.06), and being less than very happy in the relationship (fully-AOR 4.12, 95% CI 1.51–11.23).

Substance Use—Approximately half of the participants reported lifetime crack/cocaine use (48.2%), and one third reported lifetime ecstasy use (33.3%). In unadjusted and adjusted models controlling for age, education, and food insecurity, those with depressive symptoms and impaired EF had higher odds of binge drinking (AOR 3.62, 95% CI 1.22–10.80) six months before incarceration than any other group; however, there were no differences among groups with respect to self-reported use of marijuana, crack/cocaine or ecstasy.

Depressive symptoms in the absence of impaired EF, and impaired EF in the absence of depressive symptoms were not associated with substance use in the six months before incarceration.

In fully-adjusted models that additionally controlled for other mental health factors, those with depressive symptoms and impaired EF continued to have higher odds of binge drinking (fully-AOR 3.31, 95% CI 1.04–10.49) and all other associations remained non-significant.

Discussion

This study is among the first to measure EF and to evaluate the link between co-occurring executive dysfunction and mental disorders symptoms, health and well-being of men involved in the criminal justice system. In this sample of African American male inmates, executive dysfunction was associated with over twice the odds of depressive symptoms prior to prison entry. Co-occurring executive dysfunction and depressive symptoms were strongly associated with pre-incarceration poverty, relationship instability, and binge drinking. The strong associations found in this study suggest that the interaction of depressive symptoms and impaired EF is associated with poor outcomes prior to incarceration and this could have implications for post-release outcomes like income, network and relationship factors, and substance use as well. These results further underscore the call for jail and prison-based screening and treatment for common mental disorders; such programming are critical health priorities for a highly affected population and treatment may improve post-release success. In addition, programs to identify inmates with impaired EF should assist them in improving planning and problem solving skills during incarceration to support their planning abilities after release.

While the directionality of the relationship between depression and EF is unclear, extant research suggests a mutually reinforcing relationship, therefore addressing one vulnerability is likely to effect symptoms of the other. Some pharmacological treatments for depression have been shown to reduce cognitive impairments in EF (Herrera-Guzmán et al., 2009; McIntyre, Lophaven, & Olsen, 2014). Additionally, the earlier depressive symptoms are treated, the less severe EF impairment is likely to become (Lee, Hermens, Porter, & Redoblado-Hodge, 2012). The results of this study highlight the need for more improved prison-based screening and treatment for depression to reduce depressive symptoms while potentially improving cognition.

A number of associations between depressive symptom and EF groups and outcomes were attenuated after further adjustment for ASPD diagnosis, BPD symptom severity, and stress. This was especially evident for socioeconomic factors. These factors were strongly associated with depressive symptoms in our sample, and extant literature suggests stress/anxiety and personality disorders are risk factors for unemployment, unstable relationships, and illicit drug use (Brady & Sinha, 2005; Brooner et al., 1993, 1990; Compton et al., 2005; Goeders et al., 2003; Gutman et al., 2006; Kelley and Petry, 2000; Sinha, 2008, 2001). It is possible that co-occurring depressive symptoms/EF may contribute to stress which in turn may lead to adverse economic and social well-being. If this is the case, controlling for stress would bias estimates downward. Regardless, findings of strong relationships between depression and/or impaired EF and other mental disorders suggests co-occurrence of multiple disorders/deficits may negatively influence well-being and further supports the need to address a wide range of mental health issues of inmates in order to have successful reentry after release.

Previous research has shown that substance use, impaired EF, and depression are enmeshed in a co-occurring relationship. Heavy alcohol consumption (Houston et al., 2014) and substance dependence (Moreno-López et al., 2012) is associated with impaired EF; impaired

EF has been shown to impact the ability or readiness to change substance use behaviors (Blume & Alan Marlatt, 2009; Le Berre et al., 2012). There is evidence that alcohol use and dependence is a risk factor for depression (Ferguson, Conway, Endersby, & MacLeod, 2009). Alcohol dependence negatively impacts depression relapse and recovery (Hasin et al., 1996), while remission from substances is associated with improved depression (Agosti & Levin, 2006). Although in the current cross-sectional study it was not possible to assess the temporality of these associations, we found alcohol use (drinking five or more drinks on a typical day) was significantly associated with depression and impaired EF even in fully-adjusted models.

