

DISABILITY, DEPRESSION, OPIOIDS, AND SUICIDE AMONG WOMEN OF
REPRODUCTIVE AGE: FOUR DIFFERENT STUDIES OF NATIONALLY
REPRESENTATIVE SAMPLES

by

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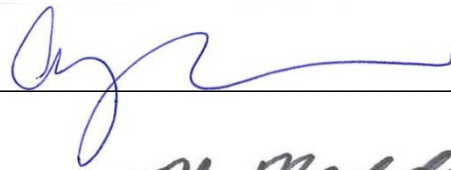
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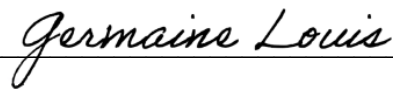
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Different Studies of Nationally Representative Samples

A dissertation submitted in partial fulfillment of the requirements for the degree of
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DEDICATION

I dedicate this dissertation to my late sister Elaine and my two amazing grandsons, Bray and Callen.

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LIST OF ABBREVIATIONS

ACASI.....	audio computer-assisted self-interviewing
AOR.....	adjusted odds ratio
CDC.....	Centers for Disease Control and Prevention
CI.....	confidence interval
CPG.....	clinical practice guideline
HHS.....	US Department of Health and Human Services
MA.....	Massachusetts
MDE.....	major depressive episode
MH.....	mental health
<i>n</i>	sample size
NSDUH.....	National Survey on Drug Use and Health
OR.....	odds ratio
<i>p</i>	probability
PD.....	psychological distress
PDS.....	postpartum depressive symptoms
PPD.....	postpartum depression
PRAMS... ..	Pregnancy Risk Assessment Monitoring System
SAMHSA.....	Substance Abuse and Mental Health Services Administration

SDOH.....	social determinants of health
SLE.....	stressful life event
US.....	United States

ABSTRACT

DISABILITY, DEPRESSION, OPIOIDS, AND SUICIDE AMONG WOMEN OF REPRODUCTIVE AGE: FOUR DIFFERENT STUDIES OF NATIONALLY REPRESENTATIVE SAMPLES

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Disability adversely affects a substantial proportion of the United States (US) population and is a recognized major public health challenge. Despite established associations between disability and adverse health conditions, limited information exists regarding its effects among women of reproductive age. This dissertation consists of four different studies that examine depression, opioids, and suicide among US women of reproductive age with disabilities. Using data from the Pregnancy Risk Assessment Monitoring System, the first study in Chapter One examined disability, stressful life events, and postpartum depressive symptoms among women. Descriptive statistics, bivariate, and binary logistic regression analyses were conducted to estimate the effect of stressful life events on postpartum depressive symptoms among women with and without disabilities. Compared to their peers without disabilities, women with disabilities reported a higher

number of stressful life events (87% to 67%) and post depressive symptoms (37% to 9%). Women with disabilities experiencing six or more stressful life events were more likely (odds ratio = 3.78, 95% confidence interval = [1.57-9.10]) to report postpartum depressive symptoms, compared to those with no stressful life events.

Data from the National Survey on Drug Use and Health (NSDUH) were used in the second, third, and fourth studies. The analyses included descriptive statistics, bivariate analyses, and logistic regression to measure associations. All of the analyses were weighted to account for the complex survey design of NSDUH. The second study in Chapter Two examined disability and prescription opioids among pregnant women. Pregnant women with any type of disability had higher adjusted odds of using (adjusted odds ratio = 1.71, 95% confidence interval = [1.27-2.29]) and misusing (adjusted odds ratio = 2.00, 95% confidence interval = [1.22-3.28]) opioids within the past year compared to their peers without disabilities.

The third study in Chapter Three assessed disability and prescription opioids among non-pregnant women of reproductive age. The findings of this study indicate that similarly to the pregnant population, non-pregnant women with disabilities had higher adjusted odds of opioid use (adjusted odds ratio = 1.59, 95% confidence interval = [1.50-1.67]) and misuse (adjusted odds ratio = 2.01, 95% confidence interval = [1.82-2.21]) than their peers without disabilities.

The fourth study in Chapter Four examined disability and suicidal behaviors among non-pregnant women of reproductive age. Women with disabilities had greater adjusted

odds of past-year suicidal behaviors (adjusted odds ratio = 1.73, 95% confidence interval = [1.60-1.87]) than women without disabilities.

Disability adversely affects women of reproductive age in multiple facets of life. Compared to their peers without disabilities, women with disabilities are at an amplified risk for stressful life events, opioid use and misuse, and postpartum depressive symptoms. Early prenatal screenings for disabilities, life stressors, and opioid use or misuse is critical for timely awareness and appropriate treatment to prevent associated adverse health conditions. Further postnatal screening for postpartum depressive symptoms and opioid use or misuse is vital to optimize favorable health outcomes for mothers and their children.

Both pregnant and non-pregnant women with disabilities are at increased risk for prescription opioid use and misuse relative to their peers without disabilities. Furthermore, non-pregnant women of reproductive age with disabilities are at increased risk for suicidal behaviors, particularly suicide attempts, compared to their counterparts without disabilities. Effectively mitigating the effects of opioids prior to reproduction will prevent associated adverse consequences for prospective mothers, children, and families. Furthermore, this study's findings elucidate the complexity of suicidal behaviors among women with disabilities and the influence of specific health determinants on such behaviors. Enhancing our knowledge of suicidal behaviors and associated health determinants among women with disabilities can preserve the wellbeing of future generations via enhanced prevention, detection, and intervention enterprises.

CHAPTER ONE

**STRESSFUL LIFE EVENTS AND POSTPARTUM DEPRESSIVE SYMPTOMS
AMONG WOMEN WITH DISABILITIES**

Abstract

Purpose: Although research evidence indicates positive associations between stressful life events and postpartum depression, limited research assessed these associations in women with disabilities. This study examined the effects of stressful life events on postpartum depressive symptoms in women with disabilities.

Method: Data from the 2012–2017 Massachusetts Pregnancy Risk Assessment Monitoring System ($n = 8453$) were used in this study. Women were asked if they experienced any life stressors (e.g., financial, traumatic, relational, and emotional) during the 12 months prior to giving birth. Disability was measured based on reports of emotional and physical functioning. Descriptive statistics, bivariate, and binary logistic regression analyses were conducted to estimate the effect of stressful life events on postpartum depressive symptoms among women with and without disabilities.

Results: Findings show that 37.4% of women with disabilities had postpartum depressive symptoms, which was significantly higher than 8.79% of women without disabilities. Stressful life events were reported in 86.6% of women with disabilities,

compared to 66.6% for women without disabilities. Prevalence of three or more stressful life events and postpartum depressive symptoms was greater among women with disabilities (50.8% and 62.9%, respectively) than women without disabilities (22.6% and 37.0%, respectively). Women with disabilities experiencing six or more stressful life events were more likely (odds ratio = 3.78, 95% confidence interval = [1.57–9.10]) to report postpartum depressive symptoms, compared to those with no stressful life events. Women with disabilities who experienced relational (odds ratio = 2.36, 95% confidence interval = [1.44–3.87]) and traumatic (odds ratio = 1.75, 95% confidence interval = [1.02–3.00]) life stressors had higher odds for postpartum depressive symptoms relative to those reporting no such life stressors.

Conclusion: Women with disabilities are at an amplified risk for stressful life events and postpartum depressive symptoms. Relational and traumatic stressful life events particularly increase the odds for postpartum depressive symptoms among this group of mothers. Early prenatal and postnatal screening for life stressors and depressive symptoms, coupled with timely referral for appropriate prenatal and postnatal care, are vital to mitigate the harmful effects of depression among mothers with disabilities and the health of their children.

Impact Statement

What is already known on this subject?

Studies show a positive association between stressful life events and postpartum depression, and research evidence indicates women with postpartum depressive symptoms are at increased risk for postpartum depression. Women with disabilities, a vulnerable population, have yet to be comprehensively studied relative to stressful life events and postpartum depressive symptoms.

What do the results of this study add?

Women with disabilities are at an amplified risk for experiencing stressful life events and postpartum depressive symptoms, compared to women without disabilities. Certain stressful life events, such as traumatic or relational stressors, significantly increased the odds for postpartum depressive symptoms among this population of mothers, compared to their peers without such stressors.

What are the implications of these findings for clinical practice and/or further research?

The present study extends this line of research to women with disabilities, and the findings indicate that early prenatal screening for life stressors and depression, and early postnatal screening for postpartum depression in pregnant women with disabilities are prudent. Early screening, coupled with timely referral for appropriate prenatal or postnatal care, may mitigate the harmful effects of depression among mothers with disabilities and their families. Public health officials, policymakers, and clinicians should

diligently assess postpartum processes and programs for women with disabilities who are at increased risk for postpartum depressive symptoms or postpartum depression.

Introduction

Around 15% (more than 1 billion) of the world's population lives with some form of disability.¹ Disability is defined as any mental or physical impairment that limits one's functionality or activity, and/or complicates or restricts participation in one's environment or setting.² Nearly 13% (more than 21 million) of females among the civilian noninstitutionalized US population live with some type of disability;³ and despite approximately 16% of reproductive-aged US women reporting serious functional limitations due to vision, cognition, mobility, selfcare, or independent living disabilities,⁴ pregnancy among this population of women is increasing.^{5,6} Recent reports indicate that 61.4% of women with disabilities desire to become pregnant, and 43.3% intend to pursue pregnancy.⁷ Medical advances in management of pregnancies and in improving diagnoses and treatment of disabilities, enable women with disabilities to successfully carry a pregnancy to term and have healthy babies.^{7,8} However, a growing number of women with disabilities may suffer from a number of comorbidities, including depression which affects at least 5% of the world's adult population.⁹ More than 40% of US women with disabilities report a history of depression, and mothers with disabilities are more prone to postpartum depression (PPD) than those without disabilities.¹⁰

PPD is a serious behavioral health condition with adverse maternal and infant health outcomes, affecting approximately 10% of women worldwide and 12%–20% of US mothers.^{10,11} Research indicates women with postpartum depressive symptoms (PDS) are at increased risk for the clinical diagnosis of PPD.^{12,13} Stress is known to contribute to depression during and after pregnancy, which can lead to adverse maternal and infant

health outcomes.¹⁴ During pregnancy, stressors and depression may result in inadequate prenatal care and unfavorable birth outcomes; while PDS or PPD corollaries include infant neglect, collapse of family relations, and maternal suicide.¹⁵ Experiencing stressful life events (SLEs), previous or in the perinatal period, is also a substantial risk factor for PPD.¹⁶⁻¹⁸ Mothers who experience a perinatal SLE have an increased prevalence of PDS,¹⁹ and approximately 65%–70% of pregnant women in the United States experience at least one recent stressful life event.²⁰ Furthermore, mothers who encounter multiple stressors are more likely to develop PPD; those who suffer four SLEs are 5 times more likely to have PDS compared to those who encounter no SLEs.¹⁶

Although several studies¹⁴⁻²⁰ have found positive relationships among the general population between SLE and depression, to include PDS and PPD, limited research has evaluated these associations in women with disabilities. This study examined the effects of SLEs on PDS in US women with disabilities using data from the Pregnancy Risk Assessment Monitoring System (PRAMS). The results of this study may inform medical and community professionals to address prevention, detection, and intervention of SLEs and PPD for women with disabilities.

Method

Data description

This is a retrospective study involving the analysis of cross-sectional PRAMS 2012–2017 data.²¹⁻²³ Since 1987, the PRAMS surveillance collects state-specific, population-based maternal data from US women who give informed consent, currently representing approximately 83% of all US births.²⁴ The primary purpose of PRAMS is to collect,

analyze, and disseminate data to promote and support policies and programs that improve maternal and infant health outcomes.²⁵ PRAMS data are frequently used to study relationships between predisposing influences and health outcomes, compare state-specific health predictors, and examine differences among targeted populations.²⁵ For this study, only data from the state of Massachusetts (MA) were available, and the sample included 8453 women for the years of 2012 thru 2017 with 710 women reporting a disability. The range of missing values for the measures used in this study was between 1.9% and 2.5%. The present study was exempt from review by the Institutional Review Board at the researchers' institution given that it used existing data (secondary data analysis) that are publicly available.

Measures

The outcome measure in this study was PDS in women with disabilities; PRAMS created an indicator variable for PDS (Yes/No),²⁶ which was determined by mothers aged 18 to 44 years old selecting *often or always* (Yes) versus *never, rarely, or sometimes* (No) responses to the question; *Since your new baby was born, how often have you felt down, depressed, or hopeless?*²³ This information was collected via mail and telephone two to four months post-delivery, and the data collection cycle lasted approximately 60 to 95 days.²⁵⁻²⁷

A dichotomous disability status variable (Yes/No) was created by combining responses (Yes/No) to the questions: *Are you limited in any way in any activities because of physical, mental, or emotional problems?*; *Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making*

*decisions?; and, Do you have serious difficulty walking or climbing stairs?*²³ A positive (Yes) response to any of the three questions generated a positive (Yes) response for the dichotomous disability status variable.

Mothers responded to 14 specific PRAMS queries of SLEs that occurred 12 months prior to birth. The SLEs were listed as follows: (1) *I moved to a new address*; (2) *I lost my job even though I wanted to go on working*; (3) *my husband or partner lost their job*; (4) *my husband, partner, or I had a cut in work hours or pay*; (5) *I had problems paying the rent, mortgage, or other bills*; (6) *I got separated or divorced from my husband or partner*; (7) *I was apart from my husband or partner due to military deployment or extended work-related travel*; (8) *my husband or partner said they didn't want me to be pregnant*; (9) *I argued with my husband or partner more than usual*; (10) *I was homeless or had to sleep outside, in a car, or in a shelter*; (11) *my husband, partner, or I went to jail*; (12) *someone very close to me had a problem with drinking or drugs*; (13) *a close family member was very sick and had to go into the hospital*; and (14) *someone very close to me died*.²³ For this study, the SLEs were categorized into four groups based on previous studies:^{19,28} financial (1 thru 5 from the list above), relational (6 thru 9), traumatic (10 thru 12), and emotional SLEs (13 and 14). In addition, a dichotomous SLE measure (yes/no) was created along with a grouped variable to identify the number of SLEs reported (none, one to two, three to five, and six or more).

Covariate measures (Table 1) included sociodemographic factors; such as mothers' age, race/ethnicity, marital status, education, and type of health insurance. Pregnancy and birth-related outcomes included previous live births, other terminations, gestational age

and birth weight of prior births, and if the mother ever breastfed. Health status and behavior covariates included medical issues during pregnancy, pregnancy intention, prenatal care initiation, physical abuse before or during pregnancy, and smoking in the last trimester.

Statistical analysis

Descriptive statistics and bivariate analysis using the chi-square test were conducted to examine differences in the distribution of sample characteristics by disability status.

Associations between life stressors and disability status were determined using the chi-square test. These analyses were repeated to determine whether any associations existed between disability status and life stressors among mothers with PDS. Unadjusted logistic regression models were built to estimate the effects of SLEs (four different groups and number of SLEs) on PDS among mothers with and without disabilities. Next, these logistic regression models were adjusted for the included covariate measures displayed in Table 1. The data were weighted to account for the complex survey design of PRAMS. All analyses were conducted using Stata/MP 16.1 (College Station, TX).

Results

The distribution of sample characteristics and associations between these characteristics and disability status are illustrated in Table 1. According to weighted percentages, women with disabilities were younger, with fewer years of education, less likely to be married, and more likely to have public insurance compared to women without disabilities. In addition, women with disabilities were more likely to have had a prior pregnancy and less likely to report breastfeeding than their peers without disabilities.

Also, a higher proportion of women with disabilities reported abuse before or during pregnancy and smoking during the last trimester compared to women without disabilities.

In this study, 8.4% ($n = 710$) of mothers reported a disability (Table 1), 13.2% ($n = 1120$) had PDS, and 68.6% ($n = 5795$) experienced at least one SLE 12 months prior to childbirth (Table 2). Of those mothers with disabilities, 86.6% ($n = 596$) reported at least one SLE while 37.4% ($n = 252$) responded positively for PDS, compared to 66.6% ($n = 5157$) of women without disabilities reporting at least one SLE and only 8.79% ($n = 868$) reporting PDS. Associations between SLEs and disability status for the entire sample, and then among mothers with PDS indicate women with disabilities experience more SLEs than women without disabilities (Table 2). A higher percentage of women with disabilities experienced three to five (34.5%) and six or more (16.3%) life stressors, relative to only 19.0% of women without disabilities experiencing three to five and only 3.6% reporting six or more life stressors (Table 2). Financial stressors constituted the highest proportion (69.6%) of reported SLEs among women with disabilities, followed by relational (46.4%) and emotional (43.9%) stressors, with traumatic stressors being the least reported (29.7%); and these findings were all significantly higher relative to women without disabilities. Among mothers who experienced PDS, 91.8% ($n = 220$) of women with disabilities reported an SLE, compared to 73.2% ($n = 616$) for women without disabilities. In addition, in this group of mothers with PDS, women with disabilities experienced a significant increase in the number of SLEs, specifically three or more life stressors, compared to those without disabilities. Overall, the proportions of financial,

emotional, relational, and notably traumatic stressors were significantly higher among women with disabilities who experienced PDS, compared to women without disabilities with PDS.

Unadjusted odds ratios (ORs) with 95% confidence intervals (CIs) for PDS based on SLEs in women with and without disabilities in Table 3 show that women with disabilities who experienced life stressors, such as relational or traumatic SLEs, were more likely to develop PDS than women without disabilities. When adjusted (adjusted OR = AOR) for covariate measures (displayed in Table 1), the following measures were statistically significant for women with disabilities: stressors of six or more, relational, and traumatic SLEs. Women with disabilities experiencing six or more SLEs had 3.78 (95% CI = [1.57–9.10]) times higher odds of PDS compared to those with no life stressors. Moreover, as the number of SLEs increased, the odds of reporting PDS also increased, indicating a positive association between SLEs and PDS, regardless of disability status. Women with disabilities reporting relational SLEs had significantly higher odds (AOR = 2.36, 95% CI = [1.44–3.87]) of experiencing PDS compared to those with no such stressors. In addition, women with disabilities who experienced traumatic SLEs had a significantly higher likelihood (AOR = 1.75, 95% CI = [1.02–3.00]) to report PDS, relative to those with no traumatic stressors.

Women without disabilities in the unadjusted models who experienced any life stressor, specifically financial, relational, or traumatic SLEs, had a higher likelihood of developing PDS. Upon adjustments of the logistic regression models for covariate measures, women without disabilities experiencing three to five and six or more SLEs

had 1.58 (95% CI = [1.16–2.15]) and 2.68 (95% CI = [1.58–4.55]) higher odds, respectively, in reporting PDS compared to others with no life stressors. In addition, women without disabilities who experienced financial (OR = 1.28, 95% CI = [1.02–1.61]) and relational (OR = 1.54, 95% CI = [1.20–1.98]) SLEs were more likely to have PDS, compared to those with no such stressors.

Discussion

The results of this study show that a higher proportion (50.8%) of women with disabilities reported three or more life stressors compared to women without disabilities (22.6%). In addition, women with disabilities contending with six or more SLEs had significantly higher odds (AOR = 3.78) in experiencing PDS compared to those with no life stressors, while controlling for potential confounders. These findings align with those of other studies conducted among general populations of women.^{9,29-31} The present study extends this line of research to women with disabilities, a vulnerable population that has not been comprehensively examined in prior research, and it shows that the accumulation of SLEs in women's lives who are also coping with disabilities can significantly increase the likelihood of PDS.^{14,19,32} The findings of this study are supported by evidence-based clinical studies concluding that the biological effects of stress include adverse effects to memory, concentration, and mood that are highly correlated with and can cause depressive symptoms.¹⁹

Furthermore, in this study, relational stressors more than doubled (AOR = 2.36), and traumatic stressors almost doubled (AOR = 1.75), the likelihood of PDS for women with disabilities, relative to those with no such stressors, while controlling for potential

confounders. Women with disabilities are not only at greater risk of SLEs during pregnancy, but relational and traumatic stressors can exacerbate their associated medical complications.³³ In addition, previous research studies found that exposure to these types of life stressors increases the likelihood of PPD.^{12,34,35} Given the current state of knowledge and our findings, it is prudent to suggest a review of root causes for these types of life stressors and their interrelationships. For example, relational stress may arise from multiple factors, including financial stressors such as employment or traumatic stressors, including drug use. In addition, other factors could affect relational stressors, such as infants requiring advanced medical care with extended stays in neonatal intensive care units upon birth. Therefore, early identification of SLEs of any type among women of reproductive age with disabilities, particularly those desiring pregnancy or pregnant, coupled with effective stress reduction interventions, are necessary. Intervention programs could include group prenatal care designed to identify relational stressors and enhance parental relations; team approach that involves behavioral health providers and social or community liaisons to improve SLE identification, treatment, and referral for community support.³⁶ In general, a life course approach to adult health could be an effective framework to enhance resiliency of adults and reduce associated risk factors of SLEs in this vulnerable population.^{36,37}

The findings of this study expand the available existing body of research evidence concerning SLEs and PDS among women with disabilities, increasing awareness and warranting further research of the effects of SLEs on PDS in women with different types of disabilities. Given that one of the Healthy People 2030 objectives is to increase PDS

screening during postnatal health checks to enhance detection and intervention of PPD,³⁸ it is essential for public health officials, policymakers, and clinicians recognize the importance of screening for SLEs during pregnancy and in the postpartum period in order to effectively intervene in preventing PDS or PPD among women with disabilities. Enhanced comprehension of relationships between SLEs and PDS in this vulnerable population with increasing intentions to become pregnant is vital, as untreated PPD can have devastating effects on mothers' and their infants' health.³⁹ Moreover, complementary longitudinal studies are required to establish causality, championing pointed action to mitigate adverse effects of SLEs on PDS in women with disabilities. Peer-reviewed, evidence-based findings are essential to enhance clinical education, training, and protocols; and furnish healthcare leaders with information to guide policy and program initiatives to mitigate adverse maternal and infant health outcomes.

Research limitations must be acknowledged when considering the findings of this study. The cross-sectional nature of this study does not allow the determination of causality, and the self-reported data are fundamentally open to biases, as they do not represent clinical diagnoses of disability or PPD. In addition, the type or severity of disability cannot be ascertained from the PRAMS data, while the depressive symptomatology measure of PDS has been recorded with a single item, and its frequency and severity have not been measured. It is possible that disabilities due to mental or emotional conditions may be associated with depression before or during pregnancy and consequently affect PDS. However, this was not possible to examine in the present study. Furthermore, the lack of information related to the type of disability does not allow

assessment of stressor variation by type of disability and their impact on PDS.

Nevertheless, PRAMS constitutes an important data set that can be used for population-based surveillance on health outcomes and conditions among pregnant or postpartum women with disabilities.

Conclusion

In conclusion, women with disabilities are at an amplified risk for SLEs and PDS, with certain SLEs increasing the odds for PDS among this population of mothers. Early prenatal screening for life stressors and screening for PDS in women with disabilities, coupled with a timely referral for appropriate healthcare are vital to mitigate the harmful effects of PPD among mothers with disabilities and to the health of their children.

