



## Review

# Non-pharmacologic interventions to improve depression and anxiety among pregnant and parenting women who use substances: An integrative literature review



Caroline K. Darlington<sup>a,\*</sup>, Peggy A. Compton<sup>a</sup>, Anne M. Teitelman<sup>a</sup>, Karen Alexander<sup>b</sup>

<sup>a</sup> University of Pennsylvania School of Nursing, Address: 418 Curie Blvd, Philadelphia, PA 19104, USA

<sup>b</sup> Friends Research Institute, Baltimore, Maryland, USA

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## ABSTRACT

Pregnant and parenting women who use substances report high rates of comorbid depression and anxiety. Due to the significant impact of this comorbidity on treatment adherence and maternal/child outcomes, effective psychosocial and behavioral interventions to address depression and anxiety in this population are necessary. A directed search of PubMed, PsycINFO, and CINAHL databases produced 22 articles from 20 distinct studies examining non-pharmacologic interventions with an effect on depression and anxiety among pregnant or parenting women using substances. Of the 20 studies reviewed, 8 were randomized controlled trials, 7 were quasi-experimental studies, and 5 were cohort studies. Results revealed a wide array of interventions targeting intrapersonal, interpersonal, and/or structural factors within these women's lives. Parenting therapy and psychosocially enhanced treatment programs had the strongest evidence for positive treatment effect in improving symptoms of depression and anxiety. The use of contingency-management, case-managed care, patient or wellness navigators, mindfulness-based therapy, maternal-child relationship-focused therapy, family therapy, peer support, and therapeutic community-based interventions show promise but warrant further experimental exploration. Comprehensive and gender-specific residential treatment was observationally associated with improvements in depression and anxiety; however, the specific modality of efficacy is unclear. Future research should focus on identifying which modalities are most cost-effective, feasible, and acceptable among this uniquely vulnerable population.

## 1. Introduction

Substance use disorders (SUDs) among pregnant and parenting women in the United States (US) remain a public health concern with significant implications for both maternal and child health. In 2018, 11.6% of pregnant women reported tobacco use, 9.9% reported alcohol use, and 5.4% reported illicit substance use, including opioids (Substance Abuse and Mental Health Services Administration, 2019). The rate of opioid use disorder (OUD), specifically, among women giving birth in hospitals has increased nationwide four-fold in the last two decades (Haight et al., 2018). When compared with other Medicaid recipients, women with SUDs enter prenatal care later in pregnancy and stay longer in the hospital after birth (Clemans-Cope et al., 2019). Fortunately, SUD treatment for pregnant women is associated with significantly decreased maternal morbidity and mortality, including complications at birth (Greenfield et al., 2010; Maeda et al., 2014). Therefore, perinatal SUD treatment, inclusive of both medication and non-

pharmacologic care, can significantly improve maternal-infant health outcomes and is nationally recommended (Reddy et al., 2017).

A gender-specific, trauma-informed approach to SUD treatment is recognized as the standard of care to address unique concerns and maximize the efficacy of treatment for pregnant and parenting women (Substance Abuse and Mental Health Services Administration, 2009; Krans et al., 2018; Metz et al., 2012; Winklbaur et al., 2008). Although women use substances at lower rates than men, they often develop substance dependence and addiction more rapidly than men after initiation and yet do not enter treatment as quickly (Greenfield et al., 2010; McHugh et al., 2018, 2014). Pregnancy is a unique, gender-specific life event for women that can increase motivation to seek substance use treatment (Mitchell et al., 2008), but challenges still exist once treatment is initiated. Pregnant women with SUD report high levels of societal stigmatization regarding substance use, internalized shame, and low self-efficacy (Goodyear et al., 2018). Furthermore, women with SUDs report higher rates of emotional, physical, and sexual abuse, intimate part-

\* Corresponding author.

E-mail address: [ckdarlin@nursing.upenn.edu](mailto:ckdarlin@nursing.upenn.edu) (C.K. Darlington).

ner violence and traumatic childhood experiences compared to men who are also in treatment for SUD (Alexander, 2013; Conway et al., 2006; Meyer et al., 2019).

Women specifically report high rates of depression and anxiety, double that of men, during treatment for SUD (Finlay et al., 2015). Depression and anxiety are the most frequently diagnosed co-morbidities for pregnant women with OUD, with prevalence estimates ranging from 45 to 74% at treatment entry (Benningfield et al., 2012; Peles et al., 2007). In addition, 43% of women in treatment for OUD report symptoms of postpartum depression after delivery (Holbrook and Kaltenbach, 2012). Women with depression and anxiety symptoms are also more likely to engage in poly-substance abuse (Tuten et al., 2018), which significantly increases the environmental risk for fetal and infant neurodevelopment (Reddy et al., 2017) and is associated with lower treatment retention (Tuten et al., 2018). The financial, emotional, and social challenges of parenting in the postpartum period can further complicate treatment access for women and, in the absence of access and support, can lead to poor long-term outcomes for both mother and her child.

Unfortunately, settings that provide SUD treatment are often under-resourced, and the integration of behavioral health interventions to address comorbid mood and anxiety disorders in SUD treatment programs remains inconsistent and participation rates are low (Coleman-Cowger, 2012; Klamon et al., 2017; Krans et al., 2019), even among women with SUD who report desiring access to mental health services (Kuo et al., 2013). Further, despite our knowledge regarding evidence-based treatment for depression and anxiety in the general population of women, our knowledge regarding the optimal treatment modalities to address these mental health disorders among women within the context of SUD treatment is limited (Arnaudo et al., 2017; Winklbaur et al., 2008). Complicating treatment, pregnant women tend to be hesitant to use medication to treat depression and anxiety during pregnancy, and prefer non-pharmacological approaches (Yuvaci et al., 2019). The complex biopsychosocial and environmental interplay between depression, anxiety and SUDs necessitates a more holistic understanding of effective treatments for these disorders, specifically, within the context of perinatal and parental substance use treatment. An integrated understanding of the ways in which interventions incorporated within SUD treatment address depression and anxiety is needed to inform delivery of comprehensive, effective SUD treatment for pregnant and parenting women.

The purpose of this integrative review is to: (1) synthesize the research related to non-pharmacologic interventions delivered to pregnant and parenting women with SUD that affect depression and anxiety and (2) identify gaps in the current literature.

## 2. Material and methods

### 2.1. Search strategy

With the guidance of a biomedical librarian, in April 2020, a methodical search of PubMed, PsycINFO, and CINAHL databases was conducted. Key search terms were chosen to restrict studies to: (1) the female population; (2) depressive or anxiety disorders, (3) substance use; and (4) interventions. An initial Boolean search was conducted using OR to connect terms within the same category and AND to connect the four categories of search terms, as listed in Appendix A. References of reviewed articles were also manually searched to identify any other relevant sources. Although many of the higher quality studies utilized the same outcome measure for depression (i.e. the Beck Depression Inventory), the disparate reporting of data and variables (i.e. types of substances used, racial/ethnic representation, types of substance use treatment, etc.) across studies were too heterogeneous to avoid bias in the interpretation of meta-analysis data. Therefore, the authors chose a narrative approach instead of meta-analysis to synthesize the findings from the selected articles.