The associations between depression and EF and other substances (marijuana, crack/cocaine, and ecstasy) were not significant in any of the models. Although prior research on a similar population in North Carolina had comparable rates of substance use to those found in the current study (Khan et al., 2015), under-reporting of substance use on self-report measures in the general population (Magura & Kang, 1996; Van De Mortel, 2008) and justice-involved samples (Harrell, 1997; Harrison, 1997; McGilloway & Donnelly, 2004) may be playing a role in these findings. Audio computer assisted self-interviewing surveys were also used to reduce social desirability bias, although under-reporting of substance use is possible, especially for highly stigmatized drugs like cocaine and heroin. Future research should expand on the self-report measures used in the current study because substance use likely plays an important role in successful re-entry.

Because effective planning, organizing behaviors, problem solving, working memory, and inhibiting impulsive behavior are crucial for those preparing to leave prison, programs addressing EF and depressive symptoms are essential (Meijers et al., 2015). The Goal-setting and Planning (GAP) intervention focuses on improving goal-setting and planning skills, and has been shown to significantly reduce depressive symptoms while improving life satisfaction and well-being (Coote & MacLeod, 2012; Farquharson & MacLeod, 2014; Ferguson et al., 2009). By giving jails and prisons the resources they need to expand access to these programs, post-release outcomes and recidivism rates will likely improve.

The findings underscore the call for improved screening and treatment of depressive symptoms in correctional settings (Baillargeon, Binswanger, Penn, Williams, & Murray, 2009). Although prisons are required to give inmates adequate access to mental health care, treatment is often reserved for the most “severe” cases and generally limited due to resources available and public support (Reingle, Gonzalez, & Connell, 2014). Hence, the results of this study indicate the efficacy of existing re-entry interventions that aim to address post-release employment, re-establishing relationships, and substance use would likely be improved when coupled with the treatment of depression and executive dysfunction.

Limitations of the present study include the cross-sectional design and use of self-report for many measures, including substance use. The modest sample of African American men being released from incarceration in North Carolina is not generalizable to the entire prison population. Furthermore, less than half of those eligible to participate enrolled in the study, with the most commonly cited reasons for not participating being a lack of time and

willingness to be followed up after release. Eligible inmates who enrolled did not differ in sociodemographic or violent crime commission from eligible non-participating inmates (Khan et al., 2015b). In addition, only one domain of EF was measured for this study, which should be expanded upon in future research. It is also possible, although unlikely, that pre-incarceration outcomes are not indicative of post-release outcomes.

Conclusions

This research indicates interventions targeted at measuring and treating depression symptoms, EF impairment, and their correlates are likely needed to increase the likelihood of success after release. While reentry interventions are vital, they must be combined with opportunities of suitable employment for those with criminal backgrounds or else failure to succeed and recidivism are inevitable outcomes.

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Table 1

Sample characteristics by low executive function and depressive symptom status

Characteristic	Among those with High EF	Among those with Low EF	OR (95% CI) for Association with Low EF	Among those Without Depressive Symptoms	Among those With Depressive Symptoms	OR (95% CI) for Association with Depressive Symptoms
	Mean (SD)					
Age	33.7 (9.5)	36.8 (10.3)	1.03 (1.00, 1.07) *	35.0	33.8	0.99 (0.96, 1.02)
	Percent					
Less than a High School Education	27.9	42.9	1.94 (0.98, 3.84) *	29.4	36.6	1.39 (0.74, 2.62)
Symptoms Indicative of Major Depression (CES-D)	32.8	52.9	2.30 (1.19, 4.44) **	---	---	---
Elevated Anxiety Symptoms (Top quartile State-Trait Anxiety Inventory; Score > 40) ^a	36.7	60.0	2.58 (1.17, 5.70) **	25.0	69.6	6.88 (3.21, 14.75) ***
Impaired Executive Function (Perseverative errors in top quartile)	---	---	---	21.1	38.0	2.30 (1.19, 4.44) **
	Mean					
Stress Score (Range: 7-70)	25.6	30.9	1.03 (1.01, 1.05) **	22.8	33.4	1.07 (1.04, 1.10) ***
BPD Symptom Severity Score (Range: 5-25)	9.1	9.0	0.99 (0.29, 1.07)	7.9	10.8	1.17 (1.08, 1.26) ***
	Percent					
ASPD Diagnosis (SCID)	14.9	15.7	1.06 (0.44, 2.59)	8.8	24.3	3.34 (1.45, 7.73) **