APPENDIX 1: TABLES

Table 1. Sample Characteristics by Disability Status from MA PRAMS (2012-2017)

	Women with Disability <i>n</i> = 710 (8.4%)	Women without Disability <i>n</i> = 7743 (91.6%)	<i>p</i> value*
	Unweighted <i>n</i> (Weighted %)	Unweighted <i>n</i> (Weighted %)	
<i>Sociodemographic</i>			
Maternal Age (years)			0.0000
≤ 25	147 (24.1)	1233 (14.7)	
25 – 34	403 (54.1)	4668 (60.8)	
≥ 35	160 (21.8)	1842 (24.5)	
Maternal Race			0.0000
White non-Hispanic	127 (51.0)	1969 (61.4)	
Black non-Hispanic	174 (12.7)	1533 (9.12)	
Hispanic	207 (13.1)	1938 (18.0)	
Other non-Hispanic	171 (23.2)	1959 (11.5)	
Married			0.0000
No	338 (53.6)	2625 (31.7)	
Yes	372 (46.4)	5115 (68.3)	
Maternal Education			0.0000
≤ 11 years	102 (15.1)	839 (8.98)	
12 years	140 (24.4)	1220 (15.4)	
13 – 15 years	216 (29.0)	1945 (23.5)	
≥ 16 years	232 (31.4)	3569 (52.1)	
Health Insurance			0.0000
Private	370 (56.3)	4692 (70.8)	
Non-private	309 (43.7)	2546 (29.2)	
<i>Pregnancy & Birth Outcomes History</i>			
Previous Live Births			0.0076
None	281 (40.0)	3413 (43.9)	
One	232 (33.2)	2700 (35.9)	
At least two	197 (26.8)	1618 (20.2)	
Other Terminations			0.0716
No	497 (69.5)	5681 (73.7)	
Yes	213 (30.5)	2047 (26.3)	
Gestational Age			0.7812
Premature	64 (7.02)	627 (7.83)	
Full & Post term	645 (93.0)	7099 (92.1)	
Birth Weight			0.7349
Low birth weight	69 (6.99)	572 (6.60)	
≥ 2500g	639 (93.0)	7153 (93.4)	
Breastfed Ever			0.0000
No	90 (18.0)	639 (10.4)	
Yes	601 (82.0)	6996 (89.6)	
<i>Health Status & Behaviors</i>			
Medical issue: during pregnancy			0.0382
No	573 (82.7)	6380 (86.5)	
Yes	125 (17.3)	1094 (13.5)	
Postpartum depressive symptoms			0.0000
No	447 (62.6)	6796 (91.2)	
Yes	252 (37.4)	868 (8.79)	
Pregnancy Intention			0.0000
No	204 (33.0)	1291 (15.5)	
Yes	490 (67.0)	6338 (84.5)	
Prenatal care initiation			0.0639
None, Second/Third trimester	84 (11.1)	818 (8.31)	
First trimester	611 (88.9)	6742 (91.7)	
Abuse: before/during pregnancy			0.0000
No	650 (92.4)	7574 (98.5)	
Yes	51 (7.63)	123 (1.52)	
Smoking last trimester			0.0000
No	625 (83.5)	7376 (94.6)	
Yes	84 (16.5)	310 (5.36)	

MA: Massachusetts; PRAMS: Pregnancy Risk Assessment Monitoring System.

* *p* values are based on Chi-squared testing

Table 2. Associations between Life Stressors and Disability for the Entire Sample and among Those Women with Postpartum Depressive Symptoms

	Disability Status <i>n</i> = 8453 (8.4%)			Women with PDS <i>n</i> = 1120 (13.2%)		
	Women with Disability <i>n</i> ** (Weighted %)	Women without Disability <i>n</i> ** (Weighted %)	<i>p</i> value*	Women with Disability <i>n</i> ** (Weighted %)	Women without Disability <i>n</i> ** (Weighted %)	<i>p</i> value*
Any of 14 Stressors			0.0000			0.0000
No	109 (13.4)	2549 (33.4)		30 (8.15)	247 (26.8)	
Yes	596 (86.6)	5157 (66.6)		220 (91.8)	616 (73.2)	
Number of Stressors			0.0000			0.0000
None	109 (13.4)	2549 (33.4)		30 (8.15)	247 (26.8)	
1 – 2	264 (35.8)	3429 (44.0)		80 (28.9)	336 (36.2)	
3 – 5	225 (34.5)	1453 (19.0)		87 (37.4)	223 (27.9)	
≥ 6	107 (16.3)	275 (3.64)		53 (25.5)	57 (9.07)	
Financial Stressors			0.0000			0.0005
No	227 (30.4)	3942 (52.8)		72 (25.3)	375 (41.3)	
Yes	477 (69.6)	3756 (47.2)		178 (74.7)	487 (58.7)	
Moved			0.0003			0.1883
No	436 (61.3)	5349 (70.2)		153 (57.6)	569 (63.9)	
Yes	261 (38.7)	2310 (29.8)		94 (42.4)	284 (36.1)	
Mother lost job			0.0000			0.3730
No	578 (82.2)	6923 (91.9)		199 (81.4)	721 (84.7)	
Yes	121 (17.8)	720 (8.10)		48 (18.6)	129 (15.3)	
Husband/partner lost job			0.0000			0.0029
No	578 (82.9)	6931 (91.2)		194 (76.5)	747 (87.2)	
Yes	118 (17.1)	691 (8.80)		53 (23.5)	102 (12.8)	
Mother or husband/partner pay reduced			0.0000			0.2112
No	525 (74.7)	6564 (85.8)		187 (73.3)	693 (78.6)	
Yes	171 (25.3)	1076 (14.2)		60 (26.7)	156 (21.4)	
Had bills could not pay			0.0000			0.0000
No	456 (62.8)	6477 (85.5)		146 (53.3)	641 (74.3)	
Yes	243 (37.2)	1181 (14.5)		102 (46.7)	208 (25.7)	
Relational Stressors			0.0000			0.0000
No	372 (53.6)	5765 (76.5)		103 (39.8)	551 (61.7)	
Yes	330 (46.4)	1923 (23.5)		145 (60.2)	307 (38.3)	
Divorce			0.0000			0.0151
No	606 (86.6)	7240 (95.2)		206 (84.4)	784 (91.5)	
Yes	92 (13.4)	420 (4.82)		41 (15.6)	71 (8.54)	
Husband/partner away at work			0.7594			0.0359
No	667 (95.8)	7355 (96.1)		238 (97.8)	815 (94.2)	
Yes	30 (4.23)	291 (3.92)		9 (2.25)	37 (5.78)	
Husband/partner wanted pregnancy			0.0000			0.2987
No	84 (12.1)	423 (5.35)		35 (13.5)	77 (10.2)	
Yes	614 (87.9)	7233 (94.7)		211 (86.5)	774 (89.8)	
Argued with husband/partner more than usual			0.0000			0.0000
No	436 (63.7)	6249 (82.9)		121 (46.3)	612 (69.6)	
Yes	261 (36.3)	1399 (17.1)		125 (53.7)	239 (30.4)	
Traumatic Stressors			0.0000			0.0000
No	523 (70.3)	6953 (88.8)		164 (58.6)	743 (81.7)	
Yes	177 (29.7)	732 (11.2)		84 (41.4)	117 (18.3)	
Homeless			0.0000			0.0000
No	628 (89.8)	7488 (97.7)		210 (82.2)	818 (95.3)	
Yes	70 (10.2)	188 (2.30)		37 (17.8)	40 (4.73)	
Mother or husband/partner went to jail			0.0000			0.0022
No	662 (94.7)	7509 (98.3)		232 (93.1)	831 (98.1)	
Yes	34 (5.25)	137 (1.74)		15 (6.91)	20 (1.93)	
Drugs: others			0.0000			0.0000
No	577 (77.1)	7118 (90.7)		190 (68.3)	778 (85.7)	
Yes	121 (22.9)	545 (9.25)		57 (31.7)	77 (14.3)	
Emotional Stressors			0.0000			0.0000
No	421 (56.1)	5697 (72.2)		149 (52.0)	646 (71.5)	
Yes	281 (43.9)	1997 (27.8)		100 (48.0)	214 (28.5)	
Family member ill			0.0000			0.0069
No	494 (67.9)	6191 (78.1)		179 (68.4)	719 (79.9)	
Yes	205 (32.1)	1486 (21.9)		68 (31.6)	138 (20.1)	
Someone close died			0.0000			0.0003
No	534 (74.4)	6583 (85.3)		187 (69.9)	722 (84.1)	
Yes	166 (25.6)	1090 (14.7)		61 (30.1)	133 (15.9)	

PDS: postpartum depressive symptoms

* *p* values are based on Chi-squared testing

** Unweighted raw number of observations

Table 3. Unadjusted and Adjusted Odds Ratios (OR) with 95% Confidence Intervals (CI) for Postpartum Depressive Symptoms by Life Stressors in Women with and without Disability

	Women with disability <i>n</i> = 710 (8.4%)		Women without disability <i>n</i> = 7743 (91.6%)	
	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
Any Stressors				
Yes	2.07 (1.11-3.84)	1.84 (0.93-3.67)	1.40 (1.13-1.74)	1.23 (0.96-1.56)
No	Reference	Reference	Reference	Reference
Grouped Stressors				
≥ 6	4.28 (2.00-9.19)	3.78 (1.57-9.10)	3.66 (2.36-5.67)	2.68 (1.58-4.55)
3 – 5	2.15 (1.09-4.26)	1.66 (0.78-3.55)	1.94 (1.49-2.54)	1.58 (1.16-2.15)
1 – 2	1.37 (0.70-2.69)	1.58 (0.75-3.29)	1.02 (0.81-1.30)	1.02 (0.78-1.33)
None	Reference	Reference	Reference	Reference
Financial Stressors				
Yes	1.12 (0.70-1.81)	1.03 (0.59-1.79)	1.39 (1.14-1.69)	1.28 (1.02-1.61)
No	Reference	Reference	Reference	Reference
Relational Stressors				
Yes	2.06 (1.30-3.24)	2.36 (1.44-3.87)	1.89 (1.53-2.33)	1.54 (1.20-1.98)
No	Reference	Reference	Reference	Reference
Traumatic Stressors				
Yes	1.91 (1.16-3.15)	1.75 (1.02-3.00)	1.44 (1.07-1.95)	1.26 (0.86-1.83)
No	Reference	Reference	Reference	Reference
Emotional Stressors				
Yes	1.03 (0.66-1.62)	0.85 (0.52-1.41)	0.90 (0.72-1.12)	0.99 (0.77-1.28)
No	Reference	Reference	Reference	Reference

Entries in **bold** are significant at a *p* value ≤ 0.05

* Models adjusted for maternal age, maternal race, marital status, maternal education, health insurance, previous live births, other terminations, gestational age, birth weight, breastfed ever, medical issue during pregnancy, pregnancy intention, prenatal care initiation, abuse (before, during pregnancy), smoking during last trimester

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APPENDIX 3: PUBLISHED ARTICLE (*WOMEN'S HEALTH*)

Stressful life events and postpartum depressive symptoms among women with disabilities

Edward J Booth¹ , Panagiota Kitsantas¹,
Hua Min¹ and Anna Z Pollack²

Abstract

Purpose: Although research evidence indicates positive associations between stressful life events and postpartum depression, limited research assessed these associations in women with disabilities. This study examined the effects of stressful life events on postpartum depressive symptoms in women with disabilities.

Methods: Data from the 2012–2017 Massachusetts Pregnancy Risk Assessment Monitoring System ($n=8453$) were used in this study. Women were asked if they experienced any life stressors (e.g. financial, traumatic, relational, and emotional) during the 12 months prior to giving birth. Disability was measured based on reports of emotional and physical functioning. Descriptive statistics, bivariate, and binary logistic regression analyses were conducted to estimate the effect of stressful life events on postpartum depressive symptoms among women with and without disabilities.

Results: Findings show that 37.4% of women with disabilities had postpartum depressive symptoms, which was significantly higher than 8.79% of women without disabilities. Stressful life events were reported in 86.6% of women with disabilities, compared to 66.6% for women without disabilities. Prevalence of three or more stressful life events and postpartum depressive symptoms was greater among women with disabilities (50.8% and 62.9%, respectively) than women without disabilities (22.6% and 37.0%, respectively). Women with disabilities experiencing six or more stressful life events were more likely (odds ratio = 3.78, 95% confidence interval = [1.57–9.10]) to report postpartum depressive symptoms, compared to those with no stressful life events. Women with disabilities who experienced relational (odds ratio = 2.36, 95% confidence interval = [1.44–3.87]) and traumatic (odds ratio = 1.75, 95% confidence interval = [1.02–3.00]) life stressors had higher odds for postpartum depressive symptoms relative to those reporting no such life stressors.

Conclusion: Women with disabilities are at an amplified risk for stressful life events and postpartum depressive symptoms. Relational and traumatic stressful life events particularly increase the odds for postpartum depressive symptoms among this group of mothers. Early prenatal and postnatal screening for life stressors and depressive symptoms, coupled with timely referral for appropriate prenatal and postnatal care, are vital to mitigate the harmful effects of depression among mothers with disabilities and the health of their children.

Keywords

disability, postpartum depression, stressful events, women

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Impact statement

What is already known on this subject?

Studies show a positive association between stressful life events and postpartum depression, and research evidence indicates women with postpartum depressive symptoms are at increased risk for postpartum depression. Women

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with disabilities, a vulnerable population, have yet to be comprehensively studied relative to stressful life events and postpartum depressive symptoms.

What do the results of this study add?

Women with disabilities are at an amplified risk for experiencing stressful life events and postpartum depressive symptoms, compared to women without disabilities. Certain stressful life events, such as traumatic or relational stressors, significantly increased the odds for postpartum depressive symptoms among this population of mothers, compared to their peers without such stressors.

What are the implications of these findings for clinical practice and/or further research?

The present study extends this line of research to women with disabilities, and the findings indicate that early prenatal screening for life stressors and depression, and early postnatal screening for postpartum depression in pregnant women with disabilities are prudent. Early screening, coupled with timely referral for appropriate prenatal or postnatal care, may mitigate the harmful effects of depression among mothers with disabilities and their families. Public health officials, policymakers, and clinicians should diligently assess postpartum processes and programs for women with disabilities who are at increased risk for postpartum depressive symptoms or postpartum depression.

Introduction

Around 15% (more than 1 billion) of the world's population lives with some form of disability.¹ Disability is defined as any mental or physical impairment that limits one's functionality or activity, and/or complicates or restricts participation in one's environment or setting.² Nearly 13% (more than 21 million) of females among the civilian noninstitutionalized US population live with some type of disability;³ and despite approximately 16% of reproductive-aged US women reporting serious functional limitations due to vision, cognition, mobility, self-care, or independent living disabilities,⁴ pregnancy among this population of women is increasing.^{5,6} Recent reports indicate that 61.4% of women with disabilities desire to become pregnant, and 43.3% intend to pursue pregnancy.⁷ Medical advances in management of pregnancies and in improving diagnoses and treatment of disabilities, enable women with disabilities to successfully carry a pregnancy to term and have healthy babies.^{7,8} However, a growing number of women with disabilities may suffer from a number of comorbidities, including depression which affects at least 5% of the world's adult population.⁹ More than 40% of US women with disabilities report a history of depression, and mothers with disabilities are more

prone to postpartum depression (PPD) than those without disabilities.¹⁰

PPD is a serious behavioral health condition with adverse maternal and infant health outcomes, affecting approximately 10% of women worldwide and 12%–20% of US mothers.^{10,11} Research indicates women with postpartum depressive symptoms (PDS) are at increased risk for the clinical diagnosis of PPD.^{12,13} Stress is known to contribute to depression during and after pregnancy, which can lead to adverse maternal and infant health outcomes.¹⁴ During pregnancy, stressors and depression may result in inadequate prenatal care and unfavorable birth outcomes; while PDS or PPD corollaries include infant neglect, collapse of family relations, and maternal suicide.¹⁵ Experiencing stressful life events (SLEs), previous or in the perinatal period, is also a substantial risk factor for PPD.^{16–18} Mothers who experience a perinatal SLE have an increased prevalence of PDS,¹⁹ and approximately 65%–70% of pregnant women in the United States experience at least one recent stressful life event.²⁰ Furthermore, mothers who encounter multiple stressors are more likely to develop PPD; those who suffer four SLEs are 5 times more likely to have PDS compared to those who encounter no SLEs.¹⁶

Although several studies^{14–20} have found positive relationships among the general population between SLE and depression, to include PDS and PPD, limited research has evaluated these associations in women with disabilities. This study examined the effects of SLEs on PDS in US women with disabilities using data from the Pregnancy Risk Assessment Monitoring System (PRAMS). The results of this study may inform medical and community professionals to address prevention, detection, and intervention of SLEs and PPD for women with disabilities.

Method

Data description

This is a retrospective study involving the analysis of cross-sectional PRAMS 2012–2017 data.^{21–23} Since 1987, the PRAMS surveillance collects state-specific, population-based maternal data from US women who give informed consent, currently representing approximately 83% of all US births.²⁴ The primary purpose of PRAMS is to collect, analyze, and disseminate data to promote and support policies and programs that improve maternal and infant health outcomes.²⁵ PRAMS data are frequently used to study relationships between predisposing influences and health outcomes, compare state-specific health predictors, and examine differences among targeted populations.²⁵ For this study, only data from the state of Massachusetts (MA) were available, and the sample included 8453 women for the years of 2012 thru 2017 with 710 women reporting a disability. The range of missing values for the

measures used in this study was between 1.9% and 2.5%. The present study was exempt from review by the Institutional Review Board at the researchers' institution given that it used existing data (secondary data analysis) that are publicly available.

Measures

The outcome measure in this study was PDS in women with disabilities; PRAMS created an indicator variable for PDS (Yes/No),²⁶ which was determined by mothers aged 18 to 44 years old selecting *often* or *always* (Yes) versus *never*, *rarely*, or *sometimes* (No) responses to the question; *Since your new baby was born, how often have you felt down, depressed, or hopeless?*²³ This information was collected via mail and telephone 2 to 4 months post-delivery, and the data collection cycle lasted approximately 60 to 95 days.²⁵⁻²⁷

A dichotomous disability status variable (Yes/No) was created by combining responses (Yes/No) to the questions: *Are you limited in any way in any activities because of physical, mental, or emotional problems?*; *Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?*; and, *Do you have serious difficulty walking or climbing stairs?*²³ A positive (Yes) response to any of the three questions generated a positive (Yes) response for the dichotomous disability status variable.

Mothers responded to 14 specific PRAMS queries of SLEs that occurred 12 months prior to birth. The SLEs were listed as follows: (1) *I moved to a new address*; (2) *I lost my job even though I wanted to go on working*; (3) *my husband or partner lost their job*; (4) *my husband, partner, or I had a cut in work hours or pay*; (5) *I had problems paying the rent, mortgage, or other bills*; (6) *I got separated or divorced from my husband or partner*; (7) *I was apart from my husband or partner due to military deployment or extended work-related travel*; (8) *my husband or partner said they didn't want me to be pregnant*; (9) *I argued with my husband or partner more than usual*; (10) *I was homeless or had to sleep outside, in a car, or in a shelter*; (11) *my husband, partner, or I went to jail*; (12) *someone very close to me had a problem with drinking or drugs*; (13) *a close family member was very sick and had to go into the hospital*; and (14) *someone very close to me died*.²³ For this study, the SLEs were categorized into four groups based on previous studies:^{19,28} financial (1 thru 5 from the list above), relational (6 thru 9), traumatic (10 thru 12), and emotional SLEs (13 and 14). In addition, a dichotomous SLE measure (yes/no) was created along with a grouped variable to identify the number of SLEs reported (none, one to two, three to five, and six or more).

Covariate measures (Table 1) included sociodemographic factors; such as mothers' age, race/ethnicity, marital status, education, and type of health insurance.

Pregnancy and birth-related outcomes included previous live births, other terminations, gestational age and birth weight of prior births, and if the mother ever breastfed. Health status and behavior covariates included medical issues during pregnancy, pregnancy intention, prenatal care initiation, physical abuse before or during pregnancy, and smoking in the last trimester.

Statistical analysis

Descriptive statistics and bivariate analysis using the chi-square test were conducted to examine differences in the distribution of sample characteristics by disability status. Associations between life stressors and disability status were determined using the chi-square test. These analyses were repeated to determine whether any associations existed between disability status and life stressors among mothers with PDS. Unadjusted logistic regression models were built to estimate the effects of SLEs (four different groups and number of SLEs) on PDS among mothers with and without disabilities. Next, these logistic regression models were adjusted for the included covariate measures displayed in Table 1. The data were weighted to account for the complex survey design of PRAMS. All analyses were conducted using Stata/MP 16.1 (College Station, TX).

Results

The distribution of sample characteristics and associations between these characteristics and disability status are illustrated in Table 1. According to weighted percentages, women with disabilities were younger, with fewer years of education, less likely to be married, and more likely to have public insurance compared to women without disabilities. In addition, women with disabilities were more likely to have had a prior pregnancy and less likely to report breastfeeding than their peers without disabilities. Also, a higher proportion of women with disabilities reported abuse before or during pregnancy and smoking during the last trimester compared to women without disabilities.

In this study, 8.4% ($n=710$) of mothers reported a disability (Table 1), 13.2% ($n=1120$) had PDS, and 68.6% ($n=5795$) experienced at least one SLE 12 months prior to childbirth (Table 2). Of those mothers with disabilities, 86.6% ($n=596$) reported at least one SLE while 37.4% ($n=252$) responded positively for PDS, compared to 66.6% ($n=5157$) of women without disabilities reporting at least one SLE and only 8.79% ($n=868$) reporting PDS. Associations between SLEs and disability status for the entire sample, and then among mothers with PDS indicate women with disabilities experience more SLEs than women without disabilities (Table 2). A higher percentage of women with disabilities experienced three to five

Table 1. Sample characteristics by disability status from MA PRAMS (2012–2017).