### 2.2. Inclusion and exclusion criteria

The inclusion criteria were as follows: peer-reviewed research studies published within the past 20 years (2000–2020) in English which evaluated interventions with a hypothesized impact on anxiety and depression among pregnant and/or parenting women with SUDs. We defined “intervention” as a non-pharmacologic or behavioral treatment in which depressive or anxiety disorder outcomes were either the primary, secondary, or dual focus of the intervention. Full text articles were excluded if the described study did not meet all the following inclusion criteria: (1) sample population among pregnant or parenting women with SUD; (2) experimental design, quasi-experimental design, or non-experimental design with pre-post or longitudinal repeat measures for intervention evaluation; (3) evaluated a non-pharmacologic or behavioral intervention; (4) included depression and/or anxiety as an outcome variable of the study. Non-peer reviewed sources, literature reviews, commentaries, editorials, dissertations, and other grey literature were excluded.

### 2.3. Study selection and data extraction

We used a revised version of the PRISMA 2009 Flow Diagram (Moher et al., 2009) to document our process of methodical article review and inclusion (see Fig. 1). After duplicates were removed, sources were initially excluded based on title and abstract if they were not peer-reviewed research studies, were not written in English, or did not address both anxiety or depression and SUDs. Articles which could not be clearly excluded based on title or abstract alone were reviewed in full text by one author (CD). After this process, 62 remaining full text articles were independently reviewed by two authors (CD and KA) to establish inclusion; any disagreement between the two authors was adjudicated by a third author (PC).

### 2.4. Data analysis and synthesis

Study data were organized in a table of evidence grouped by study design (i.e., randomized controlled trial, quasi-experimental, or cohort design) and with pertinent information according to the following categories: study/authors, sample, type of SUD treatment, depression or anxiety disorder measures, study design, intervention description, key findings, and quality score (See Table 1). Data analysis and synthesis approaches were consistent with the Whittemore and Knafel (2005) method for reviews of the literature. In this analysis, randomized controlled trials (RCTs) were considered as stronger evidence in terms of the effect of the interventions on depression and anxiety disorders. Quasi-experimental and non-experimental studies were used to determine relationships between interventions and depression and anxiety disorders but not to draw conclusions based on efficacy. Finally, research has demonstrated that change in depression, anxiety and substance use requires change in multiple facets of the environment and the individual. Therefore, data synthesis occurred through contextualizing the reviewed interventions for depression and anxiety among women with SUD within a socioecological framework (Barnea et al., 1992; Meyer et al., 2019; Teichman and Teichman, 1990).

### 2.5. Quality appraisal

Study quality was assessed with the use of the critical appraisal tools from the Joanna Briggs Institute (Joanna Briggs Institute [JBI], 2017). To critique the experimental studies, the JBI Critical Appraisal Checklist for RCTs was used. The tool consists of 13 items regarding methodology, baseline characteristics, outcome measures, and the validity and reliability of the statistical analysis, with possible scores ranging from 0 to 13. To critique the quasi-experimental studies (QED), the JBI Critical Appraisal Checklist for Quasi-experimental studies was used. This tool

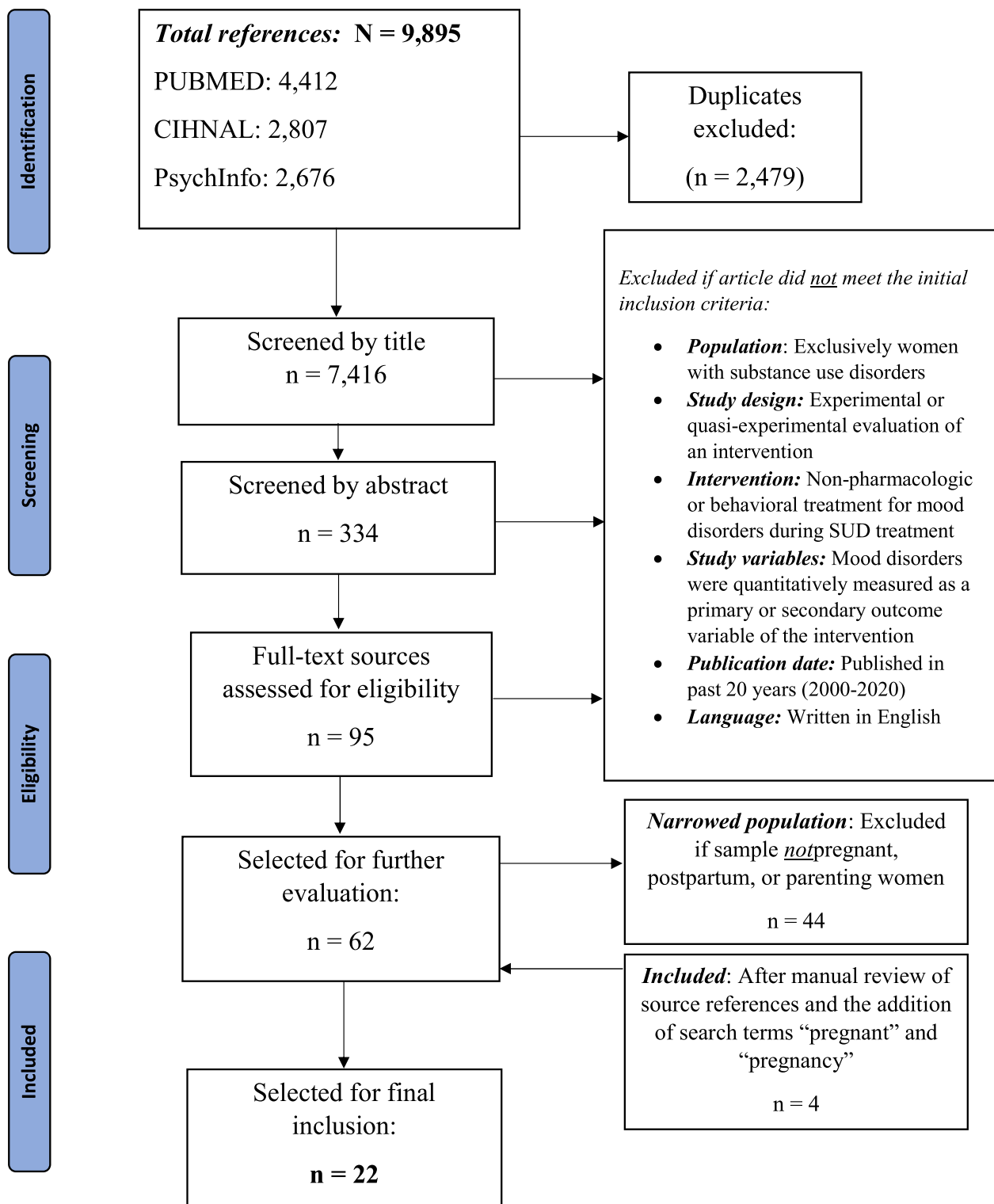


Fig. 1. PRISMA diagram of systematic article review and inclusion.

consists of nine items regarding sample selection, comparisons, measurement, and the validity and reliability of the statistical analyses, with possible scores ranging from 0 to 9. Finally, for observational studies, the JBI Critical Appraisal Checklist for Cohort studies was utilized, which ranges from 0 to 11. Items on this tool evaluated recruitment, exposures, confounding factors, outcomes, retention, and statistical analysis. The

total quality score of each study is additive of all affirmative answers to the corresponding scale items; negative answers or lack of clarity in the study about an item were scored with zero. We reported the quality scores for each article in Table 1. Two authors (CD, KA) completed quality scoring of each study, with a third author (PC) adjudicating any discrepancies.