^aIn a subset of 133 participants

* pvalue <0.10;

** pvalue <0.05;

*** pvalue <0.0001

Table 2

Associations with a three level variable (neither depression or low EF; depressed; both depression and low EF)

Factor ^d	% with Factor	Odds Ratio (95% CI)	Adjusted ^b Odds Ratio (95% CI)	Fully-Adjusted ^c Odds Ratio (95% CI)
Socioeconomic Factors				
Food Insecurity				
Neither	16.7	1.00	1.00	1.00
Depression/Low EF	4.4	0.23 (0.03, 1.83)	0.23 (0.03, 1.89)	0.19 (0.02, 1.59)
Low EF Only	36.4	2.86 (1.23, 6.62)	3.59 (1.47, 8.75)	2.36 (0.89, 6.29)
Depression Only	40.7	3.44 (1.32, 8.96)	3.81 (1.35, 10.77)	2.11 (0.68, 6.59)
Depression + Low EF				
Homelessness				
Neither	14.0	1.00	1.00	1.00
Depression/Low EF	8.7	0.59 (0.12, 2.83)	0.55 (0.11, 2.74)	0.46 (0.09, 2.38)
Low EF Only	25.0	2.06 (0.82, 5.13)	2.16 (0.84, 5.52)	1.18 (0.41, 3.38)
Depression Only	34.6	3.27 (1.19, 8.99)	3.00 (1.02, 8.80)	1.56 (0.47, 5.15)
Depression + Low EF				
Concern about Ability to Pay Bills				
Neither	21.4	1.00	1.00	1.00
Depression/Low EF	27.3	1.38 (0.47, 4.02)	1.05 (0.35, 3.18)	0.94 (0.30, 2.95)
Low EF Only	47.6	3.33 (1.50, 7.41)	3.22 (1.42, 7.27)	1.89 (0.77, 4.63)
Depression Only	53.9	4.28 (1.69, 10.85)	3.76 (1.42, 9.95)	2.21 (0.76, 6.38)
Depression + Low EF				
Joblessness				
Neither	33.3	1.00	1.00	1.00
Depression/Low EF	30.4	0.88 (0.32, 2.37)	0.82 (0.29, 2.28)	0.78 (0.27, 2.26)
Low EF Only	40.9	1.39 (0.65, 2.94)	1.37 (0.63, 2.94)	0.81 (0.34, 1.93)
Depression Only	51.9	2.15 (0.89, 5.20)	2.44 (0.96, 6.19)	1.59 (0.58, 4.41)
Depression + Low EF				
Network and Relationship Factors				
Low Perceived Significant Other Support				
Neither	28.4	1.00	1.00	1.00
Depression/Low EF	41.7	1.80 (0.71, 4.58)	1.88 (0.70, 5.07)	1.79 (0.66, 4.88)
Low EF Only	54.6	3.02 (1.42, 6.42)	3.42 (1.53, 7.66)	3.15 (1.33, 7.45)
Depression Only	70.7	5.99 (2.32, 15.43)	6.69 (2.37, 18.85)	6.37 (2.15, 18.91)
Depression + Low EF				
Low Perceived Family Support				
Neither	31.8	1.00	1.00	1.00
Depression/Low EF	33.3	1.07 (0.41, 2.80)	1.31 (0.48, 3.61)	1.18 (0.42, 3.31)