	Women with disability <i>n</i> = 710 (8.4%) Unweighted <i>n</i> (weighted %)	Women without disability <i>n</i> = 7743 (91.6%) Unweighted <i>n</i> (weighted %)	<i>p</i> value*
<i>Sociodemographic</i>			
Maternal age (years)			0.0000
≤25	147 (24.1)	1233 (14.7)	
25–34	403 (54.1)	4668 (60.8)	
≥35	160 (21.8)	1842 (24.5)	
Maternal race			0.0000
White non-Hispanic	127 (51.0)	1969 (61.4)	
Black non-Hispanic	174 (12.7)	1533 (9.12)	
Hispanic	207 (13.1)	1938 (18.0)	
Other non-Hispanic	171 (23.2)	1959 (11.5)	
Married			0.0000
No	338 (53.6)	2625 (31.7)	
Yes	372 (46.4)	5115 (68.3)	
Maternal education (years)			0.0000
≤11	102 (15.1)	839 (8.98)	
12	140 (24.4)	1220 (15.4)	
13–15	216 (29.0)	1945 (23.5)	
≥16	232 (31.4)	3569 (52.1)	
Health insurance			0.0000
Private	370 (56.3)	4692 (70.8)	
Non-private	309 (43.7)	2546 (29.2)	
<i>Pregnancy & birth outcomes history</i>			
Previous live births			0.0076
None	281 (40.0)	3413 (43.9)	
One	232 (33.2)	2700 (35.9)	
At least two	197 (26.8)	1618 (20.2)	
Other terminations			0.0716
No	497 (69.5)	5681 (73.7)	
Yes	213 (30.5)	2047 (26.3)	
Gestational age			0.7812
Premature	64 (7.02)	627 (7.83)	
Full & post-term	645 (93.0)	7099 (92.1)	
Birth weight			0.7349
Low birth weight	69 (6.99)	572 (6.60)	
≥2500 g	639 (93.0)	7153 (93.4)	
Breastfed ever			0.0000
No	90 (18.0)	639 (10.4)	
Yes	601 (82.0)	6996 (89.6)	
<i>Health status & behaviors</i>			
Medical issue: during pregnancy			0.0382
No	573 (82.7)	6380 (86.5)	
Yes	125 (17.3)	1094 (13.5)	
Postpartum depressive symptoms			0.0000
No	447 (62.6)	6796 (91.2)	
Yes	252 (37.4)	868 (8.79)	
Pregnancy intention			0.0000
No	204 (33.0)	1291 (15.5)	
Yes	490 (67.0)	6338 (84.5)	
Prenatal care initiation			0.0639
None, second/third trimester	84 (11.1)	818 (8.31)	
First trimester	611 (88.9)	6742 (91.7)	

(Continued)

Table 1. (Continued)

	Women with disability <i>n</i> = 710 (8.4%) Unweighted <i>n</i> (weighted %)	Women without disability <i>n</i> = 7743 (91.6%) Unweighted <i>n</i> (weighted %)	<i>p</i> value*
Abuse: before/during pregnancy			0.0000
No	650 (92.4)	7574 (98.5)	
Yes	51 (7.63)	123 (1.52)	
Smoking last trimester			0.0000
No	625 (83.5)	7376 (94.6)	
Yes	84 (16.5)	310 (5.36)	

MA: Massachusetts; PRAMS: Pregnancy Risk Assessment Monitoring System.

**p* values are based on chi-square testing.

Table 2. Associations between life stressors and disability for the entire sample and among those women with postpartum depressive symptoms.

	Disability status <i>n</i> = 8453 (8.4%)		<i>p</i> value*	Women with PDS <i>n</i> = 1120 (13.2%)		<i>p</i> value*
	Women with disability <i>n</i> ** (weighted %)	Women without disability <i>n</i> ** (weighted %)		Women with disability <i>n</i> ** (weighted %)	Women without disability <i>n</i> ** (weighted %)	
Any of 14 stressors			0.0000			0.0000
No	109 (13.4)	2549 (33.4)		30 (8.15)	247 (26.8)	
Yes	596 (86.6)	5157 (66.6)		220 (91.8)	616 (73.2)	
Number of stressors			0.0000			0.0000
None	109 (13.4)	2549 (33.4)		30 (8.15)	247 (26.8)	
1–2	264 (35.8)	3429 (44.0)		80 (28.9)	336 (36.2)	
3–5	225 (34.5)	1453 (19.0)		87 (37.4)	223 (27.9)	
>6	107 (16.3)	275 (3.64)		53 (25.5)	57 (9.07)	
Financial stressors			0.0000			0.0005
No	227 (30.4)	3942 (52.8)		72 (25.3)	375 (41.3)	
Yes	477 (69.6)	3756 (47.2)		178 (74.7)	487 (58.7)	
Moved			0.0003			0.1883
No	436 (61.3)	5349 (70.2)		153 (57.6)	569 (63.9)	
Yes	261 (38.7)	2310 (29.8)		94 (42.4)	284 (36.1)	
Mother lost job			0.0000			0.3730
No	578 (82.2)	6923 (91.9)		199 (81.4)	721 (84.7)	
Yes	121 (17.8)	720 (8.10)		48 (18.6)	129 (15.3)	
Husband/partner lost job			0.0000			0.0029
No	578 (82.9)	6931 (91.2)		194 (76.5)	747 (87.2)	
Yes	118 (17.1)	691 (8.80)		53 (23.5)	102 (12.8)	
Mother or husband/partner pay reduced			0.0000			0.2112
No	525 (74.7)	6564 (85.8)		187 (73.3)	693 (78.6)	
Yes	171 (25.3)	1076 (14.2)		60 (26.7)	156 (21.4)	
Had bills could not pay			0.0000			0.0000
No	456 (62.8)	6477 (85.5)		146 (53.3)	641 (74.3)	
Yes	243 (37.2)	1181 (14.5)		102 (46.7)	208 (25.7)	
Relational stressors			0.0000			0.0000
No	372 (53.6)	5765 (76.5)		103 (39.8)	551 (61.7)	
Yes	330 (46.4)	1923 (23.5)		145 (60.2)	307 (38.3)	
Divorce			0.0000			0.0151
No	606 (86.6)	7240 (95.2)		206 (84.4)	784 (91.5)	
Yes	92 (13.4)	420 (4.82)		41 (15.6)	71 (8.54)	

(Continued)

Table 2. (Continued)

	Disability status <i>n</i> = 8453 (8.4%)		<i>p</i> value*	Women with PDS <i>n</i> = 1120 (13.2%)		<i>p</i> value*
	Women with disability <i>n</i> ** (weighted %)	Women without disability <i>n</i> ** (weighted %)		Women with disability <i>n</i> ** (weighted %)	Women without disability <i>n</i> ** (weighted %)	
Husband/partner away at work			0.7594			0.0359
No	667 (95.8)	7355 (96.1)		238 (97.8)	815 (94.2)	
Yes	30 (4.23)	291 (3.92)		9 (2.25)	37 (5.78)	
Husband/partner wanted pregnancy			0.0000			0.2987
No	84 (12.1)	423 (5.35)		35 (13.5)	77 (10.2)	
Yes	614 (87.9)	7233 (94.7)		211 (86.5)	774 (89.8)	
Argued with husband/partner more than usual			0.0000			0.0000
No	436 (63.7)	6249 (82.9)		121 (46.3)	612 (69.6)	
Yes	261 (36.3)	1399 (17.1)		125 (53.7)	239 (30.4)	
Traumatic stressors			0.0000			0.0000
No	523 (70.3)	6953 (88.8)		164 (58.6)	743 (81.7)	
Yes	177 (29.7)	732 (11.2)		84 (41.4)	117 (18.3)	
Homeless			0.0000			0.0000
No	628 (89.8)	7488 (97.7)		210 (82.2)	818 (95.3)	
Yes	70 (10.2)	188 (2.30)		37 (17.8)	40 (4.73)	
Mother or husband/partner went to jail			0.0000			0.0022
No	662 (94.7)	7509 (98.3)		232 (93.1)	831 (98.1)	
Yes	34 (5.25)	137 (1.74)		15 (6.91)	20 (1.93)	
Drugs: others			0.0000			0.0000
No	577 (77.1)	7118 (90.7)		190 (68.3)	778 (85.7)	
Yes	121 (22.9)	545 (9.25)		57 (31.7)	77 (14.3)	
Emotional stressors			0.0000			0.0000
No	421 (56.1)	5697 (72.2)		149 (52.0)	646 (71.5)	
Yes	281 (43.9)	1997 (27.8)		100 (48.0)	214 (28.5)	
Family member ill			0.0000			0.0069
No	494 (67.9)	6191 (78.1)		179 (68.4)	719 (79.9)	
Yes	205 (32.1)	1486 (21.9)		68 (31.6)	138 (20.1)	
Someone close died			0.0000			0.0003
No	534 (74.4)	6583 (85.3)		187 (69.9)	722 (84.1)	
Yes	166 (25.6)	1090 (14.7)		61 (30.1)	133 (15.9)	

PDS: postpartum depressive symptoms.

**p* values are based on chi-square testing.

**Unweighted raw number of observations.

(34.5%) and six or more (16.3%) life stressors, relative to only 19.0% of women without disabilities experiencing three to five and only 3.6% reporting six or more life stressors (Table 2). Financial stressors constituted the highest proportion (69.6%) of reported SLEs among women with disabilities, followed by relational (46.4%) and emotional (43.9%) stressors, with traumatic stressors being the least reported (29.7%); and these findings were all significantly higher relative to women without disabilities. Among mothers who experienced PDS, 91.8% (*n* = 220) of women with disabilities reported an SLE, compared to 73.2% (*n* = 616) for women without disabilities. In addition, in this group of mothers with PDS, women with disabilities experienced a significant increase in the number of SLEs, specifically three or more life stressors,

compared to those without disabilities. Overall, the proportions of financial, emotional, relational, and notably traumatic stressors were significantly higher among women with disabilities who experienced PDS, compared to women without disabilities with PDS.

Unadjusted odds ratios (ORs) with 95% confidence intervals (CIs) for PDS based on SLEs in women with and without disabilities in Table 3 show that women with disabilities who experienced life stressors, such as relational or traumatic SLEs, were more likely to develop PDS than women without disabilities. When adjusted (adjusted OR = AOR) for covariate measures (displayed in Table 1), the following measures were statistically significant for women with disabilities: stressors of six or more, relational, and traumatic SLEs. Women with disabilities

Table 3. Unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (CI) for postpartum depressive symptoms by life stressors in women with and without disability.

	Women with disability n = 710 (8.4%)		Women without disability n = 7743 (91.6%)	
	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
Any stressors				
Yes	2.07 [1.11–3.84]	1.84 [0.93–3.67]	1.40 [1.13–1.74]	1.23 [0.96–1.56]
No	Reference	Reference	Reference	Reference
Grouped stressors				
>6	4.28 [2.00–9.19]	3.78 [1.57–9.10]	3.66 [2.36–5.67]	2.68 [1.58–4.55]
3–5	2.15 [1.09–4.26]	1.66 [0.78–3.55]	1.94 [1.49–2.54]	1.58 [1.16–2.15]
1–2	1.37 [0.70–2.69]	1.58 [0.75–3.29]	1.02 [0.81–1.30]	1.02 [0.78–1.33]
None	Reference	Reference	Reference	Reference
Financial stressors				
Yes	1.12 [0.70–1.81]	1.03 [0.59–1.79]	1.39 [1.14–1.69]	1.28 [1.02–1.61]
No	Reference	Reference	Reference	Reference
Relational stressors				
Yes	2.06 [1.30–3.24]	2.36 [1.44–3.87]	1.89 [1.53–2.33]	1.54 [1.20–1.98]
No	Reference	Reference	Reference	Reference
Traumatic stressors				
Yes	1.91 [1.16–3.15]	1.75 [1.02–3.00]	1.44 [1.07–1.95]	1.26 [0.86–1.83]
No	Reference	Reference	Reference	Reference
Emotional stressors				
Yes	1.03 [0.66–1.62]	0.85 [0.52–1.41]	0.90 [0.72–1.12]	0.99 [0.77–1.28]
No	Reference	Reference	Reference	Reference

Entries in **bold** are significant at a p value $\leq .05$.

*Models adjusted for maternal age, maternal race, marital status, maternal education, health insurance, previous live births, other terminations, gestational age, birth weight, breastfed ever, medical issue during pregnancy, pregnancy intention, prenatal care initiation, abuse (before, during pregnancy), smoking during last trimester.

experiencing six or more SLEs had 3.78 (95% CI = [1.57–9.10]) times higher odds of PDS compared to those with no life stressors. Moreover, as the number of SLEs increased, the odds of reporting PDS also increased, indicating a positive association between SLEs and PDS, regardless of disability status. Women with disabilities reporting relational SLEs had significantly higher odds (AOR = 2.36, 95% CI = [1.44–3.87]) of experiencing PDS compared to those with no such stressors. In addition, women with disabilities who experienced traumatic SLEs had a significantly higher likelihood (AOR = 1.75, 95% CI = [1.02–3.00]) to report PDS, relative to those with no traumatic stressors.

Women without disabilities in the unadjusted models who experienced any life stressor, specifically financial, relational, or traumatic SLEs, had a higher likelihood of developing PDS. Upon adjustments of the logistic regression models for covariate measures, women without disabilities experiencing three to five and six or more SLEs had 1.58 (95% CI = [1.16–2.15]) and 2.68 (95% CI = [1.58–4.55]) higher odds, respectively, in reporting PDS compared to others with no life stressors. In addition, women without disabilities who experienced financial

(OR = 1.28, 95% CI = [1.02–1.61]) and relational (OR = 1.54, 95% CI = [1.20–1.98]) SLEs were more likely to have PDS, compared to those with no such stressors.

Discussion

The results of this study show that a higher proportion (50.8%) of women with disabilities reported three or more life stressors compared to women without disabilities (22.6%). In addition, women with disabilities contending with six or more SLEs had significantly higher odds (AOR = 3.78) in experiencing PDS compared to those with no life stressors, while controlling for potential confounders. These findings align with those of other studies conducted among general populations of women.^{9,29–31} The present study extends this line of research to women with disabilities, a vulnerable population that has not been comprehensively examined in prior research, and it shows that the accumulation of SLEs in women's lives who are also coping with disabilities can significantly increase the likelihood of PDS.^{14,19,32} The findings of this study are supported by evidence-based clinical studies concluding that the biological effects of stress include adverse effects to

memory, concentration, and mood that are highly correlated with and can cause depressive symptoms.¹⁹

Furthermore, in this study, relational stressors more than doubled (AOR = 2.36), and traumatic stressors almost doubled (AOR = 1.75), the likelihood of PDS for women with disabilities, relative to those with no such stressors, while controlling for potential confounders. Women with disabilities are not only at greater risk of SLEs during pregnancy, but relational and traumatic stressors can exacerbate their associated medical complications.³³ In addition, previous research studies found that exposure to these types of life stressors increases the likelihood of PPD.^{12,34,35} Given the current state of knowledge and our findings, it is prudent to suggest a review of root causes for these types of life stressors and their interrelationships. For example, relational stress may arise from multiple factors, including financial stressors such as employment or traumatic stressors, including drug use. In addition, other factors could affect relational stressors, such as infants requiring advanced medical care with extended stays in neonatal intensive care units upon birth. Therefore, early identification of SLEs of any type among women of reproductive age with disabilities, particularly those desiring pregnancy or pregnant, coupled with effective stress reduction interventions, are necessary. Intervention programs could include group prenatal care designed to identify relational stressors and enhance parental relations; team approach that involves behavioral health providers and social or community liaisons to improve SLE identification, treatment, and referral for community support.³⁶ In general, a life course approach to adult health could be an effective framework to enhance resiliency of adults and reduce associated risk factors of SLEs in this vulnerable population.^{36,37}

The findings of this study expand the available existing body of research evidence concerning SLEs and PDS among women with disabilities, increasing awareness and warranting further research of the effects of SLEs on PDS in women with different types of disabilities. Given that one of the Healthy People 2030 objectives is to increase PDS screening during postnatal health checks to enhance detection and intervention of PPD,³⁸ it is essential for public health officials, policymakers, and clinicians recognize the importance of screening for SLEs during pregnancy and in the postpartum period in order to effectively intervene in preventing PDS or PPD among women with disabilities. Enhanced comprehension of relationships between SLEs and PDS in this vulnerable population with increasing intentions to become pregnant is vital, as untreated PPD can have devastating effects on mothers' and their infants' health.³⁹ Moreover, complementary longitudinal studies are required to establish causality, championing pointed action to mitigate adverse effects of SLEs on PDS in women with disabilities. Peer-reviewed, evidence-based findings are essential to enhance clinical education,

training, and protocols; and furnish healthcare leaders with information to guide policy and program initiatives to mitigate adverse maternal and infant health outcomes.

Research limitations must be acknowledged when considering the findings of this study. The cross-sectional nature of this study does not allow the determination of causality, and the self-reported data are fundamentally open to biases, as they do not represent clinical diagnoses of disability or PPD. In addition, the type or severity of disability cannot be ascertained from the PRAMS data, while the depressive symptomatology measure of PDS has been recorded with a single item, and its frequency and severity have not been measured. It is possible that disabilities due to mental or emotional conditions may be associated with depression before or during pregnancy and consequently affect PDS. However, this was not possible to examine in the present study. Furthermore, the lack of information related to the type of disability does not allow assessment of stressor variation by type of disability and their impact on PDS. Nevertheless, PRAMS constitutes an important data set that can be used for population-based surveillance on health outcomes and conditions among pregnant or postpartum women with disabilities.

Conclusion

In conclusion, women with disabilities are at an amplified risk for SLEs and PDS, with certain SLEs increasing the odds for PDS among this population of mothers. Early prenatal screening for life stressors and screening for PDS in women with disabilities, coupled with a timely referral for appropriate healthcare are vital to mitigate the harmful effects of PPD among mothers with disabilities and to the health of their children.

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CHAPTER TWO

DISABILITY AND OPIOIDS AMONG PREGNANT WOMEN

Abstract

This study using data from the 2015-2018 National Survey on Drug Use and Health examined prescription opioid use and misuse among pregnant women with sensory, cognitive or daily activities-related disabilities. Pregnant women with any type of disability had higher adjusted odds of using (AOR 1.71; 95% CI, 1.27-2.29) and misusing (AOR 2.00; 95% CI, 1.22-3.28) opioids within the past year. Pain relief (59.5%) was the greatest motive for last opioid misuse. Approximately, 45% of women acquired opioids from friends/relatives and 25% obtained opioids from other non-medical sources. Pregnant women with disabilities are at increased risk for prescription opioid use and misuse.

Introduction

Following a drastic increase in prescription opioid-related deaths that had been persistently escalating in the United States since 1999 (CDC 2020), the Department of Health and Human Services (HHS) declared opioid misuse a national public health emergency (HHS 2017). Of particular concern, was the misuse of prescription opioids among pregnant women. Approximately 23.0% of Medicaid enrolled pregnant women in 46 states filled opioid prescriptions (Desai et al. 2014); while overall, it is estimated at least 14.0% of pregnant women are dispensed opioids (Bateman et al. 2014). Alarming, the number of pregnant women with an opioid use disorder at labor and delivery quadrupled from 1999 to 2014 (Haight et al. 2018), and approximately 5.0% of all pregnant women use nonmedical prescription opioids (Kozhimannil et al. 2017). Past research linked opioid misuse among pregnant women with multiple adverse health outcomes for both the mother and infant (Brown et al. 2016; CDC 2017b; Hayatbakhsh et al. 2012; Metz et al. 2018). Opioid use has also been associated with shorter breastfeeding duration (Metz et al. 2018), and comorbid psychiatric conditions in an estimated 25-35% of pregnant women and postpartum mothers (Arnaudo et al. 2017).

Disability, defined as any physical or mental condition hindering individuals' ability to perform routine activities and customarily participate within their provincial environments (CDC 2020), is a known risk factor for opioid-related adverse effects (Liaw et al. 2020; Kuo et al. 2019). Poor health, social isolation, and chronic pain among individuals with disabilities are supplementary risk factors associated with controversial opioid prescriptions and misuse (Ford et al. 2018; Jantarada et al. 2021). Compared to

their peers without disabilities, individuals with disabilities are typically prescribed greater quantities of opioids, particularly pregnant women with disabilities (Richards et al. 2022), and are more likely to experience assiduous opioid use (Ozturk et al. 2020). Specifically, physical, inflammatory or psychiatric disabilities among women are associated with increased opioid prescriptions, including higher dose prescriptions (Richard et al. 2022). Opioid-related adverse effects are well documented among women of reproductive age (Sanmartin et al. 2019b), including those with disabilities (Sanmartin et al. 2019a; Kitsantas et al. 2021). Relative to women without a disability, women with disabilities are more likely to experience opioid misuse (Sanmartin et al. 2019a) and opioid abuse/dependency (Kitsantas et al. 2021). Approximately 18.0% of US women of reproductive age report some type of disability; 11.7% cognitive, 5.6% mobility, 5.5% independent living, 3.0% vision, 1.7% self-care, 1.6% hearing (Okoro et al. 2018).

Over 61.0% of women with disabilities desire pregnancy, and over 43% indicate intentions to actively pursue pregnancy (Brown et al. 2016; Bloom et al. 2017). However, emerging evidence indicates pregnant women with disabilities are at a higher risk for adverse birth outcomes and pregnancy complications (Akobirshoev et al. 2017; Mitra et al. 2015a; Mitra et al. 2015b). In addition, women with disabilities are at an increased risk for postpartum depression (Mitra et al. 2015b), physical abuse during pregnancy (Mitra et al. 2012), and experiencing stressful life events (Mitra et al. 2015a; Booth et al. 2021). Prevalence rates of tobacco smoking and marijuana use are also higher among pregnant women with disabilities compared to their counterparts with no disabilities (Mitra et al. 2015a; Kitsantas et al. 2020). Further, women with disabilities who

encounter stressful life events, poor health, social isolation, or chronic pain tend to experience striking rates of substance use (Alexander et al. 2022; Ford et al. 2018; Jantarada et al. 2021), which has been recognized as a major risk factor in pregnancy-related morbidity and mortality (MDH 2020; VDH 2020). Despite poorer health outcomes, amplified adverse life events and a risk of increased substance use, limited research exists related to opioids in this subpopulation (Akobirshoev et al. 2017; Kitsantas et al. 2020; Richard et al. 2022).

The purpose of this study was to examine prescription opioid use and misuse in pregnant women with sensory, cognitive or daily living disabilities, as well as motives and sources of opioid misuse using data from the National Survey on Drug Use and Health (NSDUH). The results of this study may inform prevention and intervention programs to address opioid use and misuse during preconception and perinatal care for women with disabilities.

Method

Data Description

This is a retrospective study involving the analysis of 2015-2018 data from the NSDUH, conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA 2020). The NSDUH collects a substantial amount of data on the use of illicit drugs, alcohol and tobacco, and on behavioral health matters among the non-institutional US population aged 12 years or older. Self-reported specific substance use and mental condition measures are tracked by the survey, as well as mental and/or substance use disorders and treatment (SAMHSA 2020). In this study, NSDUH data from 2015 to 2018

included 3,006 pregnant women, of which 364 reported disabilities; such as sensory, cognitive, and daily living activities. The range of missing values for the measures used in this study was between 0.2% and 0.7%.

Measures

The selection of variables and the empirical analyses of the present study have been guided by the Life Course Health Development (LCHD) model (Halfon et al. 2002; Halfon et al. 2008). An underlying premise of the LCHD is that health is a consequence of multiple determinants that evolve over an individual's lifetime and can have an impact during critical or sensitive times, such as pregnancy. In the present study, the LCHD informs the notion that the cumulative effect of preconception determinants in the women's lives has a profound effect on their health-related behaviors (e.g., opioid use or misuse).

Opioid Use. Any past-year prescription opioid use was assessed based on NSDUH questions that identify past-month, past-year, or lifetime use of opioids. Respondents who provided a positive response to past-year opioid use were asked further questions to determine classification into the following groups: prescribed use (use without misuse), misuse without use disorder, and use disorder (CBHSQ 2018). *Opioid Prescribed Use* was defined as past-year use of prescription opioids as prescribed or directed by a medical prescriber without misuse or opioid use disorder. *Opioid Misuse* was defined as use "in any way that a doctor did not direct you to use them...within the past 12 months" (CBHSQ 2018).