Table 1

Authors (Year)	Sample (N = total)	SUD treatment type	Mood variables (measures)	Intervention category	Intervention description	Key findings for mood disorders	Quality Score (JBI)
<b>Randomized Controlled Trial Study Design</b>							
Cinciripini et al. (2010)	Pregnant women (N = 257) I: (n = 128) C: (n = 129)	Smoking cessation	Depression (CES-D)	Intrapersonal: Psychotherapy (CBT)	10-week intensive depression-focused intervention (CBASP) <i>Control:</i> Health and wellness (HW) program	Women with higher levels of baseline depression treated with CBASP showed greater improvement in depression scores than those treated with HW. However, among women with low baseline depression, there was no significant difference between treatment groups.	10/13
Daley et al. (2018); Ussher et al. (2015)	Pregnant women (N = 784) I: (n = 393) C: (n = 391)	Smoking cessation	Postpartum depression (EPDS)	Intrapersonal: Mind/body	London Exercise And Pregnant smokers (LEAP) trial: Adding 14 sessions of treadmill exercise and physical activity consultations to six weekly sessions of smoking cessation <i>Control:</i> Weekly smoking cessation sessions	Postpartum depression scores were significantly higher in the physical activity group versus usual care at end-of-pregnancy. No significant difference in scores was noted at six-months postpartum.	10/13
Lopez et al. (2015)*	Pregnant women (N = 289) I: (n = 167) C: (n = 122)	Smoking cessation	Depression (BDI)	Structural: Contingency management	Vouchers for retail items contingent on abstaining from smoking <i>Control:</i> Vouchers of comparable value received independent of smoking status	Scores for depression-prone women decreased significantly in the intervention and the proportion of women scoring in the clinically significant depression range decreased significantly compared with the control treatment. Smoking abstinence among the women in the intervention increased independent of depression status.	8/13
Luthar et al. (2000)	Parenting women (N = 61) I: (n = 37) C: (n = 24)	MAT for OUD (Methadone)	Depression (BDI)	Intrapersonal: Psychotherapy AND Interpersonal: Maternal/child	Relational Psychotherapy Mothers' Group (RPMG): 24 weekly group sessions fostering supportive parenting <i>Control:</i> Standard counseling through methadone program	Post-treatment, depression scores for RPMG mothers were lower than those of mothers receiving standard counseling. A modest difference persisted, though not significantly, at 6-month follow up.	11/13
Luthar et al. (2007)	Parenting women (N = 127) I: (n = 60) C: (n = 67)	MAT for OUD (Methadone)	Depression (BDI)	Intrapersonal: Psychotherapy AND Interpersonal: Maternal/child	RPMG: 24 weekly group sessions fostering supportive parenting <i>Control:</i> Addiction-focused recovery training (RT) with weekly counseling groups and meetings with case managers	Maternal depression scores decreased more rapidly among women in RPMG than those in RT. However, there was no difference in depression scores between groups upon 6-month follow-up after the program.	11/13
Murnan, Wu, & Slesnick (2018)	Parenting women (N = 68)	No SUD treatment Alcohol (77.9%) Opioids (58.8%) Marijuana (55.8%) Cocaine (47.1%)	Depression (BDI-II)	Intrapersonal: Psychotherapy (CBT) AND Interpersonal: Maternal/Child	Ecology-based family therapy (EBFT) at home versus in office <i>Control:</i> Psychoeducation (WHE)	Women participating in EBFT showed a significant reduction in depression scores over time; and women receiving home-based EBFT showed a greater decrease in depressive symptoms post-treatment than those receiving WHE. No significant differences were found between post-treatment scores for women in EBFT in the office versus WHE.	8/13
Suchman et al. (2010) Suchman et al. (2011)	Parenting women (N = 47) I: (n = 23) C: (n = 24)	Outpatient SUD treatment for women using: Unspecified drug types	Depression (BDI)	Intrapersonal: Psychotherapy AND Interpersonal: Maternal/Child	The Mothers and Toddlers Program (MTP): 12-week attachment-based individual parenting therapy. <i>Control:</i> Parenting education	After treatment, mothers in the MTP reported fewer symptoms of depression and psychiatric distress compared to mothers in the control. At 6-week follow-up, these differences in depression were not sustained, and mothers in the control reported lower levels of psychiatric distress than mothers in the MTP.	11/13

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Table 1 (continued)

Authors (Year)	Sample (N = total)	SUD treatment type	Mood variables (measures)	Intervention category	Intervention description	Key findings for mood disorders	Quality Score (JBI)
Zvorsky et al. (2018)*	Pregnant women (N = 253) I: (n = 143) C: (n = 110)	Smoking cessation	Depression/Anxiety (BSI subscales)	Structural: Contingency management	Vouchers for retail items contingent on abstaining from smoking <i>Control:</i> Vouchers of comparable value received independent of smoking status	Depression (+) women in the intervention had similar depression scores to depression (-) women at 8 and 12 weeks postpartum, while scores for depression (+) women in the control remained significantly elevated. Treatment effects were discernible by late pregnancy, peaked at 8 weeks postpartum, and dissipated by 24 weeks postpartum.	8/13
<b>Quasi-experimental Study Design</b>							
Alexander, Kronk, Sekula, Short, & Abatamarco (2019)	Pregnant or parenting women (N = 73) I: (n = 65) C: (n = 8)	MAT for OUD (Methadone)	Depression (BDI-II)	Intrapersonal: Mind/body	12-week mindfulness-based program in addition to comprehensive OUD treatment <i>Control:</i> Standard comprehensive OUD treatment alone	There was a significant decrease in total depression scores for the intervention group and a non-significant increase in depression scores for the control group. Those with low/mild depression scores in intervention experienced less of a difference in depression scores than those with mod/severe depression scores.	8/9
Cochran et al. (2018)	Pregnant women (N = 21) with OUD recently initiating buprenorphine treatment	MAT for OUD (Buprenorphine)	Depression/ Anxiety (PHQ)	Structural: Individual	Patient navigation (PN) intervention delivered as 10 sessions prior to delivery and 4 sessions postpartum	After adjusting for number of treatment sessions attended and early discharge status, depression improved significantly over time.	8/9
Espinet et al. (2016)	Parenting women (N = 90) I: (n = 65) C: (n = 25)	SUD treatment for women using: Alcohol Crack/cocaine Cannabis Opiates Amphetamine	Depression (CES-D) Anxiety (BAI)	Interpersonal: Maternal/Child	Relationship-focused intervention (RFI) for maternal substance use focused on maternal-child interactions <i>Control:</i> Standard integrated treatment (SIT)	There was a significant association between treatment type and shift from clinical to nonclinical anxiety and depression. A higher % of women receiving RFI than women receiving SIT shifted from clinical to nonclinical levels of depression and anxiety after 1 year.	9/9
Fallin-Bennett et al. (2019)	Pregnant women (N = 50; n = 42 with OUD)	Smoking cessation for women primarily using opiates and receiving comprehensive OUD treatment at an OB/GYN center	Postpartum depression (EPDS)	Structural: Individual	Perinatal Wellness Navigator (PWN) program that provides (a) one-on-one tobacco treatment, (b) comprehensive assessment of cessation barriers, and (c) linkage to clinical/social services	Postpartum depression scores decreased significantly from baseline to post-intervention. Perceived stress scores were also significantly reduced.	6/9
Sacks et al. (2004)	Parenting women (N = 148) I: n = 77 C: n = 71	SUD treatment for women using unspecified drug types	Depression (BDI-II; SCL 90-R depression scale)	Structural: System	Therapeutic communities addressing homelessness among mothers by including parenting education, childcare, and assistance with employment and housing. <i>Control:</i> Standard therapeutic communities	Propensity analysis used to adjust for non-equivalence between treatment and control groups. Women reported moderate levels of depression and psychological symptoms at baseline; at 12 months, the decreases in depression scores for the treatment group were significantly greater than those in the control.	8/9
Slesnick & Erdem (2012)	Parenting women (N = 15)	No enrollment in SUD treatment specified: women using alcohol & other unspecified drugs	Depression (BDI-II)	Structural: System	Program that provided 1) housing; included 3 months of rental and utility assistance, 2) 6 months of case management services; and 3) substance abuse counseling/treatment	Mental health functioning significantly improved over time, from baseline to 3 months to 6 months. Reductions in depression did not reach statistical significance, though effect size was moderate and power was high.	8/9

