POOR EMPLOYMENT PROSPECT AND SUBSTANCE USE DISORDER STATUS AMONG MIDDLE-AGED MEN

A Thesis

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by

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ABSTRACT

Background. The compounded effects of the decline of low-skilled labor and the Great Recession of 2008 has caused the employment prospect of poorly educated workers to deteriorate, which may have led to substance misuse as a coping mechanism. *Objective.* This study aims to determine whether poor employment prospect has a positive association with the likelihood of having a substance use disorder (SUD) among middle-aged males in the United States. *Methods.* Using data from the 2008 to 2014 National Survey on Drug Use and Health, estimated linear probability models were utilized to evaluate the relationship between poor employment prospect and SUD status, potential moderators in the relationship, and a potential mediator – mental distress – in the relationship. In our secondary analysis, two separate linear probability models were compared to determine whether the relationship between poor employment prospect and SUD status differed across the recent economic cycle and to see how much of the relationship is accounted for by mental health. *Results.* The analysis indicated a positive correlation between poor employment prospect and SUD status, which is mediated by psychological distress. The results from the secondary analysis found that the relationship between poor employment prospect and SUD status is most magnified during times of macroeconomic upheaval and confirms that mental health explains a significant amount of the relationship. *Conclusion.* Having poor employment prospect is associated with an increased likelihood of having a SUD among middle-aged men. The relationship is strongly accounted for by psychological distress.

BIOGRAPHICAL SKETCH

Philip J. Jeng is currently enrolled in the Master of Science in Health Policy and Economics program at Weill Cornell Graduate School of Medical Sciences. He holds a Bachelor of Science in Health Science from Boston University's College of Health and Rehabilitation Sciences: Sargent College. He is interested in the fields of substance use, behavioral health, and community health. He is currently a research aide at Weill Cornell Medical College's Healthcare Policy and Research Department and will be working with the Center for Health Economics of Treatment Interventions for Substance Use Disorder, HCV, and HIV.

"There's no way to pay you back, but the plan is to show you that I understand. You are appreciated." -Tupac Shakur

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INTRODUCTION

Background and Significance

Increasingly, people with low levels of education are confronted with unemployment, underemployment, and a poor prospect of finding jobs that offer economic stability and career growth. In the US, there has been a steady decline in traditional labor-intensive industries due to factors such as outsourcing jobs overseas and automation of work, both of which are attractive to employers as they result in a cheaper cost of labor.(1) Subsequently, many of the communities that economically rely on these industries have declined and failed to thrive. The Great Recession of 2008 also had a massive effect on the US job market. The economic downturn caused an increase in unemployment from 7 million to over 15 million persons within one year.(2) Such rates of unemployment and the deterioration of employment prospects lead to many Americans to lose their sense of financial stability, identity, control, and social structure. The negative effects of unemployment are perceived to especially magnified for blue-collar workers.(3)

Unemployment has consistently been shown to be associated with substance misuse.(3, 4) From 2002 to 2013, rates of illicit drug use in the US had increased from 8.3% to 9.4% of the population aged 12 years and older. The rate of illicit drug use has also increased among fifty and sixty year olds to unprecedented levels, partly due to the number of persons born in the post- World War II baby boom.(5, 6) Nonmedical use of prescription painkillers are of great concern, as they are highly addictive, relatively accessible compared to other substances, and usually lead to illicit opioid usage. From 1999 to 2008, the overdose death rates, sales, and substance use disorder (SUD) treatment related to prescription opioids have increased in parallel.(7) The US drug overdose death rate in 2014 was the highest on record, with 165,000 deaths attributed to prescription opioid overdoses.(8)

The combination of a weak labor market and lack of applicable skills to available opportunities drove the deterioration of employment prospects for workers. With no

immediate relief and the continued diminishment of employment potential, many workers were driven to states of despair. As a consequence of their distress, some workers may misuse substances as a coping mechanism to deal with the loss of income, identity, and sense of security.

In 2015, Case and Deaton found an increase in all-cause mortality of middle-aged (45 to 54 years old) non-Hispanic whites despite a general decrease in all-cause mortality among almost all other age and race/ethnicity groups from 1999 to 2013. This increase in mortality was most prominent among those with an education level of high school or lower, whose mortality rate rose from 281 to 415 deaths per 100,000 persons. The drivers of the increase in mortality were substance overdoses, chronic liver disease, and suicides. The study also found parallel increases in chronic pain, poor health, and distress among this population. The study posits that increased economic insecurity and the deterioration of employment opportunities drove these increases, which could also account for increased substance use as a coping mechanism among this population.(9) Consistent with Case and Deaton's observations, the Centers for Disease Control and Prevention found increases in the crude death rates for chronic liver disease and cirrhosis (11.6 to 12.1 deaths per 100,000), suicide (12.9 to 13.6 deaths per 100,000), and drug overdose (14.1 to 15.0 deaths per 100,000) between 2014 to 2015.(10) Figure 1 depicts a conceptual framework for Case and Deaton's study.