Disability. The NSDUH uses standardized disability questions, which are recommended by the Department of Health and Human Services Substance Abuse and Mental Health Services Administration (Altman & Bernstein 2008). In this study, three main disability measures were created; specifically, sensory, cognitive and disabilities related to daily activities (Altman & Bernstein 2008; Krahn et al. 2015). *Sensory Disability* was characterized based on positive responses to the following: (1) “Are you deaf or do you have serious difficulty hearing?” (2) “Are you blind or do you have serious difficulty seeing, even when wearing glasses?” (CBHSQ 2018). *Cognitive Disability* was specified based on positive responses to, “Because of a physical, mental or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?” (CBHSQ 2018). *Daily Activities Disability* was documented based on positive responses to the following questions: (1) “Do you have serious difficulty walking or climbing stairs?” (2) “Do you have difficulty dressing or bathing?” (3) “Because of a physical, mental or emotional condition, do you have difficulty doing errands alone such as visiting a doctors' office or shopping?” (CBHSQ 2018). A dichotomous disability status variable was created to identify women with self-reported disabilities as indicated by limitations related to sensory, cognitive and daily activities functioning and those without disabilities.

Types of Prescription Opioids for Use and Misuse. Respondents who reported any past-year use or misuse of a prescription opioid, were asked to identify the opioid prescribed used or misused. The types of opioids included the following: hydrocodone, oxycodone,

tramadol, morphine, fentanyl, buprenorphine, oxymorphone, demerol, hydromorphone, methadone, and other pain relievers.

Motives for Last Prescription Opioid Misuse. Respondents were asked to identify the main reason they last misused a pain reliever (opioid). The reasons for misuse included “unknown, relieving physical pain, relaxing or relieving tension, experimenting to see what it’s like, feeling good or getting high, helping with sleep, helping with feelings or emotions, increasing or decreasing effects of other drugs, hooked or having to have drug, and some other reason” (CBHSQ 2018). These motives were categorized into two groups, pain (for physical pain) and non-pain (to relax, to experiment, to get high, for sleep, for emotions, for other drug effects, because hooked, for other reason) relief motives, based on prior research studies (McCabe et al. 2009; Schepis et al. 2019).

Source of Prescription Opioid for Last Misuse. Respondents were asked to select as many responses from the following sources of prescription opioids for last misuse: (1) one or more than one doctor; (2) stole from doctor’s office, clinic, hospital, or pharmacy; (3) got for free, bought, or took without asking from friend or relative; (4) drug dealer or other stranger; (5) and other source. Based on prior research (Hudgins et al. 2019), the sources were combined into three groups: (1) obtained from a medical system source (combined groups 1, 2 above), (2) obtained from friends or relatives (group 3 above), and (3) obtained from other source (combined groups 4, 5 above).

Other Substance Use and Sociodemographic Characteristics. Measures assessing tobacco and alcohol use in the past year were included in the analyses. Demographic characteristics included age (≤ 25 , 26-34, ≥ 35), race/ethnicity (Hispanic, black non-

Hispanic, white non-Hispanic, or other non-Hispanic), education level ($<$ high school, high school, some college, $\geq$ college degree), overall health status (poor-fair-good, very good-excellent), health insurance (yes, no) and trimester of pregnancy (first, second, third). These potential confounders were included in the adjusted binary logistic regression models to estimate the association between disability and opioid prescribed use and misuse among pregnant women.

Statistical Analysis

Descriptive statistics and bivariate analyses using the chi-squared test were conducted to examine disability in pregnant women and past-year opioid prescribed use and misuse, as well as associations between sample characteristics and past-year opioid prescribed use and misuse among pregnant women with and without disabilities. In addition, descriptive statistics were performed to examine the type of opioids used and misused in the past year, and the motives and sources for last opioid misuse among pregnant women by disability status.

Unadjusted and adjusted binary logistic regression models were built to estimate associations between disability (overall disability status and each disability type) and any opioid use and opioid misuse among pregnant women. NSDUH data were weighted for all analyses to account for the complex NSDUH study design. Data were analyzed using Stata/MP 16.1 (StataCorp, College Station, TX).

Results

Past-Year Opioid Use & Misuse among Pregnant Women by Disability Status

In this sample, 10.2% of pregnant women reported a disability; specifically, 3.9% reported a sensory disability, 5.3% a cognitive disability, and 4.3% a daily activity-related disability (Table 1). Among pregnant women with a disability, approximately 34.0% reported opioid prescribed use within the past year, and 15.0% misuse. Overall, sensory disabilities were associated with a significantly higher proportion of opioid misuse (22.1%) within the past year compared to the other disability types. Difficulty seeing was associated with a significantly greater likelihood of opioid prescribed use (34.2%) and misuse (21.7%), and those with difficulty hearing were more likely to misuse opioids (18.4%) compared to those with no such difficulties. A significantly higher proportion of pregnant women with a cognitive disability reported opioid prescribed use (37.6%) and misuse (15.4%) within the past year than those without such a disability. Among those with a disability of daily living, difficulty with errands was associated with a higher prevalence of opioid prescribed use (41.0%) and misuse (12.8%) within the past year, and pregnant women reporting difficulty walking were more likely to misuse opioids (14.3%) within the past year than those without these types of disabilities. Younger age (≤ 25 years old), cigarette smoking and alcohol consumption within the past year were significantly associated ($p\text{-value} \leq 0.05$) with prescription opioid prescribed use and misuse among pregnant women with disabilities (Table 2).

Logistic regression findings show that pregnant women with disabilities had higher adjusted odds of using (AOR 1.71; 95% CI, 1.27-2.29) and misusing (AOR 2.00; 95% CI, 1.22-3.28) prescription opioids within the past year than those without disabilities (Table 3). Pregnant women reporting cognitive disabilities had a higher likelihood (AOR

2.10; 95% CI, 1.40-3.13) of using prescription opioids within the past year than pregnant women without cognitive disabilities. Sensory disabilities were also associated with increasing adjusted odds of using (AOR 1.81; 95% CI, 1.10-2.99) and misusing (AOR 3.35; 95% CI, 1.83-6.14) prescription opioids within the past year. Unadjusted odds of pregnant women misusing (OR 2.65; 95% CI, 1.30-5.40) and using (OR 1.89; 95% CI, 1.23-2.91) prescription opioids within the past year was increased among those reporting daily activities disabilities relative to those without such disabilities.

Types of Past-Year Opioid Use & Misuse by Disability Status

Pregnant women with disabilities reported greater use (2.96%) and misuse (0.59%) of the strongest prescription opioid, fentanyl, within the past year than those without disabilities; while hydrocodone and oxycodone were the highest reported opioids reported by pregnant women with disabilities for use and misuse (Table 4). With the exception of oxymorphone misuse, the proportions of use and misuse for all listed opioids were greater for pregnant women with disabilities than those without disabilities.

Motives for Last Opioid Misuse by Disability Status

Pregnant women with disabilities acknowledged pain relief (59.5%) as the single greatest motive for their last prescription opioid misuse, but 73.9% of respondents also misused opioids for grouped non-pain relief motives (Table 5). Of the grouped non-pain relief motives, to relax was the second highest motive (37.2%) for opioid misuse among pregnant women with disabilities. Alarming, a substantially higher proportion of pregnant women with disabilities had a motive to misuse opioids because they were hooked or had to have the drug (19.2%) than those without disabilities (6.96%).

Source of Last Opioid Misuse by Disability Status

Among pregnant women with disabilities, 45.3% obtained prescription opioids from friends or relatives (Table 6). Furthermore, 24.9% utilized sources other than the medical system or friends and family to acquire prescription opioids, which is a pointedly higher proportion compared to pregnant women without disabilities (13.7%).

Discussion

The prevalence of opioid prescribed use (33.7%) and misuse (14.6%) within the past year among pregnant women with any disability was substantially higher than those without disabilities. Although perinatal prescription opioid use and the prevalence of chronic prescription opioid use among those with disabilities has been increasing (Desai et al. 2014; Bateman et al. 2014; Kitsantas et al. 2020; Morden et al. 2014), this is one of few studies to examine opioid use among pregnant women with disabilities (Kitsantas et al. 2020; Richard et al. 2022). Our estimates of past-year opioid prescribed use among women with disabilities are alarmingly higher than those without disabilities and the recent 6.6% prevalence rate of perinatal use during pregnancy the Centers for Disease Control and Prevention recently reported (Ko et al. 2019). These results are concerning and highlight the need for intervention and prevention efforts to particularly focus on women with a disability. The American College of Obstetricians and Gynecologists (ACOG) recommends early universal screening for substance use and brief intervention such as providing feedback and advice to the patient (ACOG 2017). Overall, standards of early prenatal screening to identify opioid use and disabilities, as well as patient education on the adverse effects of opioids on maternal and infant health should be

reviewed to ensure comprehensive efficacy among this population of pregnant women. A recent study by Ko et al. (2019) found that over 30.0% of pregnant women reported never being informed or counseled on the effects of maternal opioid use on infants. This suggests that the ongoing use of prescription opioids in pregnant women could be due to a lack of awareness related to the adverse effects of opioids, which could be exacerbated in pregnant women with disabilities.

In the present study, we found that even after adjusting for potential confounders, pregnant women with disabilities had significantly higher odds of misusing prescription opioids within the past year than those without disabilities. In particular, pregnant women with cognitive and sensory disabilities were respectively more likely to use and misuse opioids within the past year than those without such disabilities. Sensory disabilities, such as hearing loss or deafness and low vision or blindness, are associated with social isolation and depression, which may explain the findings of the present study (Trujillo-Tanner et al. 2022). Recent studies found cognitive deficits to be associated with increase substance abuse (D'Souza 2019) and women with disabilities encounter added stressful life events that can lead to prominent rates of licit or illicit substance use, such as opioid use (Alexander et al. 2022). In addition, opioids can be used for various health conditions among women with disabilities to treat acute and chronic pain, including pregnancy-related lower back and pelvic area pain (Mogren & Pohjanen 2005; Babb et al. 2010). However, the American Pain Society guidelines do not include recommendations for usage of opioids for chronic pain among pregnant women (Chou et al. 2009). This may

have implications for pregnant women with disabilities who are at increased risk for pregnancy complications and adverse birth outcomes (Mitra et al. 2015b).

From 2017 to 2018, over 42.0% of opioid-related deaths among US women included a prescription opioid (Wilson et al. 2020); with methadone, oxycodone, and hydrocodone being commonly correlated with opioid overdose deaths (CDC 2017a). Alarming, in this study, the prevalence of use and misuse of these three opioids among pregnant women with disabilities was greater than those with no disabilities. Specifically, hydrocodone and oxycodone were the most used and misused opioids within the past year by pregnant women with and without disabilities, while pregnant women with disabilities had a higher rate of use and misuse of fentanyl. Due to 67.0% of recent drug-related fatalities – over 107,000 deaths from January 2021 to January 2022 – involving licit and illicit fentanyl (DEA 2022), increased use and misuse of fentanyl among pregnant women with disabilities is an alarming result. Educating health practitioners and this vulnerable population of the dangers of opioids, licit and illicit, is critical to reducing opioid-related deaths and safeguarding the health of mothers and their infants.

Pain was the single greatest motive for last prescription opioid misuse in this study, but over 73.0% of respondents also misused opioids for non-pain relief motives. However, a notable percentage of them misused opioids for non-pain relief motives, such as to relax or get high. In addition, over 19.0% of pregnant women with disabilities reported opioid misuse due to being hooked on opioids compared to 6.9% of those with no disabilities. Pregnant women with disabilities indicated they mostly obtained opioids from friends or relatives; however, nearly 25.0% of them utilized sources (e.g., drug

dealer, stranger, etc.) other than the medical system or friends and family to acquire prescription opioids compared to 13.7% of pregnant women without disabilities. These other sources are troubling, as more than 36,000 overdose deaths in 2019, 12 times more than in 2013, were linked to illegally fabricated synthetic opioids (CDC 2021). These findings may be partially explained due to individuals with disabilities experiencing disparities in healthcare access, which could be exacerbated by pregnancy in the subpopulation with a higher prevalence (women vs. men) of disability (Okoro et al. 2018). If pregnant women with disabilities encounter barriers to medical systems, they may seek opioids, including fentanyl, from questionable non-medical sources for the motives included in this study. These findings necessitate research not only into healthcare barriers and health practitioners' opioid prescribing practices, but also into community and public health strategies to curb the illicit distribution of prescription opioids and illegally fabricated synthetic opioids.

Strengths and Limitations

This study utilized a nationally representative sample to estimate prescription opioid use and misuse in a vulnerable and understudied population, namely pregnant women with disabilities. The NSDUH collects highly private and confidential information from respondents using audio computer-assisted self-interviewing (ACASI). The ACASI is designed to reduce bias by increasing honest responses related to sensitive behaviors such as reporting substance abuse or misuse. However, the NSDUH data is restricted to the civilian non-institutional population; representing only about 79.0% of the US population (BLS 2020). Studies indicate a higher prevalence of substance use and abuse among the

institutionalized US population (Han et al. 2017); therefore, results of the present study could be underestimated and are not generalizable to institutionalized US populations. Furthermore, the NSDUH did not collect data on prescription opioid use for withdrawal symptoms or opioid use disorder, which is a reasonable, and sometimes necessary, motive for the use of buprenorphine or methadone during pregnancy to improve health outcomes for both the mother and child. Assessing prescription opioids within the past year may not coincide with the current pregnancy for some of the respondents in this study. Social-desirability bias is inherently embedded within survey data and the cross-sectional nature of the NSDUH data does not allow for determining temporal or causal inferences.

Research Implications

Given the current state of knowledge on the adverse effects of prescription opioids on maternal and infant health outcomes and the findings of this study, enhanced measures to reduce exposure to opioids while curtailing opioid misuse and opioid use disorders are necessary, especially for those with disabilities. To address the overall opioid crises, the HHS should require states to decisively establish and enforce the use of and adherence to prescription opioids clinical practice guidelines (CPGs) by all licensed practitioners. Aligned institutional CPGs can be used to educate medical practitioners while assisting, and sometimes directing, both practitioners and patients to accomplish appropriate opioid prescribing (NCCIH 2020). In addition, prescription opioid monitoring programs that include strict oversight of opioid dispensing practices by pharmacists could act as a

quality assurance component designed to not only identify non-compliant practitioners, but to mitigate unwarranted dispensing of opioids.

Coupled with CPGs, community and public health strategies could help reduce exposure to opioids and prevent opioid use disorder. Early screening and identification of disabilities, especially sensory and cognitive disabilities, is critical to managing opioid prescribing practices and mitigating opioid misuse among pregnant women. Given the findings of prescription opioids being attained from non-medical sources, community and public health officials must implement prevention and intervention programs that are designed to identify and eliminate these sources while increasing awareness of the harm these illegitimate sources of opioids have on the health of pregnant women and their offspring. In addition, patient education programs and resources could be enhanced to target vulnerable populations and inform them of the associated risks and adverse effects of opioids for mothers, infants, and families.

Conclusion

In conclusion, pregnant women with disabilities are at amplified risk for opioid use and misuse. Efficacious clinical practice guidelines for prescribing opioids combined with public health strategies can provide women with disabilities safe and effective pain management while diminishing the potential for opioid misuse and opioid use disorder. Early prenatal screening for disabilities and prescription opioid use or misuse among pregnant women, coupled with timely referral for appropriate treatment, is vital to the health of mothers and their children.

APPENDIX: TABLES

Table 1. Type of Disability and Past-Year Prescription Opioid Use & Misuse among Pregnant Women (*n* = 3006)

	All Pregnant Women*	No Opioid Use	Opioid Prescribed Use**	Opioid Misuse***	<i>p</i> Value
	Weighted % (95% CI) ****	Weighted % (95% CI) ****	Weighted % (95% CI) ****	Weighted % (95% CI) ****	
Disability reported					0.0000
No	89.8 (88.2 - 91.2)	72.3 (70.3 - 74.3)	23.2 (21.5 - 25.0)	4.47 (3.53 - 5.64)	
Yes	10.2† (8.76 - 11.8)	51.7 (44.8 - 58.6)	33.7 (27.4 - 40.7)	14.6 (10.2 - 20.4)	
Sensory Disability					0.0000
No	96.0 (95.2 - 96.8)	71.2 (69.2 - 73.1)	24.0 (22.4 - 25.8)	4.80 (3.83 - 6.01)	
Yes	3.95 (3.23 - 4.83)	48.5 (38.1 - 59.0)	29.4 (20.8 - 39.8)	22.1 (14.1 - 32.9)	
Difficulty Hearing					0.0079
No	98.7 (98.1 - 99.1)	70.4 (68.5 - 72.3)	24.3 (22.6 - 26.0)	5.32 (4.29 - 6.57)	
Yes	1.26 (0.85 - 1.86)	58.7 (40.0 - 75.2)	23.0 (11.7 - 40.0)	18.4 (7.89 - 37.1)	
Difficulty Seeing					0.0000
No	97.0 (96.2 - 97.6)	71.1 (69.1 - 73.0)	23.9 (22.3 - 25.7)	4.97 (3.97 - 6.21)	
Yes	3.04 (2.41 - 3.83)	44.1 (32.8 - 56.0)	34.2 (23.1 - 47.3)	21.7 (12.2 - 35.7)	
Cognitive Disability (Difficulty Thinking)					0.0000
No	94.7 (93.6 - 95.7)	71.5 (69.5 - 73.4)	23.5 (21.8 - 25.3)	4.95 (3.96 - 6.17)	
Yes	5.27 (4.34 - 6.39)	47.0 (37.5 - 56.7)	37.6 (28.0 - 48.4)	15.4 (9.31 - 24.3)	
Daily Activities Disability					0.0027
No	95.7 (94.3 - 96.8)	70.9 (68.9 - 72.8)	23.9 (22.2 - 25.8)	5.17 (4.17 - 6.39)	
Yes	4.29 (3.21 - 5.72)	56.3 (45.3 - 66.6)	31.1 (22.4 - 41.4)	12.6 (6.55 - 22.9)	
Difficulty Dressing					0.3526
No	99.1 (98.4 - 99.5)	70.4 (68.5 - 72.2)	24.2 (22.5 - 25.9)	5.43 (4.40 - 6.68)	
Yes	0.86 (0.46 - 1.60)	55.4 (30.2 - 78.1)	31.7 (14.5 - 55.9)	12.9 (2.19 - 49.4)	
Difficulty with Errands					0.0038
No	97.3 (96.1 - 98.1)	70.9 (68.8 - 73.0)	23.8 (22.0 - 25.7)	5.25 (4.25 - 6.46)	
Yes	2.75 (1.95 - 3.86)	46.2 (30.9 - 62.3)	41.0 (26.3 - 57.4)	12.8 (5.17 - 28.4)	
Difficulty Walking					0.0322
No	98.1 (97.3 - 98.6)	70.3 (68.4 - 72.2)	24.3 (22.7 - 26.1)	5.32 (4.27 - 6.60)	
Yes	1.94 (1.40 - 2.67)	65.9 (49.4 - 79.3)	19.9 (10.5 - 34.3)	14.3 (6.81 - 27.4)	

* Entire sample (All Pregnant Women) results presented in column format – remaining results presented in row format

** Opioid Prescribed Use (No Misuse or Use Disorder)

*** Opioid Misuse includes Use Disorder

**** Values are weighted percentages with 95% confidence intervals

† 10.2% (weighted %) reported a disability of any type; however, participants in the NSDUH were allowed to report multiple types of disabilities (sensory, cognitive, daily activities)

Table 2. Sample Characteristics by Past-Year Opioid Use & Misuse among Pregnant Women with Disabilities
(*n* = 364)

	No Opioid Use Weighted % (95% CI)***	Opioid Prescribed Use* Weighted % (95% CI) ***	Opioid Misuse** Weighted % (95% CI)***	<i>p</i> Value
Age				0.0001
≤ 25	50.4 (40.3 - 60.4)	46.7 (35.6 - 58.1)	50.4 (31.0 - 69.7)	
26 – 34	33.3 (26.2 - 41.2)	41.7 (30.8 - 53.5)	34.9 (17.4 - 57.7)	
≥ 35	16.3 (9.28 - 27.1)	11.6 (4.92 - 24.9)	14.6 (4.91 - 36.3)	
Race / Ethnicity				0.0854
White, non-Hispanic	47.8 (38.9 - 56.8)	57.3 (45.5 - 68.4)	72.3 (53.5 - 85.6)	
Black, non-Hispanic	20.5 (14.2 - 28.7)	22.8 (14.5 - 34.0)	4.28 (0.98 - 16.7)	
Other, non-Hispanic	11.7 (6.44 - 20.3)	7.47 (3.41 - 15.6)	5.86 (2.26 - 14.4)	
Hispanic	20.0 (14.6 - 26.8)	12.4 (5.94 - 24.0)	17.5 (6.87 - 38.0)	
Education				0.2592
< High School (HS)	18.5 (11.7 - 28.1)	9.08 (4.25 - 18.4)	30.1 (16.5 - 48.3)	
HS graduate	26.2 (20.5 - 32.8)	24.9 (16.4 - 36.0)	29.1 (13.7 - 51.3)	
> HS, some college	36.2 (25.8 - 48.1)	50.9 (39.7 - 62.0)	28.9 (12.9 - 52.7)	
College graduate	19.0 (10.8 - 31.3)	15.1 (8.56 - 25.2)	12.0 (3.16 - 36.1)	
Trimester				0.1748
First	28.1 (20.3 - 37.4)	40.7 (27.1 - 55.8)	41.6 (23.6 - 62.0)	
Second	39.7 (30.7 - 49.4)	42.9 (29.0 - 58.0)	37.0 (21.4 - 55.9)	
Third	32.3 (26.0 - 39.3)	16.5 (10.5 - 24.9)	21.5 (9.60 - 41.3)	
Overall Health				0.2028
Poor, Fair, Good	53.7 (44.3 - 62.8)	43.7 (32.7 - 55.4)	59.6 (40.4 - 76.3)	
Very Good, Excellent	46.3 (37.2 - 55.7)	56.3 (44.6 - 67.3)	40.4 (23.7 - 59.6)	
Health Insurance in past year				0.5201
No	16.3 (10.0 - 25.6)	16.6 (9.70 - 27.0)	25.5 (12.5 - 45.1)	
Yes	83.7 (74.4 - 90.0)	83.4 (73.0 - 90.3)	74.5 (54.9 - 87.5)	
Cigarette smoking in past year				0.0000
No	72.0 (63.6 - 79.1)	53.4 (43.0 - 63.6)	11.6 (5.23 - 23.9)	
Yes	28.0 (20.9 - 36.4)	46.6 (36.4 - 57.0)	88.4 (76.1 - 94.8)	
Alcohol in past year				0.0301
No	42.8 (35.3 - 50.6)	23.3 (15.5 - 33.6)	35.9 (19.9 - 55.8)	
Yes	57.2 (49.4 - 64.7)	76.7 (66.4 - 84.5)	64.1 (44.2 - 80.1)	

* Opioid Prescribed Use (No Misuse or Use Disorder)

** Opioid Misuse includes Use Disorder

*** Values are weighted percentages with 95% confidence intervals

Table 3. Odds Ratios (95% Confidence Intervals) for Past-Year Prescription Opioid Use and Misuse based on Disability among Pregnant Women ($n = 3006$)