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Table 1 (continued)

Authors (Year)	Sample (N = total)	SUD treatment type	Mood variables (measures)	Intervention category	Intervention description	Key findings for mood disorders	Quality Score (JBI)
<a href="#">Stahler et al. (2005)</a>	Parenting women (N = 111) I: (n = 47) C: (n = 64)	Residential SUD treatment for women using: Primarily cocaine	Depression (BDI)	Interpersonal: Peer	Bridges to the Community (BTC), a supplemental component to an intensive residential treatment program pairing woman with “peers” <i>Control:</i> Standard treatment	All women reported decreases in depression and increases in self-esteem over the course of treatment. Women in the BTC group showed significantly greater decreases in depression than women in the control group.	9/9
<b>Cohort Study Design</b>							
<a href="#">Brown et al. (2002)</a>	Parenting women (N = 362)	Residential SUD treatment for women using: Heroin Amphetamines Cocaine Alcohol Marijuana	Depression (CES-D) Risk for chronic depression (BPI-Depression item)	Structural: System	Gender-specific long-term residential treatment program (PROTOTYPES)	Women showed decreased psychological distress and depression as they progressed through the program. Twelve months after intake, CES-D scores reached below clinical cut-off for depression. Heroin use was significantly associated with depression.	9/11
<a href="#">Conners et al. (2006)</a>	Pregnant/ parenting women (N = 305)	Residential SUD treatment for women using: Methamphetamines (36.1%); cocaine (36.1%); alcohol, marijuana, or other drugs (27.8%).	Depression (BDI-II)	Structural: System	Arkansas CARES: A comprehensive, residential substance abuse treatment program for low-income pregnant and parenting women and their children	Depressive symptoms decreased significantly from intake to follow-up after treatment. Shorter treatment stay was associated with higher depressive symptoms after discharge. The number of women who scored at risk for depression decreased significantly from intake to follow-up, and logistic regression results suggested that greater length of stay was associated with reduced likelihood of having an elevated risk for depression.	9/11
<a href="#">Kern et al. (2004)</a>	Parenting women (N = 120)	SUD treatment for women using: Alcohol Tobacco Cocaine/crack Heroin/opiates Inhalants Marijuana Amphetamines Barbiturates Prescription drugs	Depression (BDI-II)	Intrapersonal: Psychotherapy AND Interpersonal: Maternal/child	New Connections: A parental education and support program for substance-involved families	Pre-post intervention depression scores significantly decreased. Reduction in several domains of parenting stress was associated with the significant reduction in depressive symptoms from pre- and post- intervention scores.	8/11
<a href="#">McComish et al. (2003)</a>	Parenting women (N = 39)	Abstinence-based residential SUD treatment for women using unspecified drugs. Most (85%) used crack cocaine	Depression (CES-D)	Structural: System	Interdisciplinary “family-focused” residential treatment program involving both women and their families	Women showed improvement over time on overall mood, self-esteem, and depression. But scores still indicated significant depression.	9/11
<a href="#">Niccols &amp; Sword (2005)</a>	Parenting women (N = 13)	SUD treatment for women using: Nicotine, alcohol, cannabis, tranquilizers, heroin, amphetamines, hallucinogens, cocaine, crack cocaine, barbiturates, inhalants, over-the-counter drugs, anti-depressants, other drugs	Depression (BDI)	Structural: System	“New Choices”: A program that provides multiple services in a supportive environment for women with SUD and their young children	Women reported moderate improvement in depressive symptoms after 3 months and large improvements after 6 months, which indicated a gradual shift from clinical levels of depression to non-clinical levels. While results were non-significant, the sample size was very small and the effect size for the change in depression scores between 1 and 6 months was large.	8/11

I Intervention, C Control, CBT Cognitive Behavioral Therapy, MAT Medication Assisted Treatment, OUD Opioid use disorder, RCT Randomized controlled trial, SUD Substance use disorder.

BDI Beck Depression Inventory, BDI-II Beck Depression Inventory-II, BPI Basic Personality Inventory, BSI Brief Symptom Inventory, CES-D Center for Epidemiologic Studies Depression Scale, EPDS Edinburgh Postnatal Depression Scale, SCL90-R Symptom Check List 90-Revised.

\*Both [Lopez et al. \(2015\)](#) and [Zvorsky et al. \(2018\)](#) used data from the same clinical trials regarding financial incentives for abstinence from cigarette smoking among pregnant women. However, they examined different sample sizes and outcome measures. Therefore, the results were presented separately in this table.

### 3. Results

#### 3.1. Search results and study characteristics

After all articles were reviewed and exclusion criteria applied, 22 articles reporting data from 20 studies met inclusion criteria and were critically appraised (see Table 1). The methodological quality for the studies ranged from 8 to 11 (out of 13) for eight RCT studies, from 6 to 9 (out of 9) for seven quasi-experimental studies, and 8 to 9 (out of 11) for five cohort studies. No studies were excluded based on quality appraisal assessment, although only two studies received perfect scores on all the items in their respective JBI appraisal tools.

The interventions in all studies targeted change in depression and/or anxiety of participants through interventions addressing the (1) intrapersonal, (2) interpersonal, and/or (3) structural spheres of the women's lives. Although we organize our results in the body of this manuscript by the sphere of intervention impact, studies in the table are grouped by study design because this categorization (unlike intervention sphere of impact) was mutually exclusive and allowed for a more useful and equivalent comparison of the studies when presenting details in table format. All 22 studies measured depression as a primary or secondary outcome measure, while several studies also included measurements for anxiety. The primary scales used to measure depression were the Beck Depression Inventory (BDI) or Beck Depression Inventory-II (BDI-II) ( $n = 12$  studies) and, less commonly, the Center for Epidemiologic Studies Depression Scale (CES-D) ( $n = 4$ ). Two assessed postpartum depression and, therefore, used the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987). A diagnosis of depression or an anxiety disorder was not a requirement for enrollment in any study, although high baseline rates of depression or anxiety were reported in most studies. All studies included pregnant or parenting women using substances or diagnosed with an SUD, but not all studies enrolled women who were active in SUD treatment.