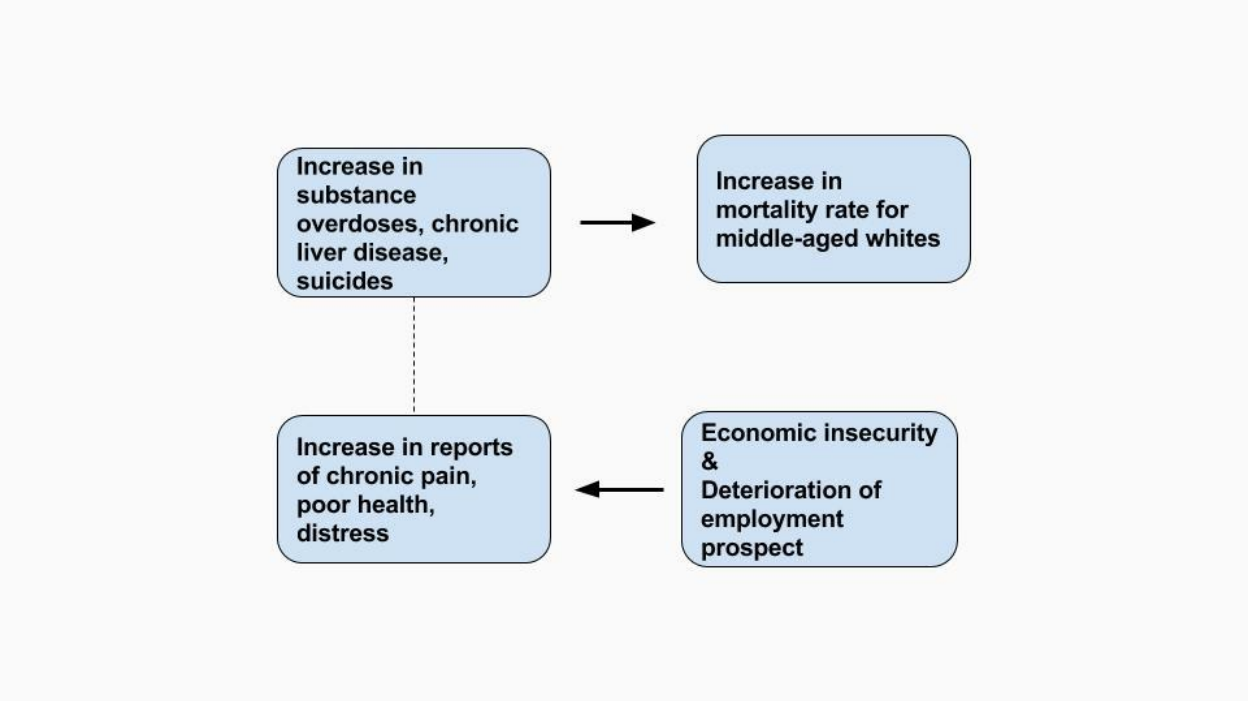

Figure 1 - Conceptual framework of Case and Deaton's findings for poorly educated middle-aged non-Hispanic whites.

The objective of this study is to examine the relationship between poor employment prospect and the likelihood of having a substance use disorder (SUD) among middle-aged men. Previous studies analyzed the relationship between employment status and SUD status.(4) Other studies about SUDs have primarily focused on national trends(11) or subgroups of adolescents(12-16). There is an increasing but limited number of studies on SUDs and the elderly.(5, 17, 18) Some literature has also focused on the comorbidity of mental health and substance use, with employment as a co-variate.(19) This study aims to expand the understanding of SUDs in regards to the middle-aged population and through the lens of employment. This study also examined how the relationship may differ for individuals with different socioeconomic demographics and whether the relationship is mediated by mental health. Given that the current attitude of addressing substance use is shifting from punishment to harm reduction and treatment,(20, 21) this study would be extremely timely in elucidating possible predictors of SUDs.

Conceptual Framework

The concept of employment prospect is significantly different than employment status. While employment status measures a person's employment at one specific point in time, employment prospect measures a respondent's potential of being employed given employment status and other factors such as educational level and disability. While current unemployment may lead to increased levels of despair, the erosion of future employment opportunities could be equally distressing. The stress associated with poor employment prospect tends to be long-term.

Case and Deaton's study noted that while all education groups saw an increase in mortality, those with less education had a much more remarkable increase. This study believes that level of education and current employment status are strongly involved with a person's employment prospects and may serve as a predictor of SUD.

This study evaluated the relationship poor employment prospect and SUD status among middle-aged men only. Due to traditional gender roles, men are more likely to see unemployment as defeat of their self-image(22) and identity when compared to women.(3) Long-term unemployment has a greater association with depression among men when compared with women. In addition, alcohol consumption and its health consequences are more prominent amongst males compared to females.(23) Certain traits among males are also associated with a decrease in psychological well-being, an increased report of alcohol usage, and an increased similarity in behavior to substance abusers.(24)

The relationship between poor employment prospect and SUD status could also be moderated by an individual's characteristics. Positive social buffers, such as a strong social support from friends and family, could have a protective effect against risky and self-harming behaviors (25-27) which can lead to the development of a SUD. Familial support and appraisal has been linked to a decreased likelihood of substance use among adolescents,(14-16) but there appears to be a dearth in literature regarding family support

and SUDs among middle-aged persons. In addition to being associated with decreased mortality outcomes,(28) religiosity has been linked to a decreased likelihood in self-harmful and risky behavior,(25, 26) such as suicide and hazardous alcohol use.(27) Demographic factors, such as age and race may also play a role in moderating the relationship between employment prospect and SUD status. Case and Deaton's study found that substance overdoses and chronic liver disease for middle-aged whites rose year-on-year after 1998.(9) In terms of age, studies have shown an increasing rate of substance usage among late middle-aged and elderly adults.(17, 18, 29, 30) A previous study compared the nonmedical prescription drug use between respondents aged 50 to 64 years and respondents older than 64 years of age, indicating nonmedical drug use increases among both populations.(5)

Psychological distress was examined as a potential mediator for the relationship between poor employment prospect and SUD status. The comorbidity between SUDs and other mental health issues have been well documented.(17, 31) This study is interested in determining if psychological distress lies on the hypothesized causal pathway between poor employment prospect and SUD status. Figure 2 depicts a conceptual framework for the relationship between poor employment prospect and SUD status.