Pregnant Women				
	Past-Year Opioid Misuse		Past-Year Opioid Use	
	Unadjusted Odds Ratios (95% CI)*	Adjusted* Odds Ratios (95% CI)*	Unadjusted Odds Ratios (95% CI)*	Adjusted* Odds Ratios (95% CI)*
Disability				
Yes	3.64 (2.37 - 5.59)	2.00 (1.22 - 3.28)	2.44 (1.86 - 3.20)	1.71 (1.27 - 2.29)
No	Reference	Reference	Reference	Reference
Sensory Disabilities				
Yes	5.63 (3.16 - 10.0)	3.35 (1.83 - 6.14)	2.62 (1.73 - 3.98)	1.81 (1.10 - 2.99)
No	Reference	Reference	Reference	Reference
Cognitive Disabilities				
Yes	3.49 (1.94 - 6.28)	2.02 (0.95 - 4.33)	2.83 (1.92 - 4.16)	2.10 (1.40 - 3.13)
No	Reference	Reference	Reference	Reference
Daily Activities Disabilities				
Yes	2.65 (1.30 - 5.40)	0.93 (0.34 - 2.52)	1.89 (1.23 - 2.91)	1.22 (0.80 - 1.88)
No	Reference	Reference	Reference	Reference

Entries in **bold** are significant at a p value ≤ 0.05

* Logistic regression models (odds ratios with 95% confidence intervals for Past-Year Opioid Use and Past-Year Opioid Misuse) adjusted for age, race/ethnicity, education, health and health insurance status, cigarette and alcohol use

Table 4. Types of Past-Year Opioid Use & Misuse among Pregnant Women
(*n* = 3006) by Disability Status

	Pregnant Women without Disabilities	Pregnant Women with Disabilities
	Weighted % (95% CI)	Weighted % (95% CI)
Fentanyl		
Any Use	0.64 (0.32 - 1.29)	2.96 (1.15 - 7.39)
Misuse	0.23 (0.05 - 0.96)	0.59 (0.17 - 2.06)
Buprenorphine		
Any Use	0.78 (0.51 - 1.18)	8.27 (4.68 - 14.2)
Misuse	0.50 (0.23 - 1.09)	2.39 (0.86 - 6.49)
Oxymorphone		
Any Use	0.39 (0.14 - 1.09)	1.48 (0.47 - 4.56)
Misuse	0.20 (0.04 - 0.91)	0.13 (0.02 - 0.98)
Hydromorphone		
Any Use	0.38 (0.15 - 0.97)	1.84 (0.67 - 4.97)
Misuse	0.18 (0.03 - 0.91)	0.66 (0.09 - 4.81)
Methadone		
Any Use	0.62 (0.32 - 1.19)	2.62 (1.23 - 5.51)
Misuse	0.26 (0.10 - 0.69)	0.82 (0.16 - 4.18)
Oxycodone		
Any Use	6.69 (5.40 - 8.26)	20.1 (15.1 - 26.1)
Misuse	1.57 (1.10 - 2.25)	7.38 (4.40 - 12.1)
Hydrocodone		
Any Use	15.3 (13.8 - 17.0)	33.5 (28.2 - 39.4)
Misuse	2.77 (2.02 - 3.80)	9.14 (5.54 - 14.7)
Morphine		
Any Use	2.13 (1.54 - 2.93)	10.7 (7.00 - 16.0)
Misuse	0.15 (0.02 - 1.00)	2.41 (0.70 - 7.96)
Tramadol		
Any Use	4.93 (3.92 - 6.18)	14.8 (10.5 - 20.4)
Misuse	0.63 (0.34 - 1.17)	4.00 (1.68 - 9.19)
Demerol		
Any Use	0.34 (0.15 - 0.74)	1.18 (0.31 - 4.31)
Misuse	0.01 (0.00 - 0.05)	0.00 (0.00 - 0.00)
Other		
Any Use	6.75 (5.70 - 7.97)	9.40 (6.41 - 13.6)
Misuse	0.09 (0.03 - 0.25)	1.09 (0.34 - 3.42)

“No Opioid Use” results excluded from the table

Table 5. Motives for Last Opioid Misuse among Pregnant Women (*n* = 3006)
by Disability Status

	Pregnant Women without Disabilities	Pregnant Women with Disabilities
	Weighted % (95% CI)	Weighted % (95% CI)
To Relieve Pain		
No	33.9 (24.9 - 44.2)	40.5 (23.2 - 60.6)
Yes	66.1 (55.8 - 75.1)	59.5 (39.4 - 76.8)
For Non-Pain Motives*		
No	49.4 (39.9 - 58.9)	26.1 (12.6 - 46.4)
Yes	50.6 (41.1 - 60.1)	73.9 (53.6 - 87.4)
To Relax		
No	74.7 (62.2 - 84.0)	62.8 (40.7 - 80.6)
Yes	25.3 (16.0 - 37.8)	37.2 (19.4 - 59.3)
To Experiment		
No	93.4 (84.9 - 97.3)	97.6 (84.1 - 99.7)
Yes	6.57 (2.71 - 15.1)	2.40 (0.32 - 15.9)
To Get High		
No	78.5 (65.1 - 87.7)	68.8 (45.8 - 85.2)
Yes	21.5 (12.3 - 34.9)	31.2 (14.8 - 54.2)
For Sleep		
No	87.4 (75.8 - 93.9)	90.8 (73.2 - 97.3)
Yes	12.6 (6.11 - 24.2)	9.21 (2.73 - 26.8)
For Emotions		
No	79.2 (66.5 - 87.9)	71.1 (50.6 - 85.5)
Yes	20.8 (12.1 - 33.5)	28.9 (14.5 - 49.4)
For Other Drug Effect		
No	97.9 (93.7 - 99.3)	89.5 (67.5 - 97.2)
Yes	2.15 (0.71 - 6.31)	10.5 (2.77 - 32.5)
Because Hooked		
No	93.0 (80.8 - 97.7)	80.8 (53.8 - 93.8)
Yes	6.96 (2.30 - 19.2)	19.2 (6.20 - 46.2)
For Other Reason		
No	99.0 (96.3 - 99.7)	90.1 (67.3 - 97.6)
Yes	1.00 (0.27 - 3.68)	9.86 (2.40 - 32.7)

* Grouped motives: to relax, experiment, get high; for sleep, emotions, other drug effect, other reasons; and because hooked

Table 6. Source of Opioid for Last Misuse among Pregnant Women
(*n* = 3006) by Disability Status

	Pregnant Women without Disabilities	Pregnant Women with Disabilities
	Weighted % (95% CI)*	Weighted % (95% CI)*
Medical System	27.1 (17.1 - 40.1)	29.8 (15.0 - 50.7)
Friends or Relatives	59.2 (45.5 - 71.6)	45.3 (25.2 - 67.0)
Other**	13.7 (7.72 - 23.3)	24.9 (10.5 - 48.4)

* Values are weighted percentages with 95% confidence intervals

** Other: drug dealer, stranger; or opioid was attained another way

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CHAPTER THREE

OPIOIDS AND DISABILITY AMONG WOMEN OF REPRODUCTIVE AGE

Abstract

Background: Despite nearly one of five US women of reproductive age reporting a disability, limited research exists on opioid behaviors in this vulnerable population.

Purpose: This study examined associations between disability and past-year prescription opioid use and misuse, and described types of opioids, sources and motives for opioid misuse among non-pregnant women of reproductive age. In addition, the effects of social, medical, and behavioral determinants of health on opioid use and misuse were assessed in this population of women with disabilities.

Methods: Data were used from the 2015-2019 National Survey on Drug Use and Health (n=93,679). Descriptive statistics and logistic regression models were used in the analyses.

Results: Overall, 48.0% of women with a disability reported past-year prescription opioid use compared to 32.3% for women without disabilities, and 10.4% of women with disabilities reported opioid misuse relative to 4.2% for women without disabilities. Hydrocodone was the most used (29.3%) and misused (5.87%) opioid. Women with disabilities had higher adjusted odds of opioid use (adjusted odds ratio = 1.59, 95% confidence interval = [1.50-1.67]) and misuse (adjusted odds ratio = 2.01, 95%

confidence interval = [1.82-2.21]) than those without disabilities. Tobacco, alcohol use, and poor to fair health were all associated with higher odds of opioid misuse. For their last opioid misuse, 5.2% attained the opioids from a dealer or stranger, and 22.1% used opioids to get high.

Conclusion: Women with disabilities are at an amplified risk for prescription opioid use and misuse. Improved medical provider education, training and capacity, and reinforcing related community-based support programs for this population is imperative.

Introduction

Increasing morbidity and mortality associated with opioid misuse and opioid dependence among the United States (US) population led the US Department of Health and Human Services (HHS) to declare opioid misuse a national public health emergency.¹ The HHS designated women a priority population of interest regarding substance use,² as prescription opioid-related deaths have increased by 415% since 1999 for US women.³ Overall, US women are more likely to be dispensed an opioid than men, and those aged 25 to 34 years have twice the odds of men to fill an opioid prescription.⁴

Adverse effects of opioid misuse have been well documented in the general population of women of reproductive age.³ However, certain populations of women of reproductive age, such as those with disabilities, are particularly susceptible to opioid misuse.⁵ For example, some women with a disability have significantly greater odds of opioid abuse/dependency than comparable women without a disability.⁶ Furthermore, individuals with disabilities are distinctly experiencing increases in opioid-related deaths.⁷ For instance, evidence indicates those with disabilities can account for up to 80% of prescription opioid overdose fatalities within a population.⁸ Additionally, evidence indicates that while only representing 3% of the US population, a subset of individuals with disabilities accounted for 25% of US prescription opioid overdose deaths.⁷

Sociodemographic characteristics can influence prescription opioid and usage in individuals with disabilities; therefore, examination of opioid behaviors and associated characteristics (e.g., social determinants of health) is warranted.¹ Social determinants of health (SDOH) are associated with opioid misuse, directly affecting risk behavior and

exacerbating the medical conditions of opioid users and those with disabilities.^{9,10} SDOH that have been associated with higher odds of opioid utilization and opioid-related deaths include age, race/ethnicity, residential area, and socioeconomic factors.^{9,11,12} For example, 2017 opioid overdose death rates in the US were higher for non-Hispanic whites (19.4 per 100,000), compared to rates of 12.9 for non-Hispanic blacks and 6.8 for Hispanics.¹² As for disability, prevalence among the young and middle-aged US population was highest in American Indians/Alaska Natives and lowest among Asians.¹³

Additionally, medical and behavioral determinants of health, including tobacco and alcohol use, are associated with opioid habits and disability among the US population.^{8,14} Reproductive-aged women experiencing certain health challenges have a higher risk of misusing prescription opioids and having an opioid use disorder than similar women without such health-related conditions.⁵ Individuals with disabilities facing diminished health also experience an increase in opioid overdose deaths.⁸ Opioids, tobacco, and alcohol use are associated with disability as well, as use of these substances increase with severity of disability.⁶

Higher rates of opioid use and misuse among US adults with disabilities may be partly due to concurrent pain syndromes,⁷ but this diverse population's multifaceted health needs prevent ascribing a single overarching cause for these higher rates.¹ Despite approximately 18% of US women of reproductive age having some type of disability,¹³ limited research exists related to opioids in this vulnerable population of women.^{1,6} More specifically, comprehensive examination of prescription opioid practices that include social, medical, and behavioral determinants of health among non-pregnant women of

reproductive age with disabilities, has been lacking.^{1,15} In addition, an increasing number of women with a disability are seeking to become pregnant¹⁶⁻¹⁹ and both opioid use and misuse have multiple adverse effects for both mother and infant, such as comorbid psychiatric conditions²⁰ and shorter breastfeeding duration.¹⁹ Nearly half of pregnancies in the US are unintended²¹ and the adverse consequences of perinatal opioid use for mothers, infants, and communities further contribute to identifying opioid use in this subpopulation as a notable public health matter.⁶

Research is needed to better understand opioid behaviors and the associated effects of social, medical, and behavioral determinants of health among non-pregnant women of reproductive age with disabilities. This vulnerable population can benefit from focused interventions based on relevant research evidence to reduce misuse of prescription opioids and associated adverse health outcomes. Therefore, the purpose of this study was to examine associations between disability and past-year prescription opioid use and misuse, as well as describe opioid types used and misused, and sources and motives for past-year opioid misuse among non-pregnant women of reproductive age. In addition, the effects of social, medical, and behavioral determinants of health on opioid use and misuse were assessed in this vulnerable population of women with disabilities.

Method

Data Description

Data from the National Survey on Drug Use and Health (NSDUH) for the years 2015 to 2019 were used in this study. The NSDUH collects highly private and confidential information, such as use of illicit drugs, among the non-institutional US population aged

12 years or older using audio computer-assisted self-interviewing (ACASI). The ACASI is designed to reduce bias by increasing honest responses related to sensitive behaviors such as reporting substance abuse or misuse.²² Self-reported substance use and mental health measures are collected in the survey, which also assesses mental and/or substance use disorders and treatment.²² The NSDUH data for this study included 93,679 non-pregnant women aged 15 to 44 years.²³ NSDUH assessed pregnancy status based on responses to the question, “Are you currently pregnant?”²⁴

Measures

Past-Year Prescription Opioid Use. Prescription opioid use, in any form, within the past year was assessed based on NSDUH questions that identify past-year use of opioids. Respondents who provided a positive response to opioid use within “the past 12 months,” were asked further questions to determine classification of use and misuse.²⁴

Past-Year Prescription Opioid Prescribed Use. Defined as past-year use of prescription opioids as prescribed or directed by a medical prescriber without misuse or opioid use disorder.

Past-Year Prescription Opioid Misuse. Prescription opioid misuse was defined as “use in any way that a doctor did not direct you to use them within the past year.”²⁴ Prescription opioid use disorder, defined as “dependence or abuse within the past year,” was included in prescription opioid misuse data for this study.²⁴

Disability. The Centers for Disease Control and Prevention (CDC) characterizes disability as any physical or mental condition hindering a person’s ability to perform routine activities and customarily participate within the provincial environment.²⁵

NSDUH standardized disability questions, recommended by the HHS' Substance Abuse and Mental Health Services Administration,²⁶ were used in this study. Three main disability measures were created; specifically, sensory, cognitive and disabilities related to activities of daily living.^{26,27} A dichotomous disability status variable was also created to identify those women with self-reported disabilities as indicated by limitations related to sensory, cognitive and activities of daily living functioning and those without disabilities. Respondents were classified as having a *sensory disability* based on positive responses to the following: (1) "Are you deaf or do you have serious difficulty hearing?" (2) "Are you blind or do you have serious difficulty seeing, even when wearing glasses?"²⁴ Respondents were classified as having a *cognitive disability* based on positive responses to, "Because of a physical, mental or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?"²⁴ Respondents were classified as having an *activities of daily living* disability based on a positive response to one of the following questions: (1) "Do you have serious difficulty walking or climbing stairs?" (2) "Do you have difficulty dressing or bathing?" (3) "Because of a physical, mental or emotional condition, do you have difficulty doing errands alone such as visiting a doctors' office or shopping?"²⁴

Types of Past-Year Prescription Opioid Use and Last Misuse. Respondents were asked to identify the types of prescription opioids used and misused within the past year. The types of opioids include the following: hydrocodone, oxycodone, tramadol, morphine, fentanyl, buprenorphine, oxymorphone, demerol, hydromorphone, methadone, and other pain relievers.

Sources of Past-Year Prescription Opioid for Last Misuse. Respondents were asked to select as many responses as possible from the following sources of prescription opioids for last misuse: (1) one or more than one doctor; (2) stole from doctor's office, clinic, hospital, or pharmacy; (3) got for free, bought, or took without asking from friend or relative; (4) drug dealer or other stranger; (5) and other source.²⁴ Based on prior research,²⁸ the sources were combined into four groups: (1) obtained from a medical system source (combined groups 1, 2 from above), (2) obtained from friends or relatives (group 3 above), (3) obtained from a dealer or stranger (group 4 above), and (4) obtained from other sources (group 5 from above).

Motives for Last Past-Year Prescription Opioid Misuse. Respondents were asked to identify the main reason they last misused a pain reliever (opioid). The reasons for misuse included "unknown, relieving physical pain, relaxing or relieving tension, experimenting to see what it's like, feeling good or getting high, helping with sleep, helping with feelings or emotions, increasing or decreasing effects of other drugs, hooked or having to have drug, and some other reason."²⁴ These motives were also categorized into two groups, pain and non-pain relief motives, based on prior research studies.^{29,30}

Social Determinants of Health. Available measures were separated into two groups consistent with recognized categories of social determinants of health^{31,32}: (1) *Economic Stability* included family income (< \$50000, ≥ \$50000) and working cell phone (yes/no); and (2) *Social and Community Context* included age (15-17 years, 18-25 years, 26-44 years), race/ethnicity (Hispanic, black non-Hispanic, white non-Hispanic, or other non-

Hispanic), household size (one-two, three-four, $\geq$ five), and county size - metropolitan (yes/no).

Medical Determinants of Health. Past-year perceived overall health status (excellent-very good, good, fair-poor) was included.

Behavioral Determinants of Health. Tobacco, alcohol, and illicit drug use in the past year (yes/no) were assessed.

Statistical Analysis

Descriptive statistics and bivariate analyses using the chi-squared test examined disability in non-pregnant women of reproductive age and past-year opioid use and misuse. In addition, associations between sample characteristics and past-year opioid use and misuse among non-pregnant women of reproductive age with and without disabilities were examined. Lastly, bivariate analyses examined the type of opioid use and misuse, and the motives and source for last opioid misuse among non-pregnant women of reproductive age by disability status.

Unadjusted logistic regression models estimated the direction and size of the association between disability (overall disability status and by disability type) and any opioid use, disability and opioid prescribed use, and disability and opioid misuse (including opioid use disorder) among non-pregnant women of reproductive age. These models were then adjusted for the measures noted above to estimate adjusted odds ratios with corresponding 95% confidence intervals.^{6,7,12,33} In addition, binary logistic regression was used to assess associations between social, medical, and behavioral determinants of health and any opioid use (versus no opioid use), opioid prescribed use

(versus no opioid prescribed use), and opioid misuse (versus no opioid misuse) among non-pregnant women of reproductive age with disabilities. The data were weighted for all analyses to account for the complex NSDUH study design, and analyzed using Stata/MP 16.1 (StataCorp, College Station, TX).

Results

Past-Year Opioid Use and Misuse by Disability Status

In this sample, 16.5% of non-pregnant women of reproductive age reported a disability; specifically, 10.4% reported a cognitive disability, 6.8% reported a disability related to activities of daily living, and 4.9% reported a sensory disability (Table 1). Proportions of past-year prescription opioid use and misuse among women with a disability were significantly ($p\text{-value} \leq 0.05$) higher than those among women without a disability. Overall, 48.0% of women with a disability reported any form of past-year prescription opioid use compared to 32.3% for women without a disability, and 10.4% of women with a disability reported past-year prescription opioid misuse compared to 4.2% for women without a disability. Women with daily living-related disabilities had a significantly higher proportion (55.2%) of any past-year prescription opioid use compared to those women with no such disability (33.4%), whereas women with cognitive disabilities, or difficulty thinking, conveyed an elevated proportion (12.0%) of past-year prescription opioid misuse compared to those women with no such disability (4.4%). Among women with an activities of daily living disability, 56.7% of those with difficulty walking reported past-year opioid prescribed use; whereas, 14.4% of those with difficulty dressing reported past-year prescription opioid misuse. Of women with a sensory disability, 36.3%

reported past-year opioid prescribed use compared to 29.3% of women with no such disability, and 8.7% reported past-year prescription opioid misuse compared to 5.0% of women with no such disability. Past-year opioid prescribed use and opioid misuse were similar among women reporting difficulty hearing (use = 36.8%, misuse = 8.4%) and seeing (use = 36.7%, misuse = 8.7%) in comparison to women with no such difficulties (hearing: use = 29.5%, misuse = 5.2%; seeing: use = 29.4%, misuse = 5.1%).

White non-Hispanic race/ethnicity, older age (26-44), family income <\$50,000, metropolitan dwelling, good health, and alcohol use within the past year were significantly associated ($p\text{-value} \leq 0.05$) with a higher prevalence of any prescription opioid use among non-pregnant women of reproductive age with a disability (Table 2). These same factors, in addition to household size of three to four and tobacco use, were also significantly associated with a higher prevalence of prescription opioid misuse among women with disabilities.

Non-pregnant women of reproductive age with a disability had greater adjusted odds of any past-year prescription opioid use (AOR 1.59; 95% CI, 1.50-1.67) and misuse (AOR 2.01; 95% CI, 1.82-2.21) than similar women without a disability (Table 3). Women reporting an activities of daily living disability had a higher likelihood (AOR 1.83; 95% CI, 1.73-1.94) of any past-year prescription opioid use than those women without such a disability. In addition, women with a cognitive disability had a higher likelihood (AOR 2.13; 95% CI, 1.92-2.37) of past-year prescription opioid misuse than those women without a cognitive disability.

Differences in determinants of health associated with past-year prescription opioid use and misuse among non-pregnant women of reproductive age with a disability are illustrated in Table 4. Overall, women of younger age that included 15-17 years (OR 0.43; 95% CI, 0.39-0.49) and 18-25 years (OR 0.54; 95% CI, 0.49-0.60), other non-Hispanic race/ethnicity (OR 0.76; 95% CI, 0.66-0.89), Hispanic (OR 0.82; 95% CI, 0.71-0.95), small household sizes of one to two (OR 0.83; 95% CI, 0.72-0.96), and metropolitan dwelling (OR 0.87; 95% CI, 0.79-0.97) were associated with significantly (p-value ≤ 0.05) lower odds of any past-year prescription opioid use compared to their counterparts of older aged women, white non-Hispanics, larger households and rural living, respectively. Compared to very good to excellent health, poor to fair health (OR 2.42; 95% CI, 2.18-2.69) and good health (OR 1.50; 95% CI, 1.36-1.64) were associated with increased likelihood of any past-year prescription opioid use. Illicit drug use (OR 1.86; 95% CI, 1.69-2.05), tobacco use (OR 1.41; 95% CI, 1.27-1.57), and alcohol use (OR 1.20; 95% CI, 1.08-1.34) were also associated with significantly higher odds of any past-year prescription opioid use.

Possession of a functioning cell phone (OR 0.46; 95% CI, 0.24-0.86) and black non-Hispanic race/ethnicity (OR 0.58; 95% CI, 0.45-0.74) were significantly associated with lower odds of past-year prescription opioid misuse, compared to those with no functioning cellphone and white non-Hispanic race/ethnicity. Significantly higher odds of past-year prescription opioid misuse, including use disorder, were observed among women reporting tobacco use (OR 2.37; 95% CI, 2.09-2.68), alcohol use (OR 2.18; 95% CI, 1.83-2.60), poor to fair health OR 1.69; 95% CI, 1.41-2.04), good health (OR 1.34;

95% CI, 1.13-1.60), to be 15-17 years of age (OR 1.32; 95% CI, 1.08-1.61), metropolitan dwelling (OR 1.20; 95% CI, 1.00-1.43) and dwelling in a household size of one to two (OR 1.20; 95% CI, 0.99-1.45), compared to their corresponding references (see Table 4).

Types of Past-Year Opioid Use & Misuse by Disability Status

Non-pregnant women of reproductive age with a disability reported greater any past-year use and misuse of various types of prescription opioids than women without a disability (Table 5). The following specific prescription opioids had elevated proportions of any past-year use and misuse by women with a disability versus women without a disability: Hydrocodone (any use = 29.3% vs. 17.4%) (misuse = 5.87% vs. 2.21%), Oxycodone (any use = 17.3% vs. 8.87%) (misuse = 3.95% vs. 1.33%), and Tramadol (any use = 13.3% vs. 6.14%) (misuse = 1.93% vs. 0.68%). Women with a disability were significantly associated ($p\text{-value} \leq 0.05$) with greater any past-year use (2.03%) and misuse (0.33%) of fentanyl than those without disabilities. Prevalence of both any opioid use and misuse among women with an activities of daily living disability was greater than women with sensory or cognitive disabilities.