Among studies that recruited women who were currently enrolled in SUD treatment, not all studies delineated the type of substance treatment or its modality (i.e. detoxification, psychosocial-only, medication-based, etc.). Of the studies among populations of women using a variety of substances, alcohol was the most frequently reported substance. In terms of types of SUD treatment, four studies examined interventions among women enrolled in treatment with medication for OUD (i.e. buprenorphine or methadone maintenance); one among women with primary cocaine use disorder; and four among pregnant smokers, although one of these studies recruited among a population of smokers with high rates of concurrent OUD.

#### 3.2. Intrapersonal interventions

Intrapersonal interventions involved counseling, psychoeducation, mind-body approaches, and contingency management that directly targeted and utilized the women's internal strengths or personal factors to effect positive change on depression and anxiety.

##### 3.2.1. Mind-body

Two studies examined interventions which targeted depression through mind-body, or complementary, therapies that utilized the connections between the woman's physical and mental processes to relieve symptoms of depression. In a quasi-experimental study, Alexander and colleagues (2019) examined the effect of a 12-week mindfulness-based program on depression symptoms in addition to standard group therapy for pregnant and parenting women enrolled in medication-based OUD treatment. The intervention incorporated guided stretching, yoga, relaxation exercises and meditations, which were performed in a group setting with instructions and content on an iPod Nano for women to continue exercises at home. Total depression scores significantly decreased ( $p = .003$ ) for the intervention group from pre- to post-intervention, compared to a nonsignificant increase in scores for the control group

( $p = .467$ ). Women entering the intervention with low to mild depression experienced less of a decrease in depression scores than women entering the intervention with moderate to severe depression ( $p < .05$ ). The London Exercise And Pregnant smokers (LEAP) RCT was designed to primarily reduce smoking among pregnant women and secondarily impact postpartum depression (Daley et al., 2018; Ussher et al., 2015). Despite the hypothesis that the physical activity intervention would decrease postpartum depression, women who were randomized to the intervention reported significantly higher mean depression scores (95% CI [0.08, 1.83];  $p = .033$ ) at the end of pregnancy; the difference in mean scores between groups became non-significant at 6 months postpartum (95% CI [-0.59, 1.33];  $p = .450$ ). When the EPDS scores were analyzed as dichotomous scales (using EPDS score  $< 13$  as threshold for low/high risk for depression), none of the scores were significantly different at end of pregnancy (OR = 1.11, CI [0.47, 2.65];  $p = .808$ ) or at 6 months (OR = 1.07, CI [0.36, 3.17];  $p = .904$ ).

##### 3.2.2. Psychotherapy

Psychotherapy is a widely-used therapeutic treatment for depression and anxiety (Picardi and Gaetano, 2014). Two studies used psychotherapy to reduce relational stress and, thereby, decrease depression. Cinciripini and colleagues (Cinciripini et al., 2010) implemented a 10-week depression-focused psychotherapy to promote smoking abstinence among pregnant women who smoke by reducing stress and increasing interpersonal relationship quality in their daily lives. When compared with a health education control which delivered stress reduction education through an instructional rather than depression-focused format, there was no significant difference between the intervention and control among women with low to moderate depression scores. However, women in the intervention with the highest depression scores at baseline exhibited sustained and significant decreases in depression scores when compared to those in the control group ( $F(1,2620)=10.49, p = .001$ ).

The NEW CONNECTIONS program, developed by Kern and colleagues (Kern et al., 2004), implemented relational psychoeducation in a 12-week program aimed at decreasing parenting stress and, in turn, depression by teaching parenting skills to women with SUD. Although this intervention had no control group, they excluded women who either started or discontinued antidepressant medication during the intervention period to control for the potentially confounding pharmacologic effect. Comparison of pre- and post-intervention depression scores revealed a significant decrease (averaging 5.18 points) on the BDI-II scale ( $t(114) = 5.87, p < .0001$ ).

##### 3.2.3. Contingency management

Contingency management, or the use of external motivators to elicit behavioral change, was used in one RCT which provided vouchers for baby care products to pregnant women who smoked (Lopez et al., 2015; Zvorsky et al., 2018). Women randomized to the intervention received abstinence-contingent vouchers whereas women in the control group received vouchers not contingent upon smoking status. The proportion of women with clinically significant mild (BDI scores  $\geq 17$ ) or moderate (BDI scores  $\geq 21$ ) depression improved significantly in the intervention compared to the control treatment ( $p \leq 0.05$ ). Further, there was a significant three-way interaction of treatment, depression status, and time ( $F(6,1233) = 2.36, p < .05$ ), such that depression-prone women (BDI score  $\geq 17$ ) in the intervention had similar depression scores to depression-negative women at 8 and 12 weeks postpartum, while scores for depression-prone women in the control group remained significantly elevated. Treatment effects were discernible by late pregnancy, peaked at 8 weeks postpartum, and dissipated by 24 weeks postpartum. Notably, the intervention's positive impact on smoking abstinence was independent of depression status. Despite the strength in study design, lack of clarity regarding methods accounting for any participants lost to follow-up and the narrow focus on smoking warrants further investigation before broadly interpreting these results.

### 3.3. Interpersonal interventions

Interpersonal interventions involve relationships between the woman and other individuals (i.e., family and friends) within her social environment. The interventions examined in several studies therapeutically used the relational aspects of the women's social and familial circles to reduce depression and anxiety.

#### 3.3.1. Maternal-child relationships

The aforementioned NEW CONNECTIONS program (Kern et al., 2004) also used interpersonal relationships between the mother and her child to enhance the parental psychoeducation. It employed role-modeling, recovery support groups, parenting feedback through interactive labs, infant massage, and parent-child "playgroups." While this intervention was designed primarily to reduce parental stress rather than depression, four of the study's parenting stress outcome measures, which were significantly decreased over the course of the program, had a strong positive association with decreases in depression. However, NEW CONNECTIONS did not control for the confounding impact of the intrapersonal counseling component within their intervention.

Breaking the Cycle (BTC) is a relationship-focused intervention for women using multiple substances, and a quasi-experimental study did control for the standard intrapersonal counseling component when evaluating the impact of this relationship-focused counseling intervention on depression (Espinete et al., 2016). Both women in the control and relational-focused intervention groups received integrated addiction treatment and parenting education, but those in BTC received additional playgroups, parent-infant activities, and parent-infant therapist sessions focused on promoting healthy maternal-child interactions. Over half of the women with clinical levels of depression and anxiety on initial enrollment in BTC experienced a shift from clinical to nonclinical range on both anxiety and depression scores; notably, only one quarter of women with clinical levels of anxiety in the control group experienced this improvement in anxiety scores, and none with clinical levels of depression experienced improvement in depression scores. The differences in this shift between treatment groups was significant for both anxiety ( $\chi^2(1, 45) = 3.78, p < .05$ ) and depression ( $\chi^2(1, 45) = 11.21, p < .01$ ).