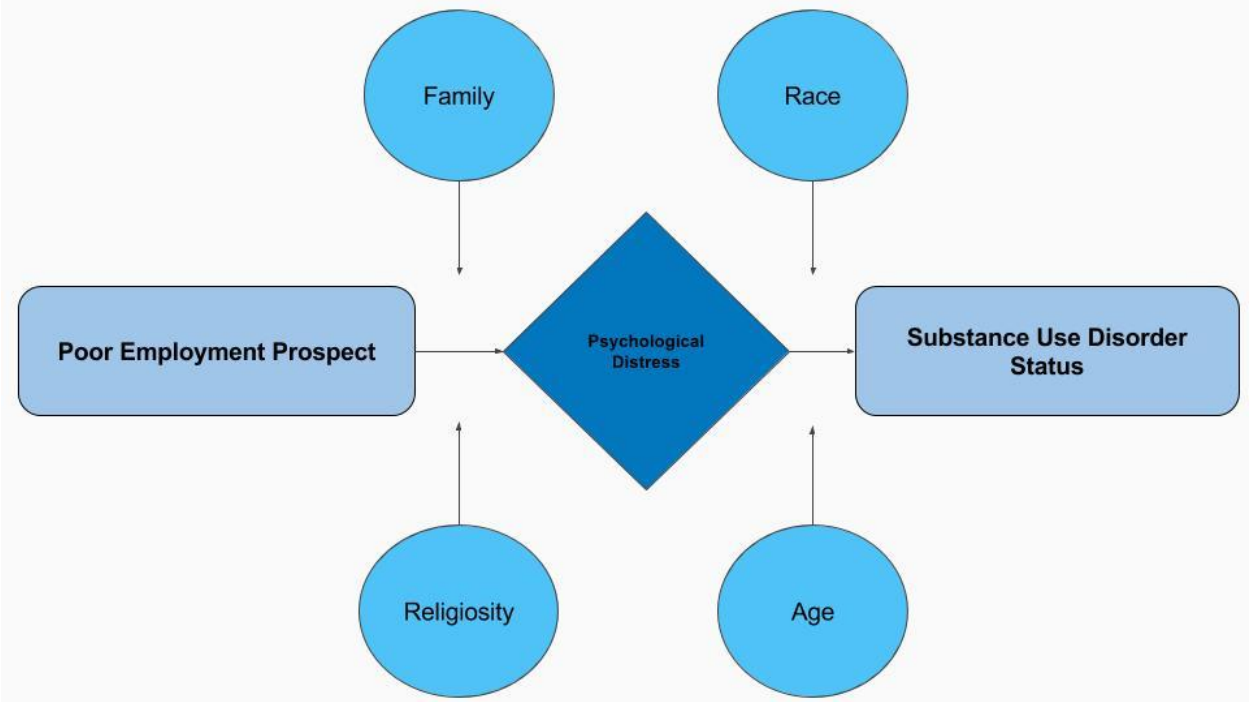

Figure 2 - Conceptual framework of employment prospect and SUD status. Psychological distress is our hypothesized mediator. Family, race, religiosity, and age are our hypothesized moderators.

This study hypothesizes that having poor employment prospect is associated with an increase in the likelihood of having a SUD. This study also hypothesizes that demographic and psychosocial factors such as family, race, religiosity, and age will have moderating effects on this relationship. Respondents that are married with children or respondents that regularly attend religious services may have a protective moderating effect against the likelihood of having a SUD given poor employment prospect. Older age and white race may be associated with a moderating effect increasing the likelihood of having a SUD given poor employment prospect. This study hypothesizes that psychological distress mediates the relationship between poor employment prospect and SUD status. This study also hypothesizes that the relationship between poor employment prospect and SUD will be magnified in times with rapid changes in the labor market.

METHODS

Study Design

This study is a repeated cross-sectional study consisting of secondary data analysis on the National Survey on Drug Use and Health of the years 2008 to 2014. The time frame for this study is the calendar years of 2008 to 2014.

Study Population

The study population consists of all non-institutionalized middle-aged males in the US. The sample population consists of male respondents of National Survey on Drug Use and Health 2008 to 2014 aged 35 to 64.

"Middle-aged" was defined to be within the age range of 35 to 64 years. This category was most representative of a middle-aged population, as the life expectancy for American males is estimated to be 76 years as of 2015.(32) 64 years of age was selected as the cut off, as 65 years of age is traditionally the retirement age for Americans, and when Medicare and social security benefit payments are typically accessed by beneficiaries.(33)

Data and Sample

The National Survey on Drug Use and Health (NSDUH) is an annual survey conducted by RTI international on behalf of the US Department of Health and Human Services' Substance Abuse and Mental Health Services Administration. The survey aims to provide nationally representative data on the US civilian non-institutionalized population aged 12 years and older for alcohol, tobacco, and illicit substance use and abuse.(34)

The unit of analysis for the NSDUH is the individual. This study utilized surveys from 2008 to 2014 for evaluation, as this study posits that the macroeconomic downturn from 2007 to 2009 created exogenous shock on employment prospects.(35) The time period was also selected as the late 2000's saw an increase in substance misuse, especially that of prescription opioids and heroin.(7)

Respondents were selected via a stratified random sampling design. Once a respondent is selected and agrees to participate, the interview takes place in the respondent's residence. There is a financial incentive of thirty dollars to participate in the survey. As of 1999, most of the survey's questions are asked by the computer to the respondent via headphones, so that the questions and responses are blinded to the interviewer. Less sensitive questions are read aloud and the respondent enters the response directly onto a computer. These two methods were adopted to encourage honest responses to questions regarding possibly stigmatizing information.(34)

Measures

Dependent Variable

This study's dependent variable is SUD status. A respondent was determined to have SUD if he met the criteria for either substance dependency or abuse. Substance dependency and substance abuse are mutually exclusive as per the NSDUH, with substance dependency taking precedence over substance abuse. The criteria for the two conditions are derived from the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV). The substances included are marijuana, inhalants, hallucinogens, tranquilizers, alcohol, pain relievers, cocaine, heroin, sedatives, and stimulants. Nicotine was not included because the NSDUH does not code nicotine dependence based on DSM-IV criteria, unlike the other substance measures in the survey. The NSDUH also does not have a nicotine abuse measure.(34)

Key Independent Variable

This study's primary independent variable is a binary measure of poor employment prospect. A respondent was determined to have poor employment prospect if he met both of the following criteria: the respondent does not have a college degree; the respondent is currently unemployed. A composite measure was selected to measure the prospect of having long-term productive employment. Current employment status has the caveat of reverse causality, in which SUD can be a predictor for employment status.(36)

Adding college education to the definition helps mitigate this reverse causality, as most respondents in the age range of 35 to 64 would have completed their educational endeavors.(37, 38) "No college degree and unemployed" was selected as the definition of poor employment prospect, after experimenting with multiple definitions and noting that this definition maximizes the contrast between respondents with the lowest employment potential and the remainder of the sample.