Sources for Past-Year Opioid Misuse by Disability Status

Among non-pregnant women of reproductive age with a disability who reported past-year opioid misuse, 55.0% obtained prescription opioids from friends or relatives for their last misuse (Table 6). Approximately, 5.2% of these women with a disability utilized a dealer or stranger to acquire prescription opioids for their last misuse compared to 3.9% of their peers without a disability; women with a cognitive disability had a prominent proportion (5.2%) of those acquiring prescription opioids from a dealer or stranger.

Motives for Past-Year Opioid Misuse by Disability Status

A greater proportion (60.9%) of non-pregnant women of reproductive age with a disability who reported past-year opioid misuse acknowledged their last misuse of a prescription opioid was for non-pain relief, compared to 52.2% for women without a disability. The top three significantly associated ($p\text{-value} \leq 0.05$) non-pain relief motives for these women with a disability versus their counterparts without a disability were to get high (misuse = 22.1% vs. 19.0%), for emotions (misuse = 21.2% vs. 11.8%), and for sleep (misuse = 20.8% vs. 16.4%).

Discussion

The use of opioids among adults with disabilities in the US is a mounting public health concern as this vulnerable population is at increased risk of frequent prescription opioid exposure due to chronic health conditions, and such prolonged exposure notably amplifies the risk for opioid-related disorders, including opioid misuse and opioid overdose.⁷ In this study, the prevalence of past-year prescription opioid use (48.0%) and misuse (10.4%) among non-pregnant women of reproductive age with disabilities was substantially higher than that among women without disabilities. Our findings also show that women with disabilities are twice as likely to misuse prescription opioids within the past year than women without disabilities even after adjusting for multiple social, medical, and behavioral health determinants. Specifically, women with an activities of daily living disability were more likely to use prescription opioids and those with a cognitive disability were more likely to misuse prescription opioids within the past year than women without such disabilities. Intermittent versus sustained opioid use may

explain the different finding of opioid misuse by disability type; therefore, studying health practitioners' opioid prescribing practices for women with disabilities is an important research undertaking. Acknowledging the enduring opioid crisis obligates federal and state intervention efforts to enhance screening methods of vulnerable populations, like women of reproductive age with disabilities, at risk for opioid-related disorders, and increase access to appropriate healthcare by leveraging electronic health records and telehealth capabilities. Advanced health technology allows for expanded screening platforms throughout health systems and community programs to amplify collection of relevant data; such as, mental health, social determinants, etc. Furthermore, it is imperative to improve medical provider education, training and capacity, and reinforce related community-based support programs.³⁴

Social determinants of health include multiple factors accountable for over 80% of health outcomes, particularly behavioral health outcomes related to opioid habits.³⁵ The ongoing pandemic brought about public health actions, such as social isolation policies, that influenced health determinants and have been correlated with at least 40 states reporting an increase in drug overdose deaths. For example, Virginia reported a 67% increase in drug overdose deaths following its implementation of a stay-at-home order.³⁴ In the present study, three social determinants of health – age (15-17 years), household size (1-2), and metropolitan dwelling (yes) – were found to be significantly associated with a lower likelihood of using but a higher likelihood of misusing prescription opioids within the past year among women of reproductive age with disabilities. Medical determinants of health such as perceiving a poor to fair overall health status, and

behavioral determinants of health such as tobacco and alcohol use were significantly associated with higher likelihood of both using and misusing prescription opioids within the past year. Health determinants are intrinsically linked to the ongoing and worsening opioid crisis; therefore, effective health policy targeting these observed health determinants, medical and behavioral, can lead to reduced opioid misuse and opioid-related overdose fatalities among this group of women with disabilities.³⁵

Hydrocodone and oxycodone, commonly associated with opioid overdose fatalities,¹⁷ had the greatest prevalence of use and misuse among non-pregnant women of reproductive age with disabilities, which was markedly greater than the prevalence among women without disabilities. Women with an activities of daily living disability reported higher rates of use and misuse of nearly all opioids compared to those with other disabilities. Approximately two-thirds of the >90,000 overdose deaths from 2019 to 2020 included an opioid³⁶ and >42% of opioid-related deaths among US women from 2017 to 2018 included a prescription opioid³⁷; therefore, these findings warrant further investigation and action to prevent opioid misuse and opioid-related fatalities, considering disability type, among this vulnerable population of women.

The findings of this study indicate that at least 60% of non-pregnant women of reproductive age with a disability who reported past-year opioid misuse reported a non-pain relief motive for their last misuse; such as, to get high, for emotions, or for sleep. While opioids can be appropriately prescribed for pain management, this finding suggests there may have been more applicable non-opioid treatment options for non-pain motives, which may have been related to determinants of health measures. However, over half of

this group of women attained opioids for their last misuse from a non-medical source, with >5% obtaining the opioids from a dealer or stranger. The finding of non-medical sources supplying opioids to these women is concerning, as at least 36,000 overdose deaths in 2019 were linked to illegally fabricated synthetic opioids³⁸ and during the recent coronavirus pandemic, overdose deaths from illicit-black market synthetic opioids has precipitously proliferated.³⁴ In addition, this population of women with disabilities had a strikingly higher rate of use and misuse of fentanyl, which is primarily responsible for an increasing rate of overdose deaths from synthetic opioids³¹; therefore, research not only into health practitioners' prescribing practices for opioids, but also into community and public health strategies to curtail the illicit distribution of opioids is necessary.

Limitations

NSDUH data are restricted to the civilian non-institutional population, representing approximately 79% of the US population.³⁹ Studies indicate a higher prevalence of substance use and abuse among the institutionalized US population¹⁵; therefore, the results of the present study could be underestimated and not generalizable to institutionalized US populations. The NSDUH does not collect data on prescription opioid use for withdrawal symptoms or opioid use disorder, which is a reasonable and sometimes necessary purpose for the use of buprenorphine or methadone. Furthermore, prescribed opioid dosage and duration are missing from data, which could be important in validating appropriate opioid prescribing practices. Severity of disabilities, level of pain, and related comorbidities were not captured by NSDUH questions; therefore, respondents with milder disabilities may not have been identified. As policymakers target health

determinants in pursuit of health, it is paramount for the NSDUH to enhance its data collection methods for health determinant factors in order to facilitate effective research studies that can guide effective health policy. Social-desirability bias is inherently embedded within survey data and the cross-sectional nature of the NSDUH data does not allow for determining temporal or causal inferences.

Conclusion

Non-pregnant women of reproductive age with a disability are at an amplified risk for opioid use and misuse. Recognizing the persistent opioid crisis that has worsened due to the ongoing pandemic, health officials at all levels of government are obliged to enhance current health policies and/or create new health policies to reduce opioid exposure, curb opioid misuse and opioid disorders, and prevent opioid-related fatalities; particularly for vulnerable, at-risk populations like non-pregnant women of reproductive age with disabilities. The physical and mental health of reproductive-aged women are critical for the wellbeing of future generations. Therefore, effectively mitigating the effects of opioids prior to reproduction will prevent associated adverse consequences for prospective children and families. The findings of this study warrant expanded screenings for associated risk factors, enhanced relevant data collection, and further research specific to women of reproductive age with disabilities. To effectively abate the adverse effects of the opioid crisis in this vulnerable population of women with disabilities, public health officials must enact informed policies that also consider associated determinants of health.

APPENDIX: TABLES

Table 1. Disability and Past-Year Prescription Opioid Use and Misuse among Non-Pregnant Women of Reproductive Age ($n = 93679$)

	Entire Sample*	No Opioid Use	Any Opioid Use	Opioid Prescribed Use**	Opioid Misuse***
	Weighted % (95% CI) ****	Weighted % (95% CI) ****	Weighted % (95% CI) ****	Weighted % (95% CI) ****	Weighted % (95% CI) ****
Disability					
No	83.5 (83.1 – 83.9)	67.7 (67.3 – 68.2)	32.3 (31.8 – 32.7)	28.1 (27.6 – 28.5)	4.19 (4.00 – 4.39)
Yes	16.5 (16.1 – 16.9)	52.0 (51.0 – 53.0)	48.0 (47.0 – 49.0)	37.6 (36.6 – 38.6)	10.4 (9.71 – 11.1)
Sensory Disability					
No	95.1 (94.9 – 95.3)	65.6 (65.2 – 66.0)	34.4 (34.0 – 34.8)	29.3 (28.9 – 29.7)	5.03 (4.84 – 5.23)
Yes	4.88 (4.69 – 5.07)	55.0 (52.9 – 57.1)	45.0 (42.9 – 47.1)	36.3 (34.4 – 38.2)	8.70 (7.64 – 9.89)
Difficulty Hearing					
No	98.5 (98.4 – 98.6)	65.3 (64.9 – 65.7)	34.7 (34.3 – 35.1)	29.5 (29.1 – 30.0)	5.17 (4.96 – 5.37)
Yes	1.53 (1.43 – 1.63)	54.8 (51.1 – 58.4)	45.2 (41.6 – 48.9)	36.8 (33.7 – 40.1)	8.38 (6.60 – 10.6)
Difficulty Seeing					
No	96.3 (96.1 – 96.4)	65.5 (65.1 – 65.9)	34.5 (34.1 – 34.9)	29.4 (29.0 – 29.8)	5.08 (4.88 – 5.29)
Yes	3.73 (3.56 – 3.89)	54.7 (52.5 – 56.7)	45.3 (43.3 – 47.5)	36.7 (34.6 – 38.8)	8.69 (7.52 – 10.0)
Cognitive Disability (Difficulty Thinking)					
No	89.6 (89.3 – 89.8)	66.6 (66.2 – 67.1)	33.4 (32.9 – 33.8)	28.9 (28.5 – 29.4)	4.43 (4.24 – 4.64)
Yes	10.4 (10.2 – 10.7)	51.9 (50.7 – 53.0)	48.1 (47.0 – 49.3)	36.1 (34.9 – 37.4)	12.0 (11.1 – 13.0)
Daily Living Activities Disability					
No	93.2 (92.9 – 93.4)	66.6 (66.2 – 67.0)	33.4 (33.0 – 33.8)	28.6 (28.2 – 29.1)	4.75 (4.55 – 4.96)
Yes	6.84 (6.60 – 7.08)	44.8 (43.6 – 46.1)	55.2 (53.9 – 56.4)	43.6 (42.2 – 45.1)	11.5 (10.4 – 12.8)
Difficulty Dressing					
No	99.0 (98.9 – 99.1)	65.5 (65.1 – 65.9)	34.5 (34.1 – 34.9)	29.4 (29.0 – 29.8)	5.12 (4.91 – 5.32)
Yes	1.03 (0.94 – 1.14)	31.6 (28.4 – 35.0)	68.4 (65.0 – 71.6)	54.0 (49.6 – 58.3)	14.4 (11.8 – 17.4)
Difficulty with Errands					
No	94.8 (94.6 – 95.0)	66.1 (65.6 – 66.5)	33.9 (33.5 – 34.4)	29.1 (28.6 – 29.5)	4.85 (4.65 – 5.05)
Yes	5.18 (4.98 – 5.39)	47.2 (45.7 – 48.6)	52.8 (51.4 – 54.3)	40.8 (39.3 – 42.3)	12.0 (10.8 – 13.4)
Difficulty Walking					
No	97.2 (97.1 – 97.4)	66.1 (65.6 – 66.5)	33.9 (33.5 – 34.4)	28.9 (28.5 – 29.3)	5.06 (4.86 – 5.26)
Yes	2.77 (2.63 – 2.92)	32.6 (30.3 – 35.0)	67.4 (65.0 – 69.7)	56.7 (53.9 – 59.4)	10.7 (8.93 – 12.9)

* Entire Sample results presented in column format – remaining results presented in row format

** Opioid Prescribed Use (No Misuse or Use Disorder); dissection of Any Opioid Use results

*** Opioid Misuse includes Use Disorder; dissection of Any Opioid Use results

**** Values are weighted percentages with 95% confidence intervals

All entries, except Difficulty with Errands (No/Yes) – Entire Sample, are significant at a p value ≤ 0.05

Chi-squared test assessed associations between disability and the study sample, opioid use (No versus Any), opioid prescribed use, and opioid misuse

Table 2. Sample Characteristics by Past-Year Prescription Opioid Use and Misuse among Non-Pregnant Women of Reproductive Age with Disabilities ($n = 17551$)

	No Opioid Use	Any Opioid Use	Opioid Prescribed Use*	Opioid Misuse**
	Weighted % (95% CI) ***	Weighted % (95% CI) ***	Weighted % (95% CI) ***	Weighted % (95% CI) ***
<i>Social Determinants of Health</i>				
Economic				
Income - Family				
< \$50K	58.1 (56.6 – 59.6)	63.6 (62.0 – 65.2)	63.4 (61.8 – 65.0)	64.3 (60.6 – 67.8)
≥ \$50K	41.9 (40.4 – 43.4)	36.4 (34.8 – 38.0)	36.6 (35.0 – 38.2)	35.7 (32.2 – 39.4)
Cell Phone Works				
No	1.24 (0.97 – 1.58)	2.10 (1.63 – 2.69)	1.77 (1.33 – 2.37)	3.26 (1.87 – 5.61)
Yes	98.8 (98.4 – 99.0)	97.9 (97.3 – 98.4)	98.2 (97.6 – 98.7)	96.7 (94.4 – 98.1)
Social and Community Context				
Age				
15 – 17 years	21.3 (20.3 – 22.3)	10.2 (9.49 – 11.0)	9.61 (8.86 – 10.4)	12.4 (10.8 – 14.2)
18 – 25 years	35.5 (34.3 – 36.7)	27.3 (26.1 – 28.5)	25.8 (24.6 – 27.0)	32.6 (30.0 – 35.3)
26 – 44 years	43.3 (41.7 – 44.8)	62.5 (61.0 – 64.0)	64.6 (63.1 – 66.1)	55.0 (51.6 – 58.3)
Race / Ethnicity				
White, non-Hispanic	56.1 (54.7 – 57.5)	62.2 (60.6 – 63.8)	61.3 (59.5 – 63.0)	65.7 (62.7 – 68.5)
Black, non-Hispanic	13.0 (12.1 – 14.1)	12.7 (11.7 – 13.7)	14.0 (12.8 – 15.2)	8.14 (6.57 – 10.1)
Other, non-Hispanic	8.97 (8.23 – 9.78)	6.93 (6.28 – 7.65)	6.63 (5.85 – 7.50)	8.04 (6.24 – 10.3)
Hispanic	21.9 (20.9 – 23.0)	18.1 (16.9 – 19.5)	18.1 (16.8 – 19.6)	18.1 (15.5 – 21.1)
Household Size				
One - Two	23.1 (21.6 – 24.6)	24.5 (23.3 – 25.8)	23.6 (22.3 – 24.9)	27.8 (25.4 – 30.5)
Three - Four	47.8 (46.3 – 49.2)	47.6 (46.2 – 48.9)	47.7 (46.2 – 49.3)	47.0 (43.5 – 50.5)
≥ Five	29.2 (27.8 – 30.6)	27.9 (26.6 – 29.2)	28.7 (27.2 – 30.2)	25.2 (22.4 – 28.2)
Metropolitan				
No	13.8 (12.8 – 14.7)	16.6 (15.5 – 17.6)	17.1 (15.9 – 18.3)	14.7 (12.9 – 16.7)
Yes	86.2 (85.3 – 87.2)	83.4 (82.4 – 84.5)	82.9 (81.7 – 84.1)	85.3 (83.3 – 87.1)
<i>Medical Determinants of Health</i>				
Health Status				
Fair/Poor	15.5 (14.7 – 16.3)	31.3 (29.8 – 32.7)	31.4 (30.0 – 32.8)	30.8 (28.0 – 33.8)
Good	31.9 (30.7 – 33.2)	34.9 (33.5 – 36.3)	34.7 (33.3 – 36.1)	35.7 (32.9 – 38.6)
>Good/Excellent	52.6 (51.3 – 53.8)	33.9 (32.6 – 35.2)	33.9 (32.6 – 35.3)	33.5 (30.3 – 36.9)
<i>Behavioral Determinants of Health</i>				
Tobacco Use				
No	70.6 (69.3 – 71.8)	52.8 (51.2 – 54.3)	56.7 (54.9 – 58.5)	38.5 (35.7 – 41.4)
Yes	29.4 (28.2 – 30.7)	47.2 (45.7 – 48.8)	43.3 (41.5 – 45.1)	61.5 (58.6 – 64.3)
Alcohol Use				
No	37.3 (35.8 – 38.7)	26.3 (24.8 – 27.9)	29.1 (27.5 – 30.8)	16.3 (13.9 – 18.9)
Yes	62.7 (61.3 – 64.2)	73.7 (72.1 – 75.2)	70.9 (69.2 – 72.5)	83.7 (81.1 – 86.1)
Illicit Drug Use				
No	70.1 (68.8 – 71.4)	53.2 (51.8 – 54.6)	67.9 (66.2 – 69.7)	0.00 (0.00 – 0.00)
Yes	29.9 (28.6 – 31.2)	46.8 (45.4 – 48.2)	32.1 (30.3 – 33.8)	100.0 (100 – 100)

* Opioid Prescribed Use = No Misuse or Use Disorder; dissection of Any Opioid Use results

** Opioid Misuse includes Use Disorder; dissection of Any Opioid Use results

*** Values are weighted percentages with 95% confidence intervals

All entries, except Household Size – Any Opioid Use, are significant at a p value ≤ 0.05

Chi-squared test assessed associations between study sample with disabilities and opioid use (No versus Any), opioid prescribed use, and opioid misuse

Table 3. Odds Ratios (95% Confidence Intervals) for Past-Year Prescription Opioid Use and Misuse based on Disability among Non-Pregnant Women of Reproductive Age (*n* = 93679)

Non-Pregnant Women of Reproductive Age						
	Any Opioid Use		Opioid Prescribed Use*		Opioid Misuse**	
	Unadjusted Odds Ratios (95% CI)***	Adjusted*** Odds Ratios (95% CI)***	Unadjusted Odds Ratios (95% CI)***	Adjusted*** Odds Ratios (95% CI)***	Unadjusted Odds Ratios (95% CI)***	Adjusted*** Odds Ratios (95% CI)***
Disability						
Yes	1.94 (1.85 – 2.03)	1.59 (1.50 – 1.67)	1.74 (1.66 – 1.83)	1.54 (1.46 – 1.63)	2.65 (2.44 – 2.89)	2.01 (1.82 – 2.21)
No	Reference	Reference	Reference	Reference	Reference	Reference
Sensory Disabilities						
Yes	1.56 (1.44 – 1.70)	1.34 (1.23 – 1.47)	1.48 (1.36 – 1.61)	1.32 (1.21 – 1.44)	1.80 (1.57 – 2.06)	1.43 (1.23 – 1.66)
No	Reference	Reference	Reference	Reference	Reference	Reference
Cognitive Disabilities						
Yes	1.85 (1.76 – 1.95)	1.48 (1.39 – 1.56)	1.60 (1.51 – 1.70)	1.41 (1.33 – 1.50)	2.94 (2.66 – 3.24)	2.13 (1.92 – 2.37)
No	Reference	Reference	Reference	Reference	Reference	Reference
Daily Living Activities Disabilities						
Yes	2.45 (2.33 – 2.59)	1.83 (1.73 – 1.94)	2.26 (2.14 – 2.39)	1.81 (1.71 – 1.93)	2.61 (2.32 – 2.95)	1.80 (1.59 – 2.03)
No	Reference	Reference	Reference	Reference	Reference	Reference

* Opioid Prescribed Use = No Misuse or Use Disorder; dissection of Any Opioid Use results

** Opioid Misuse includes Use Disorder; dissection of Any Opioid Use results

*** Logistic regression models (odds ratios with 95% confidence intervals for each measure: Any Opioid Use, Opioid Prescribed Use, Opioid Misuse) adjusted for family income, functioning cell phone, age, race/ethnicity, household size, metropolitan dwelling, health status, tobacco use, alcohol use, illicit drug use (removed for misuse)

All entries are significant at a *p* value ≤ 0.05

Table 4. Odds Ratios (95% Confidence Intervals) for Correlates of Past-Year Prescription Opioid Use and Misuse among Non-Pregnant Women of Reproductive Age with Disabilities ($n = 17551$)

Non-Pregnant Women of Reproductive Age with Disabilities			
	Any Opioid Use Odds Ratios (95% CI)***	Opioid Prescribed Use* Odds Ratios (95% CI)***	Opioid Misuse** Odds Ratios (95% CI)***
Social Determinants of Health			
Economic			
Income - Family			
< \$50K	1.07 (0.98 – 1.16)	1.06 (0.96 – 1.17)	1.06 (0.90 – 1.24)
≥ \$50K	Reference	Reference	Reference
Cell Phone Works			
No	Reference	Reference	Reference
Yes	0.80 (0.54 – 1.19)	0.93 (0.61 – 1.43)	0.46 (0.24 – 0.86)
Social and Community Context			
Age			
15 – 17 years	0.43 (0.39 – 0.49)	0.42 (0.37 – 0.47)	1.32 (1.08 – 1.61)
18 – 25 years	0.54 (0.49 – 0.60)	0.55 (0.50 – 0.61)	1.06 (0.93 – 1.22)
26 – 44 years	Reference	Reference	Reference
Race / Ethnicity			
White, non-Hispanic	Reference	Reference	Reference
Black, non-Hispanic	0.95 (0.84 – 1.08)	1.01 (0.88 – 1.15)	0.58 (0.45 – 0.74)
Other, non-Hispanic	0.76 (0.66 – 0.89)	0.73 (0.61 – 0.86)	1.01 (0.74 – 1.37)
Hispanic	0.82 (0.71 – 0.95)	0.81 (0.70 – 0.94)	0.90 (0.74 – 1.10)
Household Size			
One - Two	0.83 (0.72 – 0.96)	0.82 (0.71 – 0.95)	1.20 (0.99 – 1.45)
Three - Four	0.95 (0.86 – 1.06)	0.96 (0.86 – 1.06)	1.08 (0.89 – 1.30)
≥ Five	Reference	Reference	Reference
Metropolitan			
No	Reference	Reference	Reference
Yes	0.87 (0.79 – 0.97)	0.87 (0.78 – 0.96)	1.20 (1.00 – 1.43)
Medical Determinants of Health			
Health Status			
Fair/Poor	2.42 (2.18 – 2.69)	2.47 (2.24 – 2.73)	1.69 (1.41 – 2.04)
Good	1.50 (1.36 – 1.64)	1.50 (1.37 – 1.64)	1.34 (1.13 – 1.60)
>Good/Excellent	Reference	Reference	Reference
Behavioral Determinants of Health			
Tobacco Use			
No	Reference	Reference	Reference
Yes	1.41 (1.27 – 1.57)	1.43 (1.28 – 1.60)	2.37 (2.09 – 2.68)
Alcohol Use			
No	Reference	Reference	Reference
Yes	1.20 (1.08 – 1.34)	1.26 (1.12 – 1.42)	2.18 (1.83 – 2.60)
Illicit Drug Use			
No	Reference	Reference	NA
Yes	1.86 (1.69 – 2.05)	0.96 (0.86 – 1.07)	NA