Another study also explored the therapeutic potential of the maternal-child relationship and included intrapersonal (i.e. psychotherapy) and structural (i.e. case management) components (Murnan et al., 2018). The core component of Ecology-based Family Therapy (EBFT) for parenting women in the sex trade seeking SUD treatment was the relationship between mother-child dyads through 12-week therapy sessions that included both the woman and her child. The women in this study were randomized into three groups: a psychoeducation control, home-based EBFT, and office-based EBFT. Although women in both office- and home-based EBFT showed significant post-treatment decreases in depression scores over time ( $b = -0.99, SE = 0.41, t = -2.41, p = .02$ ), only women in the home-based EBFT showed significantly lower depression scores ( $b = -7.97, SE = 3.60, t = -2.21, p < .03$ ) than women in the psychoeducational control. While no racial analysis was done comparing treatment response, it is interesting to note that African American women reported more depressive symptoms than White women in this study.

Also including the intrapersonal component (i.e. psychotherapy), Luthar and colleagues designed an RCT piloting a supportive 24-week parenting group intervention for substance abusing women enrolled in a methadone-maintenance program (Luthar and Suchman, 2000; Luthar et al., 2007). Women randomized to the Relational Psychotherapy Mothers' Group (RPMG) in addition to standard methadone-maintenance counseling showed lower levels of depressive symptoms ( $d = 0.36$ ) after treatment than women receiving standard counseling (Luthar and Suchman, 2000). While not significant, a modest difference in depression ( $d = 0.28$ ) between RPMG mothers and standard-treatment mothers persisted at 6-month follow-up. In a larger trial of this program, RPMG mothers showed more rapid decreases in depression scores than

mothers receiving alternative addiction-focused recovery training (RT); however, there was no difference in depression scores between groups upon 6-month follow-up after the program (Luthar et al., 2007).

Another RCT examining an attachment-based intervention utilizing maternal-child relationship within intrapersonal psychotherapy, the 12-session Mothers and Toddlers Program (MTP), was developed primarily to improve reflective parenting skills among women in outpatient SUD treatment and secondarily targeted depression and SUD (Suchman et al., 2010; Suchman et al., 2011). Although baseline levels of depression and psychiatric distress were moderate among all mothers, mothers in the MTP reported fewer symptoms of depression ( $d > 0.20$ ) and psychiatric distress ( $d > 0.20$ ) immediately post-treatment than mothers in the parenting education control. However, at 6-week follow-up, the effect on depression was not sustained, and mothers in the control group showed lower levels of psychiatric distress than mothers in the MTP.

#### 3.3.2. Peer relationships

The therapeutic potential of women's relationships with peers from their own communities was utilized by the Bridges to the Community program, which helped African American mothers with cocaine dependence transition back to their communities after completing an intensive residential treatment program (Stahler et al., 2005). Each woman was paired with a community anchor person (CAP), primarily chosen from faith communities and churches, who maintained close daily contact with the women while in treatment and for the 12 months following treatment. In addition to participating in weekly spiritual and cultural activities with the women while in treatment, the CAPs assisted women in integrating back into their community upon graduation from the program by continuing close contact and connecting them to other women within African American church communities. While all women showed decreases in depression (effect size = 0.18;  $p = .001$ ) and increases in self-esteem (effect size = 0.11;  $p = .011$ ) throughout treatment, those who participated in the BTC program exhibited significantly greater decreases in depression (effect size = 0.10;  $p = .018$ ) than women in standard treatment only.

### 3.4. Structural interventions

Structural interventions included those which assisted women to navigate life stressors and treatment choices through case management on the individual (i.e., patient care navigators) or systems (i.e., integrated coordinated care systems) level.

#### 3.4.1. Individual

Two studies examined the effect of individual case management, or patient care navigators, to personally connect with and coordinate care for the women. Both studies specifically focused on women in treatment for OUD (Cochran et al., 2018; Fallin-Bennett et al., 2019). Fallin-Bennett et al. (2019) established perinatal wellness navigators (PWN) for high-risk perinatal women with tobacco use, 84% of whom were in concurrent treatment for OUD. The PWN provided smoking cessation curriculum to the woman, coordinated referrals to treatment for smoking cessation, resources to address barriers to smoking cessation (i.e. housing, unemployment, domestic violence, etc.), and followed up via phone for continued support and resource referral. Postpartum depression scores of the women at baseline were significantly reduced over the course of treatment from clinically significant ( $>12$ ) to non-clinical ( $<10$ ) (EPDS score: 12.04 to 9.47;  $p = .03$ ); perceived stress scores decreased significantly as well ( $p = .03$ ). However, as there was no comparison group, this study did not control for the confounding impact of OUD treatment concurrently received by a high percentage of women enrolled in the study.

Also lacking a control comparison, the study by Cochran et al. (2018) evaluated a broader but more intensive patient navigation service, OPTI-Mom program, for pregnant women with OUD who had recently ( $<2$  weeks) initiated buprenorphine services. These women re-



ceived 10 one-on-one sessions with a navigator prior to delivery and 4 sessions postpartum, which all focused on education and linkage to support resources for long-term treatment success. While women exhibited significant improvements in depression (but not anxiety) over time (OR = 7.70, 95% CI = 2.4–25.1), the interpretability of these results is limited due to the lack of control for confounding variables, small sample size ( $n = 21$ ), and the exclusion of women diagnosed with major depressive disorder.

### 3.4.2. Systemic

Care coordination through integrated service models or coordinated care delivery was another intervention strategy used to address the environmental stressors, such as lack of childcare and housing, which are associated with depression and anxiety among pregnant and parenting women with SUD.

Three comprehensive SUD treatment programs (PROTOTYPE, “New Choices,” and Arkansas CARES) for pregnant and parenting women were designed to provide gender-specific services within a single setting that addressed multiple aspects of the women’s lives, including general medical care for woman and her children, trauma-informed counseling services, parenting education, support groups, tailored health education, vocational support, etc. While women enrolled in the PROTOTYPE program reported high levels of psychological distress upon program entry, symptoms of depression decreased significantly from the 6-week assessment to 42 weeks ( $t = 2.48, p < .02$ ), with the mean dropping below clinical levels of depression (Brown et al., 2002). Furthermore, at discharge, women reported significantly decreased scores on outcome measures for long-term risk for depression.

Similar to PROTOTYPE, mean depression scores for the women enrolled in the “New Choices” program improved progressively from 1 month to 3 months to 6 months in treatment, shifting from clinical levels to non-clinical levels of depression (Niccols and Sword, 2005). This difference, however, was non-significant although the effect size for this decrease over time between 1 month to 6 months was large ( $d = 0.7$ ). In the program Arkansas CARES, 84.3% of women reported at least minimal risk for depression (BDI II score  $> 13$ ) upon intake, and this percentage decreased significantly to 35.7% upon final follow-up visit ( $p < .001$ ) (Connors et al., 2006). In this study, shorter length of stay was associated with higher depressive symptoms at discharge ( $F(1154) = 4.11, p = .04$ ), and longer length of stay in treatment was associated with reduced risk for depression (Wald  $t(1) = 5.1, p = .02$ ).