Other Independent Variables

Race is a binary variable of "white" or "nonwhite." Hispanic whites and multiracial men were grouped into the nonwhite group. Family structure is a categorical composite variable based on two dichotomous variables of marital status and presence of children in the household. Religiosity is a categorical variable based on the number of religious services attended in the past year. The categories for religiosity are "0 services," "1 to 5 services," "6 to 24 services," and "24 to 52+ services." Age was coded as a binary variable, which separated respondents to "aged 35 to 49 years" and the "aged 50 to 64 years." All the above variables were also considered as potential moderators of the relationship between poor employment prospect and SUD status.

The mental health mediator evaluated was psychological distress. Psychological distress is based on the Kessler 6 Scale (K6), which measures nonspecific psychological distress, defined as general psychological problems impeding activities of daily living. K6 scores range from 0 to 24. The categories for psychological distress are "none (K6 score 0 to 5)," "moderate (K6 score 6 to 12)," and "serious (K6 score 13 to 24)."(39-41)

Confounders

There are confounders that the study is unable to adjust for, as the survey does not provide data for these variables. These unmeasured variables, typically related to environmental and psychosocial factors, affect education and the probability of developing a SUD. Examples of these unmeasured variables are family upbringing and traumatic experiences. Childhood exposure to various types of abuse or household

dysfunction is associated with behavioral health conditions, such as binge drinking and depression.(42) Adverse childhood events are associated with low levels of education and poor health outcomes as adults.(43) Another source of confounding is patient characteristics that are not provided in the publicly available dataset, such as the weight, the exact age, the exact income, and the geographic location of the respondent.

Analytical Strategies

This study utilized a linear probability model to evaluate the relationship between poor employment prospect and SUD using pooled data from 2008 to 2014. Three equations were used in this study. The first equation of regression is:

$$SUD = \beta_0 + \beta_1(PEP) + \beta_2(Controls) + T\tau + e$$

where $T\tau$ represents time fixed effects and e is the error term. This is the Base Model. The second equation of regression is:

$$SUD = \beta_0 + \beta_1(PEP) + (\Sigma_k m^k * PEP) + T\tau + e$$

where $(\Sigma_k m^k * PEP)$ tests the hypothesized moderating effects of race, family structure, religiosity, and age. This is Model 2.

Our final equation of regression is:

$$SUD = \beta_0 + \beta_1(PEP) + (\Sigma_k m^k * PEP) + \gamma_1(PD) + \gamma_2(PD * PEP) + T\tau + e$$

where $\gamma_1(PD)$ and $\gamma_2(PD * PEP)$ combined tests the hypothesized mediating effect of psychological distress for the relationship between poor employment prospect and SUD status. This is Model 3.

In a secondary analysis, Model 2 and Model 3 were estimated separately for all individual years from 2008 to 2014. As the 7 years covers the full cycle of the recent economic recession, this analysis allowed for an examination of whether the relationship between poor employment prospect and SUD status differed at different points of the economic and labor market cycle. This analysis also permits a view to how mental health affects the relationship of interest over the time period.

RESULTS

The final unweighted sample size consists of 39,108 respondents. A total of 4,150 (10.61%) respondents had a SUD. A total of 6,475 respondents (16.56%) had poor employment prospect. A much higher percentage of respondents with a SUD had poor employment prospect (24.64%) than those without a SUD (15.62%). A chi-squared test found a statistically significant association between poor employment prospect and having a SUD ($X^2 = 209.79$, 1 DF; $p = 0.000$). See table 1 for descriptive statistics of the sample.

In the primary analysis, poor employment prospect was statistically significantly associated with an increase in the likelihood of having a SUD. When the psychological distress mediator was included, the relationship between poor employment prospect and SUD status decreased in magnitude and lost statistical significance.

The primary analysis also observed moderating effects in the relationship between poor employment prospect and SUD status. The probability of having a SUD conditional on poor employment prospect was reduced for individuals who are married and have children in the household, compared to those not married and have no children in the household. The probability of having a SUD conditional on poor employment prospect was increased for nonwhite individuals, compared to white individuals. Religiosity did not provide a moderating effect. The probability of having a SUD conditional on poor employment prospect was reduced for individuals who were 50 to 64 years old, compared to those who were 35 to 49 years old. In terms of mediating effects, psychological distress had a statistically significant association with having a SUD ($p = 0.000$). Compared to those without psychological distress, respondents with serious psychological distress saw the strongest association with having a SUD, with a 17.4 percentage point increase in the likelihood of having a SUD.

Table 1 - Descriptive statistics of the sample population.