* Opioid Prescribed Use = No Misuse or Use Disorder; dissection of Any Opioid Use results

** Opioid Misuse includes Use Disorder; dissection of Any Opioid Use results

*** Values are binary logistic regression odds ratios with 95% confidence intervals for each measure (Any Opioid Use, Opioid Prescribed Use, Opioid Misuse)

Entries in **bold** are significant at a p value ≤ 0.05

Table 5. Types of Past-Year Opioid Use and Misuse among Non-Pregnant Women of Reproductive Age
(n = 93679) by Disability Status

Non-Pregnant Women of Reproductive Age					
	Without Disabilities	With Disabilities	Sensory Disabilities	Cognitive Disabilities	Daily Living Activities Disabilities
	Weighted %* (95% CI)**	Weighted %* (95% CI)**	Weighted %* (95% CI)**	Weighted %* (95% CI)**	Weighted %* (95% CI)**
Fentanyl					
Any Use	0.67 (0.59 – 0.76)	2.03 (1.71 – 2.41)	1.88 (1.37 – 2.59)	2.17 (1.77 – 2.64)	3.24 (2.62 – 4.01)
Misuse	0.09 (0.06 – 0.13)	0.33 (0.23 – 0.48)	0.29 (0.14 – 0.58)	0.47 (0.32 – 0.68)	0.46 (0.28 – 0.76)
Buprenorphine					
Any Use	0.79 (0.72 – 0.88)	2.48 (2.20 – 2.79)	1.91 (1.49 – 2.44)	2.91 (2.52 – 3.36)	3.42 (2.83 – 4.13)
Misuse	0.24 (0.20 – 0.28)	0.83 (0.69 – 1.01)	0.46 (0.30 – 0.71)	1.07 (0.85 – 1.35)	0.98 (0.75 – 1.27)
Oxymorphone					
Any Use	0.24 (0.19 – 0.29)	1.04 (0.86 – 1.26)	0.95 (0.64 – 1.40)	1.21 (0.97 – 1.51)	1.42 (1.13 – 1.78)
Misuse	0.11 (0.08 – 0.15)	0.43 (0.32 – 0.59)	0.39 (0.23 – 0.66)	0.57 (0.40 – 0.82)	0.47 (0.31 – 0.70)
Hydromorphone					
Any Use	0.74 (0.66 – 0.82)	2.31 (2.03 – 2.63)	1.36 (1.02 – 1.80)	2.44 (2.04 – 2.93)	3.81 (3.29 – 4.42)
Misuse	0.07 (0.05 – 0.10)	0.35 (0.23 – 0.54)	0.35 (0.15 – 0.80)	0.47 (0.29 – 0.75)	0.47 (0.27 – 0.81)
Methadone					
Any Use	0.27 (0.23 – 0.32)	1.28 (1.07 – 1.53)	0.91 (0.62 – 1.33)	1.52 (1.25 – 1.84)	1.99 (1.62 – 2.46)
Misuse	0.07 (0.05 – 0.09)	0.40 (0.30 – 0.53)	0.35 (0.18 – 0.67)	0.50 (0.38 – 0.71)	0.52 (0.34 – 0.77)
Oxycodone					
Any Use	8.87 (8.60 – 9.15)	17.3 (16.5 – 18.0)	15.4 (14.1 – 16.9)	17.8 (17.0 – 18.7)	21.9 (20.5 – 23.4)
Misuse	1.33 (1.22 – 1.44)	3.95 (3.56 – 4.38)	3.13 (2.50 – 3.92)	4.75 (4.20 – 5.36)	4.9 (4.19 – 5.71)
Hydrocodone					
Any Use	17.4 (17.1 – 17.8)	29.3 (28.4 – 30.2)	26.1 (24.5 – 27.8)	29.4 (28.1 – 30.6)	35.5 (34.2 – 36.8)
Misuse	2.21 (2.07 – 2.36)	5.87 (5.36 – 6.43)	4.74 (3.95 – 5.68)	6.84 (6.13 – 7.62)	6.64 (5.77 – 7.64)
Morphine					
Any Use	2.14 (1.99 – 2.30)	6.03 (5.55 – 6.55)	5.05 (4.26 – 5.98)	6.14 (5.52 – 6.82)	8.67 (7.76 – 9.69)
Misuse	0.17 (0.13 – 0.21)	0.69 (0.55 – 0.87)	0.48 (0.30 – 0.77)	0.92 (0.72 – 1.18)	0.95 (0.74 – 1.23)
Tramadol					
Any Use	6.14 (5.93 – 6.35)	13.3 (12.5 – 14.1)	11.2 (10.1 – 12.3)	13.8 (12.8 – 14.9)	17.9 (16.7 – 19.2)
Misuse	0.68 (0.59 – 0.77)	1.93 (1.65 – 2.27)	1.57 (1.21 – 2.05)	2.31 (1.96 – 2.74)	2.45 (1.96 – 3.07)
Demerol					
Any Use	0.32 (0.26 – 0.38)	0.80 (0.61 – 1.05)	0.85 (0.51 – 1.41)	0.92 (0.70 – 1.23)	1.04 (0.71 – 1.54)
Misuse	0.03 (0.02 – 0.05)	0.04 (0.02 – 0.08)	0.06 (0.02 – 0.14)	0.05 (0.02 – 0.11)	0.05 (0.02 – 0.14)
Other					
Any Use	9.26 (8.93 – 9.60)	14.1 (13.3 – 14.8)	13.9 (12.6 – 15.2)	14.0 (13.0 – 15.1)	16.2 (15.1 – 17.2)
Misuse	0.32 (0.25 – 0.41)	0.96 (0.73 – 1.25)	0.54 (0.30 – 0.96)	1.24 (0.91 – 1.68)	1.22 (0.86 – 1.74)

* Values are weighted percentages from bivariate comparisons based on Use versus Non-Use, and Misuse versus Non-Misuse

** Values are weighted percentages with 95% confidence intervals

All entries, except Demerol Misuse entries, are significant at a p value ≤ 0.05

Chi-squared testing for associations between disability and various types of opioid use and misuse

Table 6. Source of Opioid for Last Misuse among Non-Pregnant Women of Reproductive Age who Reported Past-Year Opioid Misuse ($n = 5061$) by Disability Status

	Non-Pregnant Women of Reproductive Age				
	Without Disabilities	With Disabilities	Sensory Disabilities	Cognitive Disabilities	Daily Living Activities Disabilities
	Weighted % (95% CI)*	Weighted % (95% CI)*	Weighted % (95% CI)*	Weighted % (95% CI)*	Weighted % (95% CI)*
Medical System	34.8 (32.7 – 36.9)	36.4 (33.6 – 39.3)	38.7 (32.1 – 45.7)	34.1 (31.0 – 37.3)	35.5 (31.8 – 39.3)
Friends or Relatives	56.9 (54.8 – 59.0)	55.0 (51.8 – 58.1)	52.5 (45.0 – 60.0)	57.2 (53.6 – 60.8)	58.0 (53.8 – 62.0)
Dealer or Stranger	3.91 (3.16 – 4.83)	5.15 (3.95 – 6.69)	4.35 (2.23 – 8.31)	5.22 (3.87 – 7.02)	4.52 (3.19 – 6.36)
Other	4.37 (3.41 – 5.58)	3.47 (2.52 – 4.77)	4.44 (1.89 – 10.1)	3.48 (2.37 – 5.06)	2.03 (1.09 – 3.76)

* Values are weighted percentages with 95% confidence intervals

The results were not statistically significant at a p value ≤ 0.05

Table 7. Motives for Last Opioid Misuse among Non-Pregnant Women of Reproductive Age who Reported Past-Year Opioid Misuse ($n = 5061$) by Disability Status

Non-Pregnant Women of Reproductive Age					
	Without Disabilities Weighted % (95% CI)*	With Disabilities Weighted % (95% CI)*	Sensory Disabilities Weighted % (95% CI)*	Cognitive Disabilities Weighted % (95% CI)*	Daily Living Activities Disabilities Weighted % (95% CI)*
To Relieve Pain					
No	27.7 (26.0 – 29.5)	28.8 (26.4 – 31.4)	30.2 (23.9 – 37.4)	29.5 (27.0 – 32.1)	28.1 (24.1 – 32.3)
Yes	72.3 (70.5 – 74.0)	71.2 (68.6 – 73.6)	69.8 (62.6 – 76.1)	70.5 (67.9 – 73.0)	71.9 (67.7 – 75.9)
For Non-Pain Motives**					
No	47.8 (45.3 – 50.3)	39.1 (35.8 – 42.5)	37.9 (30.6 – 45.8)	37.3 (33.9 – 40.8)	38.7 (34.4 – 43.3)
Yes	52.2 (49.7 – 54.7)	60.9 (57.5 – 64.2)	62.1 (54.2 – 69.4)	62.7 (59.2 – 66.1)	61.3 (56.7 – 65.6)
To Relax					
No	72.1 (69.7 – 74.4)	68.8 (66.1 – 72.6)	68.8 (62.8 – 74.3)	67.4 (64.4 – 70.2)	67.6 (63.4 – 71.6)
Yes	27.9 (25.6 – 30.3)	31.2 (28.6 – 33.9)	31.2 (25.7 – 37.2)	32.6 (29.8 – 35.6)	32.4 (28.4 – 36.6)
To Experiment					
No	93.6 (92.1 – 94.8)	92.9 (91.2 – 94.3)	94.9 (92.0 – 96.8)	91.7 (89.5 – 93.4)	94.4 (92.2 – 96.0)
Yes	6.41 (5.22 – 7.86)	7.12 (5.72 – 8.82)	5.09 (3.18 – 8.05)	8.34 (6.62 – 10.5)	5.64 (4.03 – 7.83)
To Get High					
No	81.0 (79.2 – 82.7)	77.9 (74.9 – 80.5)	81.3 (75.9 – 85.8)	76.3 (72.9 – 79.4)	74.6 (70.2 – 78.5)
Yes	19.0 (17.3 – 20.8)	22.1 (19.5 – 25.1)	18.7 (14.2 – 24.1)	23.7 (20.6 – 27.1)	25.4 (21.5 – 29.8)
For Sleep					
No	83.6 (82.0 – 85.1)	79.2 (76.5 – 81.5)	80.1 (73.5 – 85.3)	78.2 (75.2 – 80.9)	80.6 (76.5 – 84.1)
Yes	16.4 (14.9 – 18.0)	20.8 (18.5 – 23.5)	19.9 (14.7 – 26.5)	21.8 (19.1 – 24.8)	19.4 (15.9 – 23.5)
For Emotions					
No	88.2 (86.7 – 89.6)	78.8 (76.2 – 81.1)	82.6 (76.4 – 87.4)	76.1 (73.2 – 78.8)	78.1 (74.7 – 81.1)
Yes	11.8 (10.4 – 13.3)	21.2 (18.9 – 23.8)	17.4 (12.6 – 23.6)	23.9 (21.2 – 26.8)	21.9 (18.9 – 25.3)
For Other Drug Effect					
No	98.3 (97.7 – 98.8)	95.8 (94.1 – 97.1)	96.7 (93.8 – 98.2)	94.9 (92.6 – 96.5)	95.0 (92.6 – 96.6)
Yes	1.66 (1.20 – 2.29)	4.17 (2.93 – 5.91)	3.33 (1.77 – 6.20)	5.12 (3.52 – 7.38)	5.01 (3.39 – 7.36)
Because Hooked					
No	96.6 (95.7 – 97.3)	96.1 (94.9 – 97.0)	96.2 (92.9 – 98.0)	95.4 (94.0 – 96.6)	94.6 (92.2 – 96.3)
Yes	3.44 (2.74 – 4.30)	3.91 (2.98 – 5.11)	3.77 (1.97 – 7.10)	4.56 (3.43 – 6.04)	5.39 (3.71 – 7.77)
For Other Reason					
No	96.1 (95.0 – 96.9)	93.9 (92.1 – 95.3)	93.9 (89.6 – 96.5)	94.6 (92.5 – 96.1)	93.1 (90.3 – 95.1)
Yes	3.94 (3.11 – 4.97)	6.10 (4.69 – 7.89)	6.06 (3.46 – 10.4)	5.42 (3.89 – 7.51)	6.90 (4.85 – 9.73)

* Values are weighted percentages with 95% confidence intervals

** Grouped motives: to relax, experiment, get high; for sleep, emotions, other drug effect, other reasons; and because hooked

Entries in **bold** are significant at a p value ≤ 0.05

Chi-squared testing assessed associations between disability (overall and by type) and various motives for last opioid misuse

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CHAPTER FOUR

DISABILITY AND SUICIDAL BEHAVIORS AMONG WOMEN OF REPRODUCTIVE AGE

Abstract

Background: Despite current research indicating an increased risk for suicidal behaviors among both women and people with disabilities, and the known relationship between health determinants and both disability and suicidal behaviors, limited research has assessed these associations among non-pregnant women of reproductive age.

Purpose: This study examined disability, suicidal behaviors, and associated health determinants among non-pregnant women of reproductive age.

Method: Data from the 2015-2019 National Survey on Drug Use and Health (n=76,750) were used to estimate associations between disability and suicidal behaviors (suicidal ideation, suicidal planning, suicide attempt), and evaluate the effects of health determinants (social, medical, behavioral) on suicidal behaviors among non-pregnant women of reproductive age with disabilities.

Results: Approximately 22% of non-pregnant women of reproductive age with disabilities reported suicidal behaviors compared to only 4.3% of women without disabilities. Women with disabilities had greater adjusted odds of past-year suicidal behaviors (AOR 1.73; 95% CI 1.60-1.87) than those without disabilities. Psychological

distress (OR 3.66; 95% CI 2.98-4.49), major depressive episode (OR 3.22; 95% CI 2.82-3.67), unmet perceived mental health need (OR 2.29; 95% CI 1.98-2.65), age 18-25 years (OR 1.65; 95% CI 1.43-1.92), and illicit drug use (OR 1.40; 95% CI 1.20-1.64) were significantly associated with higher odds of suicidal behaviors, and specifically suicidal ideation, among women with disabilities.

Conclusion: Non-pregnant women of reproductive age with disabilities are at increased risk for exhibiting suicidal behaviors. Better understanding of suicidal behaviors among women with disabilities can assist public health officials and medical professionals in developing meaningful prevention, detection, and intervention programs.

Introduction

Suicidality is a major public health issue currently classified as the 10th leading cause of death in the United States (US) (NIMH 2021; Hedegaard et al 2021; Kochanek et al 2020; Lund et al 2016b). While suicide rates are modest in comparison to other adverse health-related outcomes, suicide is remarkably more definitive and the detrimental effects of suicidal behaviors ripple through families, communities, and associated health personnel (Lund et al 2016b). Women are more likely than men to exhibit suicidal ideation and attempt suicide (CDC 2020a; NIMH 2021). Suicide rates among women aged 25 to 44 years have been increasing as of 2020 (Hedegaard et al 2021), and women's overall suicide rates are not decreasing at the same rate as the men's (Hedegaard et al 2021; Hedegaard et al 2020; Pettrone & Curtin 2020; Curtin & Heron 2019; Stone et al 2018). Individuals with disabilities also have a greater risk for suicidal behaviors than those without disabilities (Lund et al 2016b). A positive association exists between disability and suicidal behaviors even when accounting for potential confounders, including mental health conditions (Lund et al 2016b; Giannini et al 2010). Additional evidence shows increased rates of suicidal behaviors among individuals with sensory-related, cognitive, neurological, physical, and daily living-related disabilities (Giannini et al 2010; Conejero et al 2018; Khazem 2018; Meltzer et al 2011).

The World Health Organization (WHO 2020) refers to disability as individuals' problematic interactions between their health conditions and their personal and environmental factors; including social, medical, and behavioral determinants of health. Social determinants of health (SDOH), such as socioeconomic status, are associated with

higher risks of both disability (Lund et al 2016b; Boen & Hummer 2019) and suicidal behaviors (Lund et al 2016b; Brown et al 2017; Alemi et al 2020; Fuller-Thomson et al 2018). Medical (i.e., healthcare access and depression) and behavioral (i.e., tobacco and alcohol use) determinants of health are also directly linked to both disability (Lund et al 2016b; Fuller-Thomson et al 2018) and suicidal behaviors (Lund et al 2016b; Brown et al 2017; Alemi et al 2020; Fuller-Thomson et al 2018).

Limited research, however, has assessed the associations between disability, suicidal behaviors, and health determinants among non-pregnant women of reproductive age (Kitsantas et al 2020; Lund et al 2020; McConnell et al 2016; Meltzer et al 2011).

Extensive research is warranted to better understand disability, suicidal behaviors and the associated effects of social, medical, and behavioral determinants of health among this group of women. Women of reproductive age is a particularly vulnerable population, especially before and following childbirth, for suicidal behaviors (Admon et al 2020). The purpose of this study was to examine prevalence of suicidal behaviors and their associations with disability and health determinants among non-pregnant women of reproductive age. Findings from this study can be used to inform targeted interventions for suicide prevention among women of reproductive age with disabilities.

Method

Data Description

Data from the 2015-2019 National Survey on Drug Use and Health (NSDUH) were used in this study. The NSDUH, a US nationally representative cross-sectional survey

conducted annually by the Substance Abuse and Mental Health Services Administration (SAMHSA), collects data on substance use and health-related matters among the civilian, non-institutional US population aged 12 years or older (SAMHSA 2021a). However, only adults 18 years and older are surveyed regarding suicidal behaviors (SAMHSA 2021a). In this study, data included 76,750 women of reproductive age, of which 13,023 self-reported disabilities, with missing data ranging from 0.44% to 0.71%.

Measures

Non-Pregnant Women of Reproductive Age. Women were classified as non-pregnant based on yes/no responses to, “Are you currently pregnant?” (SAMHSA 2021b). Non-pregnant women aged 18-44 years comprised the reproductive-aged sample in this study (SAMHSA 2021a; Ellington et al 2020).

Suicidal Behaviors. Suicidal behaviors included suicidal ideation, suicidal planning, and suicide attempt. *Suicidal ideation* was assessed via the question, “At any time in the past 12 months, including today, did you seriously think about trying to kill yourself?” (SAMHSA 2021b). *Suicidal planning* was based on, “During the past 12 months, did you make any plans to kill yourself?” (SAMHSA 2021b). *Suicide attempt* was measured using the question, “During the past 12 months, did you try to kill yourself?” (SAMHSA 2021b). Consistent with prior literature (Kitsantas et al 2020; Choi et al 2015), a dichotomous suicidal behavior measure was created by combining the presence or absence of suicidal ideation, planning, or suicide attempt.

Disability. The Centers for Disease Control and Prevention (CDC) characterizes disability as any physical or mental condition hindering a person's ability to perform everyday activities and customarily participate within the provincial environment (CDC 2020b). Aligned with prior literature and existing NSDUH data (Altman & Bernstein 2008; Krahn et al 2015; SAMHSA 2021b), this study classified women into three disability measures; sensory, cognitive and daily living. Women were classified as having a *sensory disability* based on positive responses to: "Are you deaf or do you have serious difficulty hearing?"; "Are you blind or do you have serious difficulty seeing, even when wearing glasses?" (SAMHSA 2021b). *Cognitive disability* was assessed via responses to, "Because of a physical, mental or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?" (SAMHSA 2021b). *Daily activities disability* was measured using the questions: "Do you have serious difficulty walking or climbing stairs?"; "Do you have difficulty dressing or bathing?"; "Because of a physical, mental or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?" (SAMHSA 2021b). Additionally, a dichotomous overall disability variable was created to identify women with and without a reported disability.

Social Determinants of Health. Available measures were separated into four groups consistent with recognized categories of social determinants of health (CDC 2021; HHS 2021). (1) *Economic Stability* included personal income (<\$20000, \$20000-\$49999, ≥\$50000); (2) *Education* (<high school, high school, some college, ≥college degree); (3) *Healthcare Access* incorporated health insurance (past-year lapse, no lapse) and mental health (MH) access (perceived MH need unmet, no unmet MH needs); and (4) *Social and*

Community Context encompassed age (18-25 years, 26-44 years), race/ethnicity (Hispanic, black non-Hispanic, white non-Hispanic, other non-Hispanic), household size (1, 2, 3, 4, ≥ 5), and religiosity (yes/no).

Medical Determinants of Health. Measures assessing past-year major depressive episode (MDE) and past-year psychological distress (PD) (yes/no), as well as perceived overall health status (excellent-very good, good, fair-poor) were included in the analyses.

Behavioral Determinants of Health. Measures assessing past-year tobacco, alcohol, and illicit drug use (yes/no) were included in the analyses.

Statistical Analysis

Descriptive statistics and bivariate analyses using the chi-squared test were conducted to describe disabilities and suicidal behaviors among non-pregnant women of reproductive age. Unadjusted binary logistic regression models estimated the direction and size of the association between disability and suicidal behaviors (overall and each specific behavior) among non-pregnant women of reproductive age. These models were then adjusted for potential confounders to estimate adjusted odds ratios, with corresponding 95% confidence intervals. Logistic regression models estimated the effects of social, medical, and behavioral determinants of health on suicidal behaviors (overall and each specific behavior) among women with and without disabilities. All analyses were weighted to account for the complex NSDUH study design and analyzed using Stata/MP 16.1 (StataCorp, College Station, TX).

Results

In this sample, 15.4% of non-pregnant women of reproductive age reported a disability; 9.5% a cognitive disability, 6.5% a disability related to activities of daily living, and 4.6% a sensory disability (Table 1). In general, women with a disability were more likely to report suicidal behaviors (21.9%) than women without a disability (4.3%) in the past year. Specifically, women with disabilities had higher rates of suicidal ideation only (13.1%), suicidal planning without attempting suicide (4.8%), and suicide attempt (4.1%) compared to those without disabilities (3.1%, 0.7%, 0.5% respectively). Past-year suicidal behaviors were exhibited by a larger proportion (28.1%) of women with cognitive disabilities than those without such a disability (4.8%); higher rates of suicidal ideation (16.4% vs 3.4%), suicidal planning (6.3% vs 0.8%), and suicide attempt (5.4% vs 0.6%). Women with disabilities related to daily activities reported a higher proportion of suicidal behaviors (26.5%) than those without such a disability (5.6%); higher rates of suicidal ideation (15.3% vs 3.9%), suicidal planning (5.8% vs 1.0%), and suicide attempt (5.4% vs 0.8%). A larger proportion (15.2%) of women with sensory disabilities conveyed suicidal behaviors than those without such a disability (6.6%); higher proportions of suicidal ideation only (8.7% vs 4.4%), suicidal planning (3.0% vs 1.3%), and suicide attempt (3.6% vs 1.0%).