Expanding upon the traditional gender-specific treatment that accommodates a woman’s maternal responsibilities in the program, one study examined the impact of “family-based” treatment focused on the substance-involved mother, child, as well as any other family members as a holistic emphasis in treatment and the recovery process (McComish et al., 2003). This program involved individual and group therapy session with an interdisciplinary team of mental health, substance abuse, and child development specialists. While women showed improvements over time on overall mood ( $p = .027$ ), self-esteem ( $p = .001$ ), and depression ( $p = .009$ ), their scores after the program still indicated significant depression (CES-D scores  $> 16$ ) and low self-esteem. Despite the program’s emphasis on involving the entire family, the primary measures focused on the women and their children only because of the limited number of women with involved partners or supportive family members who could actively participate in treatment. This factor and the observational design of the study limits conclusions that can be made about the program’s effectiveness, especially in comparison to traditional gender-specific treatment.

Two quasi-experimental structural interventions were tailored to homeless mothers with SUD. One of these interventions (Slesnick and Erdem, 2012) assisted homeless, parenting women with SUD by providing services which addressed housing (including 3 months of rental and utility assistance); case management (referrals for psychiatric evaluation, assistance with welfare benefits, transportation to job interviews); and psychotherapy (weekly SUD and mental health-focused counseling ses-

sions). Mental health functioning significantly improved ( $p = .002$ ) but reductions in depression scores were not statistically significant ( $p = .08$ ) despite a moderate effect size ( $d = 0.59$ ) and high power (0.82). Building upon the therapeutic community model to address homelessness among mothers with addiction, another study compared standard therapeutic community treatment (i.e. residential integrated, group-based treatment) to the same treatment with the addition of parenting education, child care, employment training, and housing stabilization (Sacks et al., 2004). While non-randomized, this study used propensity analysis to adjust for non-equivalence between groups and control for treatment selection bias. Those in the intervention group showed greater reductions than those in the control group on depression ( $p < .05$ ) and other psychological measures over 12 months.

## 4. Discussion

The findings from our analysis reveal a promising understanding of the impact that non-pharmacologic interventions can have on depression and anxiety among pregnant and parenting women with SUD. To the best of our knowledge, this is the first review to characterize non-pharmacologic interventions with an effect on depression and anxiety in this population. Each intervention used at least one of the intrapersonal, interpersonal, or structural aspects within these women’s lives to effect change in emotions, cognitions, or behaviors and, thereby, improve depression and anxiety. As detailed in Table 1, the quality of the studies reviewed was generally fair to good, with the average overall score meeting 79% of relevant grading criteria. RCTs averaged the lowest scores (74%) and quasi-experimental studies averaged the highest (89%).

Mind-body modalities, contingency management, and psychotherapy were all intrapersonal therapies used to internally effect positive change in mood. As previously found in literature, mind-body methods (i.e. yoga, acupuncture, etc.) hold less substantive evidence of efficacy for depression than directed psychotherapeutic measures (i.e. CBT, motivational interviewing) among pregnant women in the general population (Dimidjian and Goodman, 2009). In our review, mindfulness-based meditation was associated with decreases in depression among mothers with OUD; but physical exercise in the LEAP trial was associated with marginally higher depression scores among pregnant smokers, contrary to hypothesis. In evaluating the depression outcomes of the LEAP trial, the strong physiologic link through endogenous neuromodulation pathways between nicotine withdrawal and depression was not considered (Busto et al., 2009), nor was the well-documented association between physical exercise and depression (Chen et al., 2016). Given that the primary purpose of the intervention was smoking cessation, the exacerbating physiologic effects of nicotine withdrawal on depression and the burden placed upon the women in the activity intervention to make changes in both smoking cessation and physical activity level could have outweighed any potential positive effect of physical activity on depression. Further research is needed on the relationship between physical activity and depression among pregnant smokers as well as among women in treatment for other substances to evaluate the risks and benefits of adding physical exercise as an adjunctive therapy for depression and anxiety disorders.

Contingency management, which linked financial incentives to internal behavior change, was another intrapersonal intervention found to impact depression in one smoking cessation intervention among pregnant women (Lopez et al., 2015; Zvorsky et al., 2018). The authors of the LEAP trial for smoking cessation hypothesized that using financial compensation to incentivize adherence to the physical activity intervention may reduce the perceived “burden” of exercise and, therefore, increase the effectiveness of the intervention in reducing depression. Contingency management used among pregnant women with SUD has been associated with increased adherence to SUD treatment and reduced drug use (Forray, 2016; Terplan et al., 2015). Therefore, the impact of contingency management on reducing depression may be attributable

to increasing adherence to treatment for both SUD and mental health services (Petry, 2011). However, we must note that this study on contingency management only focused on women using nicotine. Therefore, the mechanistic impact of contingency management on depression among pregnant and parenting women using substances with more robust physiologic responses (i.e. opioids) needs further clarification before it can be broadly recommended.

Psychotherapy, particularly cognitive behavioral therapy (CBT), is often the core behavioral treatment used within comprehensive SUD programs, particularly those which rely heavily upon abstinence-based or psychosocial treatment rather than medication-assisted treatment. Due to the substantial evidence documenting the efficacy of psychotherapy in treating anxiety and depression during pregnancy (van Ravesteyn et al., 2017) and in reducing substance use among both genders (Dutra et al., 2008), it was unsurprising that many interventions used psychotherapy as a core component of the interventions for pregnant or parenting women with SUD. Some interventions used depression-focused psychotherapy alone as an intervention (Cinciripini et al., 2010) while others used psychotherapy as a component of baseline control group treatment. Decreases in depression among the women were often noted in both the intervention and psychotherapeutic control groups, even if decreases were more significant for those in the intervention. This finding underscores the importance of incorporating psychotherapy as an integral part of SUD treatment, even for those receiving medication for SUDs.

Despite the importance of psychotherapy, significant decreases in depression among women in studies that used psychotherapeutic control groups or were enhanced with other modalities (i.e. maternal-child or peer relationships, case management, etc.) suggests that psychotherapy alone may not be sufficient to maximize the efficacy of non-pharmacologic interventions on depression and anxiety. The therapeutic strength of familial and social relationships within a woman's life was evident from the number of reviewed studies that used maternal-child therapies and peer interventions to affect maternal depression. Maternal-child attachment can be negatively impacted by the woman's own experience with trauma and the demands of an infant exposed to substances (Meulewaeter et al., 2019). Involving children in treatment programs is a key component of gender-specific SUD treatment and has been linked to increased likelihood of women keeping their infants or being reunited with their children previously placed in foster care (Grella et al., 2009; Meyer et al., 2019). As such, interventions that encourage and support this maternal-child attachment mutually benefit both mother and child, therapeutically addressing the effects of past trauma in the mother and preventing continued intergenerational trauma for the child (Meulewaeter et al., 2019). Peer relationships (Stahler et al., 2005) from within the community were also particularly important to integrate African American women back into their communities and reduce depression after discharge from cocaine treatment. Previous studies on peer support within SUD treatment programs, including those among mothers with OUD, have shown therapeutic promise (Tracy and Wallace, 2016), but more research is needed on the efficacy of using peer support to decrease depression and anxiety among pregnant and parenting women.