Factor ^a	% with Factor	Odds Ratio (95% CI)	Adjusted ^b Odds Ratio (95% CI)	Fully-Adjusted ^c Odds Ratio (95% CI)
Low EF Only	52.3	2.35 (1.12, 4.93)	2.22 (1.01, 4.86)	1.80 (0.78, 4.16)
Depression Only	51.9	2.31 (0.96, 5.55)	1.87 (0.72, 4.85)	1.48 (0.54, 4.09)
Depression + Low EF				
Low Perceived Friend Support				
Neither	35.2	1.00	1.00	1.00
Depression/Low EF	37.5	1.10 (0.43, 2.81)	1.10 (0.41, 2.94)	1.06 (0.39, 2.85)
Low EF Only	50.0	1.84 (0.88, 3.84)	1.68 (0.78, 3.64)	1.43 (0.62, 3.30)
Depression Only	66.7	3.68 (1.48, 9.15)	3.47 (1.30, 9.26)	3.28 (1.16, 9.28)
Depression + Low EF				
Did Not Think Relationship was Going Well				
Neither	21.4	1.00	1.00	1.00
Depression/Low EF	41.7	2.63 (1.01, 6.85)	2.45 (0.87, 6.91)	2.43 (0.85, 6.97)
Low EF Only	45.5	3.07 (1.41, 6.70)	2.90 (1.26, 6.66)	2.49 (1.02, 6.06)
Depression Only	48.2	3.42 (1.38, 8.49)	2.86 (1.05, 7.80)	2.26 (0.78, 6.51)
Depression + Low EF				
Less than Very Happy in the Relationship				
Neither	55.1	1.00	1.00	1.00
Depression/Low EF	56.5	1.06 (0.42, 2.67)	0.89 (0.34, 2.36)	0.91 (0.34, 2.45)
Low EF Only	81.8	3.67 (1.54, 8.79)	4.40 (1.72, 11.23)	4.12 (1.51, 11.23)
Depression Only	80.8	3.43 (1.19, 9.91)	3.59 (1.15, 11.19)	3.12 (0.93, 10.42)
Depression + Low EF				
Substance Use				
5 Drinks on Typical Day				
Neither	18.1	1.00	1.00	1.00
Depression/Low EF	14.3	0.76 (0.20, 2.90)	0.62 (0.16, 2.51)	0.57 (0.14, 2.30)
Low EF Only	22.5	1.32 (0.52, 3.33)	1.76 (0.64, 4.78)	1.52 (0.52, 4.42)
Depression Only	38.5	2.83 (1.08, 7.46)	3.62 (1.22, 10.80)	3.31 (1.04, 10.49)
Depression + Low EF				
Frequent Marijuana Use in Lifetime				Not estimated due to collinearity
Neither	64.8	1.00	1.00	
Depression/Low EF	69.6	1.24 (0.46, 3.35)	1.31 (0.46, 3.77)	
Low EF Only	72.7	1.45 (0.66, 3.21)	1.24 (0.53, 2.92)	
Depression Only	76.9	1.81 (0.66, 4.98)	1.62 (0.55, 4.76)	
Depression + Low EF				
Lifetime Crack/Cocaine Use				
Neither	34.1	1.00	1.00	1.00

Factor ^a	% with Factor	Odds Ratio (95% CI)	Adjusted ^b Odds Ratio (95% CI)	Fully-Adjusted ^c Odds Ratio (95% CI)
Depression/Low EF	47.8	1.77 (0.70, 4.49)	1.47 (0.50, 4.28)	1.44 (0.50, 4.31)
Low EF Only	43.2	1.47 (0.70, 3.09)	1.96 (0.84, 4.60)	1.85 (0.74, 4.62)
Depression Only	48.2	1.80 (0.75, 4.30)	1.79 (0.64, 5.00)	1.47 (0.49, 4.40)
Depression + Low EF				
Lifetime Ecstasy Use				
Neither	29.6	1.00	1.00	1.00
Depression/Low EF	13.0	0.36 (0.10, 1.31)	0.37 (0.09, 1.44)	0.30 (0.07, 1.20)
Low EF Only	27.9	0.92 (0.41, 2.07)	0.85 (0.35, 2.04)	0.49 (0.18, 1.33)
Depression Only	33.3	1.19 (0.47, 3.00)	1.10 (0.37, 3.24)	0.59 (0.18, 1.96)
Depression + Low EF				

^aPrevalence of indicators: food insecurity=23.6%; homelessness=19%; concern about ability to pay bills=33.3%; joblessness=37.6%; low significant other support=42.6%; low family support=39.9%; low friend support=43.7%; relationship not going well=33.7%; less than very happy in relationship=65.4%; incarcerated 9 times=38.4%; spent >5 years in incarcerated=18.5%; 5 drinks on typical day=21.8%; frequent marijuana use=60.9%; lifetime crack/cocaine use=40.1%; lifetime ecstasy use=27.6%

^bSocioeconomic outcome models adjusted for age and education; criminal justice involvement history, relationship factors and substance use models adjusted for age, education, and food insecurity

^cSocioeconomic outcome models adjusted for age, education, ASPD, depression score, and BPD symptom severity score; criminal justice involvement history, relationship factors and substance use models adjusted for age, education, food insecurity, ASPD, depression score, and BPD symptom severity score