	Full Sample	No SUD	SUD	Chi-Squared Test
	n = 39,108	34,958 (89.39)	4,150 (10.61)	
Full Time	28,898 (73.89)	26,196 (74.94)	2,702 (65.11)	X^2 = 222.97, 4 DF
Part Time	2,549 (6.52)	2,234 (6.39)	315 (7.59)	p = 0.000 ***
Unemployed	2,280 (5.83)	1,890 (5.41)	390 (9.40)	
Disabled	3,096 (7.92)	2,639 (7.55)	457 (11.01)	
Out of Labor Force	2,285 (5.84)	1,999 (5.72)	286 (6.89)	
Less Than High School	5,667 (14.49)	4,829 (13.81)	838 (20.19)	X^2 = 202.00, 3 DF
High School Graduate	12,076 (30.88)	10,729 (30.69)	1,347 (32.46)	p = 0.007 **
Some College	9,464 (24.20)	8,437 (24.13)	1,027 (24.75)	
College Graduate	11,901 (30.43)	10,963 (31.36)	938 (22.60)	
No	32,633 (83.44)	29,498 (84.38)	3,135 (75.54)	X^2 = 209.79, 1 DF
Yes	6,475 (16.56)	5,460 (15.62)	1,015 (24.46)	p = 0.000 ***
Not Married-No Children	10,528 (26.92)	8,874 (25.38)	1,654 (39.86)	X^2 = 543.51, 3 DF
Not Married-Yes Children	3,396 (8.68)	2,894 (8.28)	502 (12.10)	p = 0.000 ***
Yes Married-No Children	10,180 (26.03)	9,371 (26.81)	809 (19.49)	
Yes Married-Yes Children	15,004 (38.37)	13,819 (39.53)	1,185 (28.55)	
White	26,719 (68.32)	23,953 (68.52)	2,766 (66.65)	X^2 = 5.99, 1 DF
Nonwhite	12,389 (31.68)	11,005 (31.48)	1,384 (33.35)	p = 0.014*
None	17,404 (44.50)	15,235 (43.58)	2,169 (52.27)	X^2 = 367.93, DF = 4
1 to 5	7,731 (19.77)	6,732 (19.26)	999 (24.07)	p = 0.000 ***
6 to 24	4,963 (12.69)	4,466 (12.78)	497 (11.98)	
25 to 52+	9,010 (23.04)	8,525 (24.39)	485 (11.69)	
35 to 49 years of age	26,466 (67.67)	23,316 (66.70)	3,150 (75.90)	X^2 = 143.73, DF = 1
50 to 64 years of age	12,642 (32.33)	11,642 (33.30)	1,000 (24.10)	p = 0.000 ***
None	25,817 (66.01)	24,202 (69.23)	1,615 (38.92)	X^2 = 1.7e+03, 2 DF
Moderate	10,101 (25.83)	8,397 (24.02)	1,704 (41.06)	p = 0.000 ***
Serious	3,190 (8.16)	2,359 (6.75)	831 (20.02)	
2008	5,020 (12.84)	4,481 (12.82)	539 (12.99)	X^2 = 19.20, DF = 6
2009	5,149 (13.17)	4,530 (12.96)	619 (14.92)	p = 0.004 **
2010	5,386 (13.77)	4,852 (13.88)	534 (12.87)	
2011	5,484 (14.02)	4,935 (14.12)	549 (13.23)	
2012	5,161 (13.20)	4,621 (13.22)	540 (13.01)	
2013	5,210 (13.32)	4,626 (13.23)	584 (14.07)	
2014	7,698 (19.68)	6,913 (19.78)	785 (18.92)	

In all three models, compared to those that are not married and have no children in the household, both respondents married with children in the household and married without children in the household had a statistically significant reduction in the likelihood of having a SUD (both p = 0.000). The family structure with the largest protective effect was married with children in the household. Race did not have a statistically significant association in the likelihood of having a SUD in all three models. Religiosity had a

statistically significant reduction in the likelihood of having a SUD across all three models if the respondent attended religious services 6 to 24 times or 25 to 52+ times in the past year, compared to those who did not attend religious services in the past year. Attending religious services 25 to 52+ times was statistically significantly associated with having a larger protective effect ($p = 0.000$). Compared to respondents aged 35 to 49 years, respondents aged 50 to 64 years had a consistent statistically significant decrease in likelihood in having a SUD across all three models ($p = 0.000$). See table 2 for a summary of the primary analysis.

Table 2 - Results from primary analysis comparing base model, model with moderators, and model with mediators.

		Model 1	Model 2	Model 3
Poor Employment Prospect (PEP)	Yes	**0.0461 *** **	**0.0553 *** **	0.0188
Family	Not Married, Yes Children	**-0.0166 ** **	**-0.0163 * **	-0.0129
	Married, No Children	**-0.0522 *** **	**-0.0501 *** **	**-0.0376 *** **
	Married, Yes Children	**-0.0693 *** **	**-0.0634 *** **	**-0.0506 *** **
Race	Nonwhite	-0.00108	-0.00610	-0.000459
Religiosity	1-5 Services	**0.00908 * **	0.00563	0.00251
	6-24 Services	**-0.0141 ** **	**-0.0144 ** **	**-0.0167 ** **
	25-52+ Services	**-0.0502 *** **	**-0.0511 *** **	**-0.0508 *** **
Age	50-64 Years Old	**-0.0486 *** **	**-0.0424 *** **	**-0.0333 *** **
Year	2009	0.0109	0.0106	0.00764
	2010	-0.00895	-0.00932	-0.00983
	2011	-0.00662	-0.00679	-0.00719
	2012	-0.00335	-0.00357	-0.00571
	2013	0.00362	0.00336	0.00184
	2014	-0.00548	-0.00569	-0.00640
PEP X Family	PEP X Not Married, Yes Children	---	0.000439	0.00108
	PEP X Married, No Children	---	-0.00706	-0.00601
	PEP X Married, Yes Children	---	**-0.0375 ** **	**-0.0384 ** **
PEP X Race	PEP X Nonwhite	---	**0.0285 ** **	**0.0317 *** **
PEP X Religiosity	PEP X 1-5 Services	---	0.0171	0.0124
	PEP X 6-24 Services	---	-0.00234	-0.00326
	PEP X 25-52+ Services	---	-0.00291	-0.000433
PEP X Age	PEP X 50-64 Years Old	---	**-0.0301 ** **	**-0.0227 * **
Psychological Distress (PD)	Moderate PD	---	---	**0.0951 *** **
	Serious PD	---	---	**0.174 *** **
PEP X Psychological Distress	PEP X Moderate PD	---	---	0.0164
	PEP X Serious PD	---	---	0.00753

In the secondary analysis, there was a statistically significant positive relationship between poor employment prospect and SUD for the years of 2008, 2009, 2010, 2013, and 2014, when psychological distress was not included as a potential mediator. When psychological distress was included, poor employment prospect did not predict SUD in a statistically significant way throughout all 7 years. Across the timespan, being married with children and attending religious services 25 to 52+ times in the past year were consistently statistically significantly associated with a decrease in the likelihood of having a SUD. When including mediating effects, psychological distress was consistently associated with an increase in the likelihood of having a SUD throughout the timespan. See table 3 and figure 3 for a summary of the secondary analysis.

Table 3 - Results from secondary analysis comparing Model 2 and Model 3 for each individual year from 2008 to 2014.