Table 2 displays the unadjusted odds ratios (OR), adjusted odds ratios (AOR), and 95% confidence intervals for past-year suicidal behaviors among non-pregnant women of reproductive age by disability. Overall, women with a disability had greater odds of past-year suicidal behaviors (AOR 1.73; 95% CI 1.60-1.87) than their counterparts without

disabilities; higher likelihood of suicidal ideation (AOR 1.62; 95% CI 1.47-1.77), suicidal planning (AOR 1.64; 95% CI 1.35-1.99), and suicide attempt (AOR 1.86; 95% CI 1.51-2.30). Women with a cognitive disability had a higher likelihood of past-year suicidal behaviors (AOR 1.77; 95% CI 1.61-1.95) than comparable women without such a disability; greater odds of suicidal ideation (AOR 1.66; 95% CI 1.48-1.86), suicidal planning (AOR 1.58; 95% CI 1.28-1.96), and suicide attempt (AOR 1.90; 95% CI 1.56-2.30). In addition, women with sensory disabilities had a higher likelihood of past-year suicidal behaviors (AOR 1.45; 95% CI 1.25-1.69) than those without sensory disabilities; greater odds of suicidal ideation (AOR 1.33; 95% CI 1.11-1.59), suicidal planning (AOR 1.31; 95% CI 0.98-1.73), and suicide attempt (AOR 1.73; 95% CI 1.34-2.24). Women with a disability related to daily activities were also at an increased risk of past-year suicidal behaviors (AOR 1.52; 95% CI 1.34-1.73) than those without such a disability; increased odds of suicidal ideation (AOR 1.50; 95% CI 1.30-1.74), suicidal planning (AOR 1.23; 95% CI 0.98-1.55), and suicide attempt (AOR 1.55; 95% CI 1.26-1.91) were observed.

Several social, medical, and behavioral determinants of health were significantly associated with past-year suicidal behaviors among non-pregnant women of reproductive age with a disability (Table 3). Psychological distress (OR 3.66; 95% CI 2.98-4.49), major depressive episode (OR 3.22; 95% CI 2.82-3.67), unmet perceived mental health need (OR 2.29; 95% CI 1.98-2.65), age 18-25 years (OR 1.65; 95% CI 1.43-1.92), and illicit drug use (OR 1.40; 95% CI 1.20-1.64) were significantly associated with higher odds of suicidal behaviors, and specifically suicidal ideation, among women with

disabilities. In addition, major depressive episode (OR 4.01; 95% CI 2.77-5.81), psychological distress (OR 3.15; 95% CI 2.02-4.91), unmet perceived mental health needs (OR 2.44; 95% CI 1.86-3.21), and a lapse in health insurance coverage (OR 1.42; 95% CI 1.05-1.92) significantly increased the odds of suicidal planning among women with disabilities. Black women with disabilities were less likely to report (OR 0.62; 95% CI 0.40-0.96) suicidal planning compared to their white counterparts. Further analyses revealed that psychological distress (OR 4.52; 95% CI 3.13-6.54), less than high school education (OR 3.12; 95% CI 1.60-6.08), high school education (OR 2.71; 95% CI 1.46-5.04), major depressive episode (OR 2.18; 95% CI 1.67-2.85), 18-25 years (OR 2.05; 95% CI 1.52-2.77), illicit drug use (OR 1.77; 95% CI 1.22-2.58), fair to poor health (OR 1.72; 95% CI 1.30-2.27), residing alone in a household (OR 1.68; 95% CI 1.04-2.69), lapse in health insurance coverage (OR 1.51; 95% CI 1.06-2.15), other race/ethnicity (OR 1.49; 95% CI 1.01-2.19), and unmet perceived mental health need (OR 1.47; 95% CI 1.12-1.93) were significantly associated with higher odds of suicide attempts in this group of women. Religiosity (OR 0.84; 95% CI 0.72-0.97) was significantly associated with lower odds of suicidal behaviors among women with disabilities.

Discussion

A primary objective of this study was to examine the effect of disability (sensory, cognitive, daily activities) on suicidal behaviors (suicidal ideation, suicidal planning, suicide attempt) in an understudied vulnerable population (NIMH 2021; Lund et al 2016b; Fuller-Thomson et al 2018). Extending current knowledge of individuals with disabilities, and specifically women who are at increased risk for suicidal behaviors

(NIMH 2021; Lund et al 2016b; Fuller-Thomson et al 2018), we found disability among women of reproductive age to be a significant indicator of suicidal behaviors (AOR 1.73), even after adjusting for known medical, behavioral, and social determinants of health. The prevalence of suicidal behaviors among women with disabilities in this study was significantly greater (21.9%) than those without disabilities (4.3%), and a sizable difference in reported suicide attempts (4.1% to 0.5%) was observed. Women with disabilities also reported a considerably higher rate of suicidal ideation (13.1%) and were nearly twice as likely to attempt suicide (AOR=1.86) than similar women without disabilities. The results of this study strongly suggest that disability in this group of women may lead to increased deliberation of suicide. It may be that futility disproportionately exists among these women, leading them to consider suicide as an acceptable resolution to their perceived inconveniencing and devaluing lives (Lund et al. 2016a). Given these findings and the awareness of attempted suicide typically occurring within a year of the onset of suicidal ideation (McConnell et al 2016), programs with targeted early screening that facilitate life-saving intervention to diminish suicidality are prudent for this subpopulation of women (Kitsantas et al 2020) and particularly those with disabilities.

Consistent with prior research (Lund et al 2016b; Giannini et al 2010; Choi et al 2015), the findings of this study show that women with a cognitive disability had both a higher prevalence and increased risk of experiencing suicidal behaviors, including suicidal ideation and suicide attempt, relative to similar women without such disabilities. Cognitive disability includes intellectual deficits which could contribute to these findings,

as individuals with lower intellectual quotients demonstrate a higher prevalence of suicide risk factors (Giannini et al 2010). It may be that mental or psychological distress related to their disabilities could diminish cognitive functioning among these women, inhibiting their abilities to seek aid from health professionals, critically assess life's stressors, or perceive a future without these disability-related stressors. These findings warrant further research related to cognitive functioning and suicidal behaviors among this vulnerable population in support of early detection of associated predictors of suicidal behaviors.

Psychological distress, followed closely by MDE, was a significant health determinant measure in this study associated with suicidal behaviors and in particular, suicide attempt. Disconcerting research evidence augments this finding, as US adults with disabilities report mental distresses almost five times as often as those without disabilities (Cree et al 2020; NIMH 2020), and 90% of suicide victims may display symptoms consistent with a mental health condition (NIMH 2020). Moreover, we found non-pregnant women of reproductive age with disabilities who perceived an unmet need for mental healthcare to have higher odds of exhibiting suicidal behaviors relative to those with no unmet need. Healthcare access disparities could contribute to this finding, as women with disabilities were more likely to experience suicidal behaviors and report a lapse in past-year health insurance relative to those with no suicidal behaviors. Additionally, healthcare providers commonly overlook mental health symptoms among those with disabilities (Smith & Matson 2010); therefore, clinical practice guidelines should be updated to capture mental health statuses and suicidal tendencies among

women with disabilities in particular. Based on the overall findings of this study, it is recommended that targeted suicide detection, intervention, and prevention programs designed for this vulnerable population particularly consider younger (18-25 years old) women, those who are white and other non-Hispanic living alone, women with unmet mental health needs, those with a high school or less education, illicit drug use, and a perception of a poor to fair health status.

Additionally in this study, religiosity (i.e., a strong religious belief) was found to be a significant protective factor for suicidal behaviors among women with disability. This finding aligns with prior research that indicates religious affiliation and attendance may be protective factors against suicide (Lawrence et al 2016; Lund et al 2020). This protective effect may arise from religious teachings that form moral beliefs regarding suicide, religious condemnation of suicide, or social constructs of religious congregations and groups (Lund et al 2020); therefore, the inclusion of religiosity in the assessment of suicidality in research, public health activities, and clinical settings is imperative to comprehensively confronting risk factors associated with suicidal behaviors.

Limitations

The NSDUH uses computer-assisted personal interviewing and audio computer-assisted self-interviewing to reduce bias (CBHSQ 2019); however, underreporting of suicidal behaviors is still possible due to self-reporting versus validated instruments among these women with disabilities and associated stigmas from positive responses. The severity of disabilities was not captured by NSDUH questions; therefore, respondents with milder disabilities may not have been identified. Abuse, lack of social support, and homelessness

are specific risk factors not included in this study and could be associated with our findings of increased suicidal behaviors among this sample of women with disabilities (Kitsantas et al 2020; Gelaye et al 2016). Cross-sectional survey data, such as NSDUH data, are inherently embedded with social-desirability bias and do not allow for determining temporal or causal inferences.

Conclusion

Non-pregnant women of reproductive age with disabilities are at increased risk for exhibiting suicidal behaviors. The findings of this study elucidate the complexity of suicidal behaviors among women with disabilities and the influence of specific health determinants on such behaviors. Further research should examine the severity of specific disabilities and its association with suicidal behaviors within the context of social, medical and behavioral determinants of health. Better understanding of suicidal behaviors among women with disabilities can assist public health officials and medical professionals in developing meaningful prevention, detection, and intervention programs.

APPENDIX: TABLES

Table 1. Disability and Past-Year Suicidal Behaviors (Ideation, Planning, Attempt) among Non-Pregnant Women of Reproductive Age ($n = 76750$)

	Entire Sample* $n = 76750$ Weighted % (95% CI) ***	No Suicidal Behaviors $n = 69922^{**}$ Weighted % (95% CI) ***	Suicidal Behaviors**** $n = 6374^{**}$ Weighted % (95% CI) ***	Suicidal Ideation***** $n = 4100$ Weighted % (95% CI) ***	Suicidal Planning***** $n = 1223$ Weighted % (95% CI) ***	Suicide Attempt***** $n = 1051$ Weighted % (95% CI) ***
Disability						
No	84.6 (84.1 – 85.0)	95.7 (95.5 – 95.9)	4.27 (4.07 – 4.49)	3.06 (2.88 – 3.25)	0.69 (0.62 – 0.78)	0.52 (0.47 – 0.59)
Yes	15.4 (15.0 – 15.9)	78.1 (77.1 – 79.0)	21.9 (21.0 – 22.9)	13.1 (12.2 – 14.0)	4.81 (4.39 – 5.26)	4.10 (3.70 – 4.54)
Sensory Disability						
No	95.4 (95.2 – 95.6)	93.4 (93.1 – 93.7)	6.60 (6.35 – 6.86)	4.40 (4.19 – 4.63)	1.25 (1.16 – 1.34)	0.95 (0.87 – 1.04)
Yes	4.63 (4.42 – 4.84)	84.8 (83.6 – 85.9)	15.2 (14.1 – 16.4)	8.65 (7.67 – 9.75)	2.99 (2.47 – 3.62)	3.58 (3.07 – 4.18)
Difficulty Hearing						
No	98.5 (98.4 – 98.6)	93.1 (92.9 – 93.4)	6.87 (6.62 – 7.12)	4.55 (4.34 – 4.77)	1.29 (1.21 – 1.38)	1.03 (0.95 – 1.11)
Yes	1.49 (1.38 – 1.61)	84.3 (81.5 – 86.7)	15.7 (13.3 – 18.5)	8.08 (6.39 – 10.2)	3.69 (2.62 – 5.18)	3.95 (2.76 – 5.64)
Difficulty Seeing						
No	96.5 (96.3 – 96.7)	93.3 (93.0 – 93.5)	6.71 (6.46 – 6.97)	4.45 (4.24 – 4.68)	1.28 (1.20 – 1.38)	0.98 (0.90 – 1.06)
Yes	3.48 (3.31 – 3.67)	85.0 (83.5 – 86.3)	15.0 (13.7 – 16.5)	8.67 (7.53 – 9.98)	2.55 (1.94 – 3.35)	3.83 (3.24 – 4.51)
Cognitive Disability (Difficulty Thinking)						
No	90.5 (90.2 – 90.8)	95.2 (95.0 – 95.4)	4.78 (4.58 – 4.99)	3.35 (3.18 – 3.54)	0.81 (0.74 – 0.88)	0.62 (0.56 – 0.68)
Yes	9.51 (9.24 – 9.80)	71.9 (70.6 – 73.2)	28.1 (26.8 – 29.4)	16.4 (15.2 – 17.7)	6.28 (5.59 – 7.06)	5.41 (4.87 – 6.00)
Daily Activities Disability						
No	93.5 (93.2 – 93.7)	94.4 (94.1 – 94.6)	5.63 (5.39 – 5.88)	3.85 (3.66 – 4.06)	1.01 (0.92 – 1.11)	0.77 (0.71 – 0.83)
Yes	6.54 (6.29 – 6.81)	73.5 (71.8 – 75.1)	26.5 (24.9 – 28.2)	15.3 (13.9 – 16.7)	5.84 (5.22 – 6.53)	5.44 (4.72 – 6.26)
Difficulty Dressing						
No	98.9 (98.8 – 99.0)	93.2 (93.0 – 93.4)	6.80 (6.56 – 7.05)	4.52 (4.31 – 4.73)	1.27 (1.19 – 1.37)	1.01 (0.93 – 1.10)
Yes	1.07 (0.97 – 1.18)	74.9 (71.1 – 78.3)	25.1 (21.7 – 28.9)	12.3 (9.06 – 16.5)	6.15 (4.45 – 8.43)	6.67 (4.61 – 9.54)
Difficulty with Errands						
No	95.1 (94.9 – 95.3)	94.2 (94.0 – 94.5)	5.76 (5.54 – 6.00)	3.92 (3.73 – 4.13)	1.04 (0.95 – 1.13)	0.80 (0.74 – 0.87)
Yes	4.87 (4.65 – 5.10)	68.8 (66.7 – 70.8)	31.2 (29.2 – 33.3)	17.9 (16.3 – 19.7)	6.98 (6.16 – 7.89)	6.39 (5.46 – 7.47)
Difficulty Walking						
No	97.2 (97.0 – 97.3)	93.3 (93.0 – 93.6)	6.70 (6.45 – 6.96)	4.46 (4.25 – 4.67)	1.26 (1.17 – 1.35)	0.99 (0.92 – 1.07)
Yes	2.84 (2.68 – 3.01)	83.0 (81.4 – 84.6)	17.0 (15.4 – 18.6)	9.56 (8.05 – 11.3)	3.50 (2.62 – 4.65)	3.90 (3.18 – 4.78)

* Entire Sample results presented in column format – remaining results presented in row format

** Total does not equal 76,750 due to missing data (454 = 0.59%)

*** Values are weighted percentages with 95% confidence intervals

**** Suicidal Behaviors = Suicidal Ideation, Suicidal Planning, Suicide Attempt

***** Suicidal Behaviors differentiated into Suicidal Ideation only, Suicidal Planning without suicide attempt, Suicide Attempt

All entries are significant at a p value ≤ 0.05 ; Chi-squared testing for associations between Disability (Sensory, Cognitive, Daily Activities) and Suicidal Behaviors (Ideation, Planning, Attempt)

Table 2. Odds Ratios (95% Confidence Intervals) for Past-Year Suicidal Behaviors (Ideation, Planning, Attempt) among Non-Pregnant Women of Reproductive Age by Disability ($n = 76750$)

Non-Pregnant Women of Reproductive Age								
	Suicidal Behaviors		Suicidal Ideation		Suicidal Planning		Suicide Attempt	
	Unadjusted Odds Ratios (95% CI)*	Adjusted** Odds Ratios (95% CI)*	Unadjusted Odds Ratios (95% CI)*	Adjusted** Odds Ratios (95% CI)*	Unadjusted Odds Ratios (95% CI)*	Adjusted** Odds Ratios (95% CI)*	Unadjusted Odds Ratios (95% CI)*	Adjusted** Odds Ratios (95% CI)*
Disability								
Yes n = 13,023	6.29 (5.88 – 6.74)	1.73 (1.60 – 1.87)	5.23 (4.75 – 5.76)	1.62 (1.47 – 1.77)	7.44 (6.37 – 8.70)	1.64 (1.35 – 1.99)	8.16 (7.00 – 9.51)	1.86 (1.51 – 2.30)
No	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Sensory Disabilities								
Yes n = 3,944***	2.54 (2.30 – 2.81)	1.45 (1.25 – 1.69)	2.16 (1.87 – 2.50)	1.33 (1.11 – 1.59)	2.51 (2.02 – 3.13)	1.31 (0.98 – 1.73)	3.87 (3.22 – 4.64)	1.73 (1.34 – 2.24)
No	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Cognitive Disabilities								
Yes n = 8,185***	7.78 (7.23 – 8.37)	1.77 (1.61 – 1.95)	6.48 (5.83 – 7.21)	1.66 (1.48 – 1.86)	8.58 (7.28 – 10.1)	1.58 (1.28 – 1.96)	9.20 (8.00 – 10.6)	1.90 (1.56 – 2.30)
No	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Daily Activities Disabilities								
Yes n = 5,499***	6.05 (5.50 – 6.65)	1.52 (1.34 – 1.73)	5.08 (4.52 – 5.71)	1.50 (1.30 – 1.74)	6.34 (5.36 – 7.50)	1.23 (0.98 – 1.55)	7.44 (6.32 – 8.77)	1.55 (1.26 – 1.91)
No	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference

* Values are weighted percentages with 95% confidence intervals

** Models adjusted for the Social, Medical, and Behavioral Determinants of Health included in the study

*** Disability types are not mutually exclusive - individuals may report more than one type: Total of Disability Types ≠ 13,023

Entries in **bold** are significant at a p value ≤ 0.05

Table 3. Odds Ratios (95% Confidence Intervals) for Correlates of Past-Year Suicidal Behaviors (Ideation, Planning, Attempt) among Non-Pregnant Women of Reproductive Age with Disabilities

Non-Pregnant Women of Reproductive Age with Disabilities (n = 13023)				
	Suicidal Behaviors Yes (n = 6374) Odds Ratios (95% CI)*	Suicidal Ideation Yes (n = 4100) Odds Ratios (95% CI)*	Suicidal Planning Yes (n = 1223) Odds Ratios (95% CI)*	Suicide Attempt Yes (n = 1051) Odds Ratios (95% CI)*
Social Determinants of Health				
Economic: Income - Personal				
< \$20K	1.36 (0.92 – 2.01)	1.37 (0.87 – 2.16)	1.36 (0.74 – 2.48)	1.22 (0.45 – 3.32)
\$20K – < \$50K	1.37 (0.92 – 2.04)	1.33 (0.83 – 2.15)	1.52 (0.83 – 2.78)	1.11 (0.45 – 2.70)
≥ \$50K	Reference	Reference	Reference	Reference
Education				
< High School (HS)	1.09 (0.82 – 1.45)	0.82 (0.59 – 1.14)	1.24 (0.66 – 2.36)	3.12 (1.60 – 6.08)
HS Graduate	1.20 (0.99 – 1.46)	0.93 (0.73 – 1.19)	1.67 (1.00 – 2.80)	2.71 (1.46 – 5.04)
Some College	1.14 (0.93 – 1.39)	1.03 (0.80 – 1.33)	1.32 (0.87 – 2.01)	1.68 (0.99 – 2.88)
College Graduate	Reference	Reference	Reference	Reference
Healthcare Access				
Health Insurance				
Lapse	1.22 (1.00 – 1.50)	1.05 (0.79 – 1.39)	1.42 (1.05 – 1.92)	1.51 (1.06 – 2.15)
No Lapse	Reference	Reference	Reference	Reference
Mental Health				
Perceived Need Unmet	2.29 (1.98 – 2.65)	2.17 (1.84 – 2.56)	2.44 (1.86 – 3.21)	1.47 (1.12 – 1.93)
No Unmet Need	Reference	Reference	Reference	Reference
Social and Community Context				
Age				
18 – 25 years	1.65 (1.43 – 1.92)	1.53 (1.29 – 1.81)	1.25 (0.97 – 1.61)	2.05 (1.52 – 2.77)
26 – 44 years	Reference	Reference	Reference	Reference
Race / Ethnicity				
White, non-Hispanic	Reference	Reference	Reference	Reference
Black, non-Hispanic	0.84 (0.65 – 1.09)	0.83 (0.60 – 1.16)	0.62 (0.40 – 0.96)	1.39 (0.91 – 2.13)
Other, non-Hispanic	0.99 (0.77 – 1.16)	0.86 (0.63 – 1.19)	1.05 (0.64 – 1.73)	1.49 (1.01 – 2.19)
Hispanic	0.94 (0.76 – 1.27)	0.96 (0.75 – 1.24)	0.82 (0.55 – 1.23)	1.07 (0.71 – 1.61)
Household Size				
One	1.35 (0.91 – 1.99)	1.23 (0.77 – 1.95)	1.38 (0.84 – 2.28)	1.68 (1.04 – 2.69)
Two	1.14 (0.92 – 1.40)	1.11 (0.86 – 1.43)	1.15 (0.83 – 1.60)	1.31 (0.88 – 1.96)
Three	1.08 (0.88 – 1.32)	1.10 (0.85 – 1.43)	1.22 (0.88 – 1.68)	0.85 (0.56 – 1.28)
Four	0.93 (0.75 – 1.14)	0.97 (0.77 – 1.24)	0.91 (0.67 – 1.25)	0.97 (0.65 – 1.46)
≥ Five	Reference	Reference	Reference	Reference
Religiosity				
No	Reference	Reference	Reference	Reference
Yes	0.84 (0.72 – 0.97)	0.89 (0.75 – 1.05)	0.83 (0.65 – 1.08)	0.79 (0.59 – 1.05)
Medical Determinants of Health				
Perceived Health Status				
Fair/Poor	1.12 (0.95 – 1.32)	0.93 (0.76 – 1.14)	1.14 (0.83 – 1.55)	1.72 (1.30 – 2.27)
Good	1.12 (0.95 – 1.32)	1.11 (0.92 – 1.33)	0.89 (0.66 – 1.20)	1.33 (0.98 – 1.81)
> Good/Excellent	Reference	Reference	Reference	Reference
Major Depressive Episode				
No	Reference	Reference	Reference	Reference
Yes	3.22 (2.82 – 3.67)	2.84 (2.42 – 3.34)	4.01 (2.77 – 5.81)	2.18 (1.67 – 2.85)
Psychological Distress				
No	Reference	Reference	Reference	Reference
Yes	3.66 (2.98 – 4.49)	3.36 (2.61 – 4.32)	3.15 (2.02 – 4.91)	4.52 (3.13 – 6.54)
Behavioral Determinants of Health				
Tobacco Use				
No	Reference	Reference	Reference	Reference
Yes	1.07 (0.90 – 1.26)	1.06 (0.87 – 1.29)	0.94 (0.69 – 1.30)	1.24 (0.98 – 1.56)
Alcohol Use				
No	Reference	Reference	Reference	Reference
Yes	0.96 (0.80 – 1.16)	0.99 (0.81 – 1.21)	1.03 (0.77 – 1.38)	0.84 (0.60 – 1.17)
Illicit Drug Use				
No	Reference	Reference	Reference	Reference
Yes	1.40 (1.20 – 1.64)	1.41 (1.17 – 1.68)	0.98 (0.75 – 1.27)	1.77 (1.22 – 2.58)

* Values are weighted percentages with 95% confidence intervals
 Entries in **bold** are significant at a p value ≤ 0.05

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BIOGRAPHY

Edward J. Booth graduated from Jim Ned High School, Tuscola, Texas and received a Bachelor of Science in Business Management from the University of Phoenix before earning a Bachelor of Science and Master of Physician Assistant Studies from the University of Nebraska Medical Center, Omaha, Nebraska. He later received his Master of Business Administration and his Master of Health Administration from Baylor University, Waco, Texas.

Edward enlisted in the US Army in 1995, serving as a combat medic before commissioning as a combat arms officer in 2003. He currently serves as a medical officer with multiple overseas and combat tours, and will transition to conducting research for the US Army following his doctoral studies.