		2008	2008 PD	2009	2009 PD	2010	2010 PD	2011	2011 PD	2012	2012 PD	2013	2013 PD	2014	2014 PD
Poor Employment Prospect (PEP)	Yes	**0.0510 ***	0.00704	**0.0867 *****	0.0240	**0.0661 ****	0.0284	0.0145	-0.00806	0.0367	0.0147	**0.0822 ****	0.0248	**0.0493 ***	0.0267
Family	Not Married, Yes Children	-0.0129	-0.0117	0.0228	0.0208	0.00512	0.00587	-0.0227	-0.0142	**-0.0418 ***	**-0.0368 ***	-0.0289	-0.0214	-0.0274	-0.0242
	Married, No Children	**-0.0655 *****	**-0.0517 *****	**-0.0551 *****	**-0.0439 ****	**-0.0535 *****	**-0.0441 ****	**-0.0465 *****	**-0.0349 ****	**-0.0548 *****	**-0.0378 ****	**-0.0339 ***	-0.0200	**-0.0440 *****	**-0.0329 ****
	Married, Yes Children	**-0.0760 *****	**-0.0632 *****	**-0.0496 *****	**-0.0388 ****	**-0.0635 *****	**-0.0516 *****	**-0.0580 *****	**-0.0476 *****	**-0.0704 *****	**-0.0570 *****	**-0.0621 *****	**-0.0466 *****	**-0.0659 *****	**-0.0526 *****
Race	Nonwhite	0.00966	0.0127	-0.00744	-0.00308	**-0.0243 ***	**-0.0212 ***	-0.00889	-0.00119	-0.00991	-0.00294	0.00124	0.00656	-0.00416	0.00326
Religiosity	1-5 Services	0.000807	-0.00200	0.00907	0.00489	-0.00758	-0.00787	0.00244	-0.00194	-0.0118	-0.0145	**0.0272 ***	**0.0244 ***	0.0131	0.00901
	6-24 Services	-0.00101	-0.00605	**-0.0567 *****	**-0.0593 *****	0.00851	0.00432	-0.0257	-0.0266	-0.0108	-0.0120	-0.0133	-0.0152	-0.00453	-0.00592
	25-52+ Services	**-0.0505 *****	**-0.0494 *****	**-0.0564 *****	**-0.0580 *****	**-0.0394 *****	**-0.0417 *****	**-0.0632 *****	**-0.0623 *****	**-0.0569 *****	**-0.0524 *****	**-0.0494 *****	**-0.0472 *****	**-0.0452 *****	**-0.0457 *****
Age	50-64 Years Old	**-0.0429 *****	**-0.0340 ****	**-0.0336 ****	**-0.0239 ***	-0.0177	-0.00762	**-0.0592 *****	**-0.0512 *****	**-0.0497 *****	**-0.0426 *****	**-0.0501 *****	**-0.0394 *****	**-0.0431 *****	**-0.0340 *****
PEP X Family	PEP X Not Married, Yes Children	0.0126	0.00969	-0.0707	-0.0529	-0.0179	-0.0221	-0.0112	-0.0199	**0.101 ***	**0.0982 ***	-0.0540	-0.0244	0.0396	0.0293
	PEP X Married, No Children	0.00974	0.00758	-0.0292	-0.0321	0.0191	0.0343	0.00310	-0.00363	0.0149	0.0118	-0.0162	-0.00373	-0.0397	-0.0407
	PEP X Married, Yes Children	-0.0318	-0.0382	**-0.0809 ***	**-0.0740 ***	-0.0384	-0.0317	-0.0129	-0.0153	0.00246	-0.00156	-0.0451	-0.0381	**-0.0587 ***	**-0.0668 ***
PEP X Race	PEP X Nonwhite	0.00988	0.0139	**0.0653 ****	**0.0751 ****	0.0206	0.0215	0.0254	0.0271	0.0224	0.0215	-0.0130	-0.0104	**0.0615 ****	**0.0630 ****
PEP X Religiosity	PEP X 1-5 Services	0.0298	0.0364	0.0227	-0.00227	0.0337	0.0289	**0.0559 ***	**0.0587 ***	-0.0104	-0.0159	0.0416	0.0294	-0.0459	-0.0459
	PEP X 6-24 Services	-0.0104	-0.000571	0.0249	0.0233	0.00910	0.00607	0.00401	0.00754	0.0186	0.0166	-0.0296	-0.0309	-0.0337	-0.0399
	PEP X 25-52+ Services	-0.0307	-0.0430	-0.0164	-0.00418	-0.0310	-0.0184	0.0288	0.0278	0.0182	0.0194	-0.0113	-0.0129	0.0119	0.0159
Age X PEP	PEP X 50-64 Years Old	-0.0470	-0.0329	**-0.0675 ***	**-0.0239 ***	**-0.0577 ***	**-0.0620 ****	-0.00266	0.00970	-0.0150	-0.00555	-0.0151	-0.00133	-0.0144	-0.0139
Psychological Distress (PD)	Moderate	---	**0.101 *****	---	**0.0887 *****	---	**0.100 *****	---	**0.0846 *****	---	**0.0884 *****	---	**0.104 *****	---	**0.0978 *****
	Serious	---	**0.163 *****	---	**0.163 *****	---	**0.0163 *****	---	**0.166 *****	---	**0.247 *****	---	**0.201 *****	---	**0.133 *****
PEP X Psychological Distress	PEP X Moderate PD	---	0.0501	---	**.0688 ***	---	-0.00163	---	-0.00357	---	0.0220	---	0.0217	---	-0.0147
	PEP X Serious PD	---	-0.0302	---	0.662	---	0.0501	---	-0.0122	---	**-0.103 ****	---	0.0316	---	0.0398

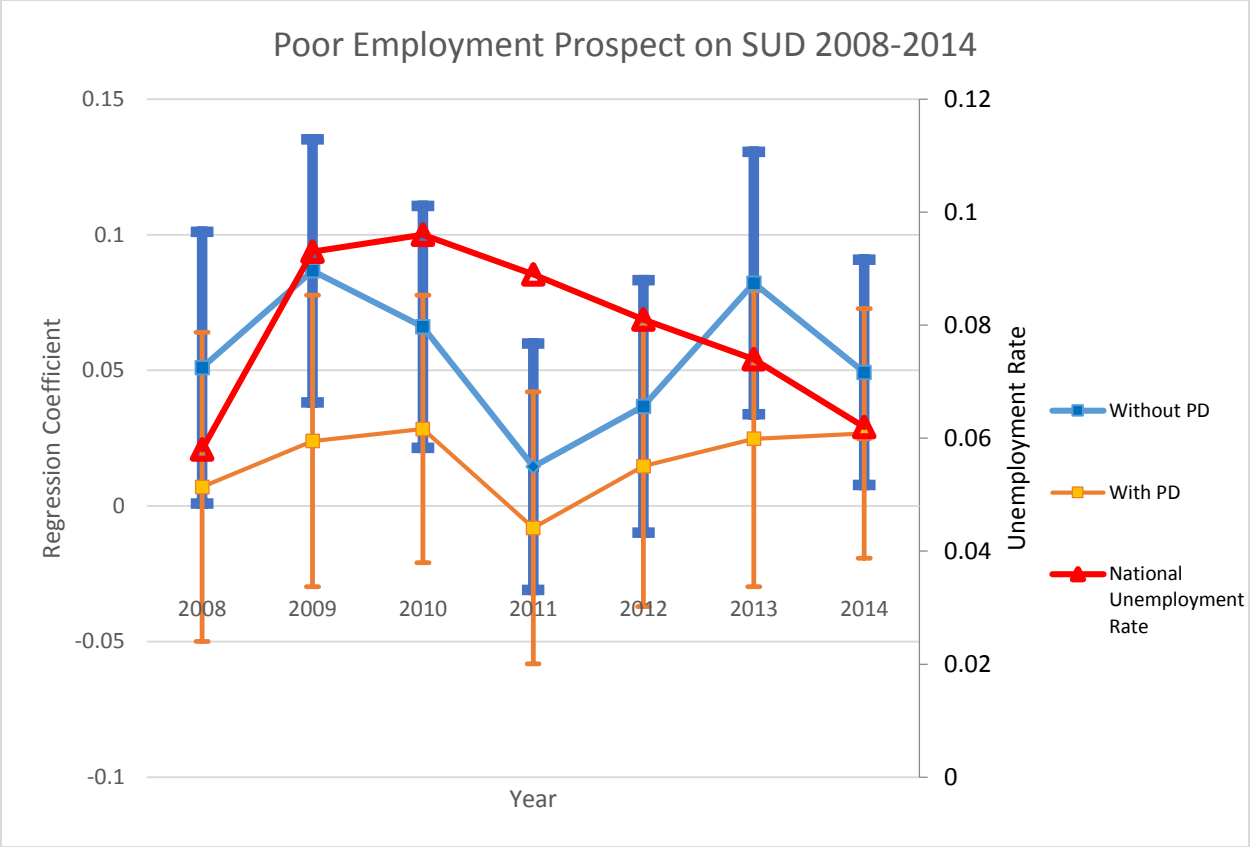

Figure 3 - Poor employment prospect on SUD from 2008 to 2014 comparing models with and without psychological distress as a mediator. National unemployment rate is plotted on the secondary vertical axis.

DISCUSSION

The primary analysis showed that there is a positive correlation between poor employment prospect and SUD status, and that most of the relationship is explained by psychological distress. Being married, attending religious services more than six times, and being 50 to 64 years old was associated with a protective effect against the likelihood of having a SUD. There was a protective moderating effect for respondents with poor employment prospect and that are married with children or are 50 to 64 years old. There was a positive moderating effect for respondents with poor employment prospect and were nonwhite. The secondary analysis showed that the relationship between poor employment prospect and SUD status was statistically significant (when psychological distress was not considered as a mediator) in years associated when nation-wide unemployment rate was changing rapidly.

The positive correlation between poor employment prospect and SUD status and how the relationship is mediated by psychological distress was consistent with the proposed conceptual framework between poor employment prospect and SUD. Consistent with the proposed framework, the relationship was moderated by a few sociodemographic factors, although not necessarily in the same hypothesized direction. This study's empirical findings shed light on the possibility that the relationship between the deterioration of employment prospect and the likelihood of developing a SUD is causal, and that the relationship is mediated by psychological distress.

In terms of family structure's moderating effect, the study's findings were consistent with the literature regarding familial support for adolescents' SUD status.(13-16) For middle-aged males, being married and having children in the household was the only family structure associated with a protective moderating effect given poor employment prospect. The absence of a moderating effect conditional on poor employment prospect when married respondents have no children in the household or when respondents have children in the household but are not married indicates that the

specific combination of being married and having children in the household provides moderating effects in the poor employment prospect and SUD status relationship.

In terms of age's moderating effect, this study's findings were not consistent with literature stating that the increase in rates of SUD misuse among late middle-aged adults.(17, 18, 29, 30) This study found that being in the older age group was associated with a decrease in likelihood of having a SUD status. These findings may suggest that because late middle-aged men are closer to the typical retirement age and accessing social security benefits than 35 to 49 year olds, the older group has already had fulfilling careers and/or financial savings to mitigate economic insecurity and identity loss.

Despite the first-order effect of religiosity directly predicting a reduction in the likelihood of having a SUD, the absence of a moderating effect provided by religiosity was not consistent with literature stating religiosity's association with lower rates of risky behavior.(25-27) The discrepancy could possibly be due to the fact that this study's definition for religiosity was a one-dimensional measure for the number of religious services attended. A future study may utilize a definition of religiosity with additional measures to capture the complexity of religiosity.(44)

The study's findings regarding race were contrary to its hypothesis for race and seem to disagree with Case and Deaton's findings. There was no association between race and SUD, but the moderating effect indicates that poor employment prospect has a stronger effect on nonwhites than nonwhites. This discrepancy may be explained by the idea that racial and ethnic minorities may be more sensitive to the deterioration of employment prospect compared to whites. A study found that the effects of long-term unemployment on distress and alcohol use were more prominent among poorly educated black workers.(3) A different study found that black males at all educational levels were less likely to attain employment compared to white males, due to differential access to labor opportunities.(45) Another possible explanation for the protective moderating effect for whites could be the exclusion of females from this study. Women are more likely to

have chronic pain and be prescribed pain relievers in higher doses and for longer durations than men,(7, 18) which can result in higher rates of SUDs among women. A future study could investigate if poorly educated middle-aged white females drove the increase in mortality rates for poorly educated middle-aged whites.

The secondary analysis showed that years 2008 to 2010 follow the macroeconomic events of the financial crisis and recession of 2008. The link between the relationship between poor employment prospect and SUD and macroeconomic trends was especially evident in 2009, which was the peak year for both the relationship and for unemployment rate.(2) The years 2011 and 2012 were associated with an economic stagnation, which is reflected by the lack of significance in the relationship between poor employment prospect and SUD for those years. 2013 saw the addition of 2.3 million nonfarm jobs and a 10.8 percentage point increase in Consumer Confidence Index, indicating that 2013, and subsequently 2014, would be a strong recovery year for the US economy.(46) Exogenous shock to poor employment prospect, as evidenced by presence of statistical significance only in years of economic upheaval, allows this study to support the hypothesized causal relationship from poor employment prospect to SUD status.

The weighted percentage of the study population with poor employment prospect in each year generally increased until peaking in 2011 at 17.5% and decreased over time, ending at 15.09% in 2014. The trend in weighted percentages differs significantly from the relationship between poor employment prospect and SUD status from 2008 to 2014, giving credence to the hypothesis that the relationship between poor employment prospect and SUD status follows macroeconomic trends. See table 4 for a comparison of the national unemployment rate, the weighted percentage of this study's population with poor employment prospect, and the estimated effect of poor employment prospect on SUD with 95% confidence intervals.

Table 4 - Comparison of national unemployment rate, weighted percentage of study population with poor employment prospect, and estimated effect of poor employment prospect on SUD status with 95% confidence intervals throughout the time span of 2008 to 2014.

Year	Unemployment Rate (%)	Weighted (%)	Estimated Effect	95% CI Low	95% CI High
2008	5.8	14.1	0.051	0.000938	0.101099
2009	9.3	16.35	0.0867	0.0382235	0.1351994
2010	9.6	17.24	0.0661	0.0214634	0.1106607
2011	8.9	17.5	0.0145	-0.0309088	0.0599511
2012	8.1	17.18	0.0367	-0.0098239	0.0832995
2013	7.4	15.58	0.0822	0.0337916	0.130596
2014	6.2	15.09	0.0493	0.0077331	0.0908304

It is important to note that when psychological distress was included in the equation, poor employment prospect was not associated with SUD status. This change in statistical significance is consistent with our results from the primary analysis. Psychological distress itself was consistently associated with an increased likelihood in having a SUD. Mental health accounts for a major portion of the relationship between poor employment prospect and SUD status. The positive moderating effect for nonwhite males with poor employment prospect is only significant in 2009 and 2013, which is consistent with the macroeconomic effect hypothesis.

Study Limitations

A major limitation of the cross-sectional study design is the inability to establish causality in the relationship between employment prospect and having a SUD. There may be a case of reverse causality, in which SUD status is a predictor of employment prospect. The study is only able to establish a correlational relationship. This study addresses these limitations by utilizing a robust composite measure for poor employment prospect and by conducting a secondary analysis investigating the relationship of interest for each individual year from 2008 to 2014. A major data limitation is that the study does not have macroeconomic and labor market data for the smaller geographic area where respondents live. Another limitation is the self-reported nature of the structured interview, which may or may not capture a respondent's true answers. The financial

incentive, sensitive data capture methods, and large sample size aim to mitigate such reporting bias from systematically biasing results.

Study Strengths

This study has a number of strengths. The NSDUH is the only national survey that provides high-quality measures for drug usage and uses structured computerized surveys for sensitive data capture. The aggregated data of the NSDUH 2008 to 2014 was utilized to maximize the observed effect between poor employment prospect and SUD status. This study also used each individual year's data to track the link of the relationship with macroeconomic events. Despite being unable to establish causality in the relationship between poor employment prospect and SUD status, this study was able to illuminate details of the causal pathway in that relationship by including a primary and secondary analysis on the relationship between poor employment prospect and SUD.

Implications

Given the positive correlational relationship between poor employment prospect and SUD status, initiatives to increase employment prospect should be considered. Employment assistance and vocational rehabilitation can be utilized for those with poor employment prospect to access employment opportunities and training for skills relevant to the current labor market. Because this study's results showed being married with children in the household was associated with a moderating effect against the likelihood of having a SUD, social programs can be developed to increase familial stability and to encourage familial support. Social activities, such as attending religious services or community service, may also help to preserve a sense of identity. It would also be important to consider whether these initiatives should focus on early middle-aged men, given that this study's results indicated late-middle aged men with poor employment prospect saw a moderating effect against the likelihood of having a SUD.

Screening procedures for SUD should be utilized in a diagnostic manner. Given the co-occurrence of mental health issues and SUDs, early screening can identify SUD or

risk factors of SUD and treatment can be provided earlier. A study on federal vocational rehabilitation programs found that persons diagnosed with a SUD were more likely to attain employment compared to those who screened positive for SUD but were not diagnosed with SUD.(47) Early detection via SUD screening can prevent the development of SUDs and would be beneficial for persons with poor employment prospect. As mental health screening has been successfully integrated into primary care, it would be possible to integrate SUD screening into primary care and mental health care.

Conclusion

This study found that poor employment prospect is positively correlated with SUD status, and that much of the relationship is explained by mental health. The social buffer of family and demographic buffer of age are associated with protective effects in this relationship. The demographic buffer of being nonwhite given poor employment prospect is associated with a positive contributive effect in the likelihood of having a SUD. The relationship between poor employment prospect and SUD is most apparent during times of great economic change. This study's findings support the idea that employment assistance should be integrated into SUD treatment and that SUD screening should be integrated into primary care and mental health care.

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