Despite the utilization of peers and children, notably, only one study attempted to examine the therapeutic use of the relationship between women and their partners (McComish et al., 2003). However, as noted in the limitation of this study, a low percentage of women with SUDs have partners who can be meaningfully involved in the woman's treatment. Partners of women with SUDs may have a significant, and potentially negative, impact on drug use and treatment adherence (Tuten and Jones, 2003). If partners are currently involved in the women's lives at the time of pregnancy or parenting, many women express the desire to involve their current partners in their treatment (Kuo et al., 2013). Future interventions for depression and anxiety in this population must explore the therapeutic potential of, when possible, involving women's partners in care.

Structural interventions on the systemic and individual level addressed multiple environmental stressors that exacerbate both drug use and psychiatric disorders, resulting in improved depression and retention in SUD treatment. Although often providing interpersonal relational support, care navigators function on the structural level by providing women with individualized case management, referrals, and psychosocial support. Both studies which evaluated peer navigator programs among pregnant women with OUD, reported significant decreases in depression (Cochran et al., 2018; Fallin-Bennett et al., 2019). But neither study was randomized nor truly controlled for the confounding effect of OUD or other baseline SUD treatment. Future RCTs are needed to further evaluate the efficacy of peer navigation programs on reducing depression and anxiety.

Consistent with previous literature, the integrated treatment programs reviewed in our study appeared to reduce depression by addressing gender-specific structural barriers and providing women with comprehensive services for both themselves and their child. A previous meta-analysis of integrated care programs reported a moderate yet significant effect on mental health outcomes, specifically depression, among pregnant/parenting women with SUD (Niccols et al., 2010). Furthermore, pregnant and parenting women with SUD have expressed a preference for integrated and easily accessible services that address multiple needs in a single setting (Hubberstey et al., 2019). Integrated care services, or treatment programs that facilitate access to multitude of comprehensive services, can address the fragmentation of care that often prevents women with SUD from accessing and adhering to care, even for women who may lack motivation to seek treatment (Jones et al., 2004).

#### 4.1. Limitations

While the findings from our review contribute to a more integrated understanding of treatment for depression and anxiety disorders among this specific population, our review is not without limitations. First, the insufficiency of high quality RCTs prevented us from conducting a quantitative summary of the findings. Most studies were conducted with very small sample sizes and with substantial heterogeneity in the populations assessed and in the components of the interventions. There were several non-experimental studies, particularly those which evaluated entire programs of integrated care, that used a combination of multiple modalities (i.e. interpersonal, intrapersonal, and structural) without controlling for the effects of each treatment modality or other confounding factors. Few studies mentioned, much less controlled for, the confounding effect of pharmacologic treatment introduced in the treatment programs. Therefore, we cannot identify which specific treatment modality within those interventions causally improved depression outcomes. Furthermore, due to the lack of clarity in reporting the type of SUD treatment and only two studies among women outside of SUD treatment, we did not feel that we could draw conclusions about the differences in outcomes either between types of SUD treatment or active enrollment in treatment. Treatment type is a potentially confounding factor in treatment and should be more carefully described and accounted for in future intervention studies.

Secondly, despite the high rate of co-morbid depression and anxiety reported in this population, some studies excluded those with major depressive disorder or other more severe psychiatric co-morbidities. Among studies which compared women with low-risk for depression to those with high-risk for depression, interventions appeared to have a more significant impact on depression for those with greater risk for depression. Therefore, future studies on the efficacy and feasibility of these interventions among populations of women with a diagnosed mood disorder or severe psychiatric co-morbidity are necessary.

Thirdly, racial and ethnic representation varied widely across the studies reviewed, and two did not describe the racial/ethnic demographics of their sample. While one study noted racial differences in depression (Murnan et al., 2018) and another piloted an intervention exclu-

sively among African American women (Stahler et al., 2005), none examined racial differences in treatment effect. Women from systemically marginalized backgrounds who historically experience higher rates of depression and anxiety (Perez et al., 2020) may access and engage in depression and substance abuse treatment differently than the populations represented in the reviewed studies. Therefore, it is critical to explore and understand these significant disparities to develop culturally relevant interventions capable of serving these women.

Finally, we analyzed treatment among all types of substance, including alcohol, opioids, nicotine, and cocaine. Due to the varying physiologic mechanisms of specific SUDs, pharmacological treatment for SUDs often differs by the substance abused. Some drug types, such as opioids, may require more intensive medication and behavioral treatment than others, such as nicotine. Therefore, we recognize that behavioral interventions that improved depression and anxiety among pregnant smokers might not necessarily be generalizable to effects on depression among pregnant women with OUD. However, polysubstance use is frequent among substance users (Crummy et al., 2020), and nicotine use is common among users of other substances (Apollonio et al., 2016). Many studies reviewed did not specify the primary type of drug used but piloted their intervention among populations of pregnant/parenting women using a variety of substances, with the understanding that addiction, regardless of the substance used, shares associations with depression and anxiety. Therefore, there is much overlap in the non-pharmacological management of both psychiatric disorders and SUDs. A transdiagnostic model of addiction (Kim and Hodgins, 2018), psychiatric disorders (Dalglish et al., 2020), and co-morbidity between the two (Eaton et al., 2015) may explain the overlapping efficacy of these non-pharmacologic treatment interventions. Due to this theoretical approach, we believe it is appropriate to combine studies within this review that address anxiety and depression within the context of treatment for a variety of substance disorders. However, future differentiation among pregnant and parenting women in treatment for abuse of different substance types would be helpful to clarify any differences in treatment efficacy for depression and anxiety disorders in these subpopulations.

## 5. Conclusion

Based upon this review and analyses, psychotherapeutic and maternal-child parenting therapy showed significant positive treatment effects in five RCTs to improve depression and anxiety among pregnant or parenting women in treatment for SUD. In addition, experimental evidence strongly links contingency management with reductions in depression, though stronger experimental studies are needed to discern its specific mechanism of effect. Interventions which appear to hold promise but require more rigorous experimental study include the use of case-managed care, patient or wellness navigators, mindfulness-based therapy, maternal-child relationship-focused therapy, therapeutic community-based interventions, and community peers. Finally, observational evidence was found to support comprehensive and women- and parenting-focused residential treatment resulting in improved depression and anxiety among enrolled women. These systems-level interventions portend benefit but should be used within the context of pharmacologic and non-pharmacologic interventions of known efficacy. Future research should not only focus on identifying the degree to which specific intervention modalities reduce depression and anxiety, but also which modalities are most cost-effective, feasible, and acceptable to integrate into SUD treatment for this population.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

No conflict declared.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.dadr.2021.100017](https://doi.org/10.1016/j.dadr.2021.100017).

## Appendix A. Search methodology

DATABASE SEARCHED (from April – May 2020)

PubMed:

("Women"[Mesh] OR "Mothers"[Mesh] OR "Women"[All Fields] OR Woman[All Fields] OR Mother\*) AND ("Mood Disorders"[Mesh] OR "Anxiety Disorders"[Mesh] OR "mood disorder" OR "anxiety" OR "depression" OR "psychiatric comorbidities"[All Fields] OR "psychiatric comorbidities"[All Fields]) AND ("Substance-Related Disorders"[Mesh] OR "Opiate Substitution Treatment"[Mesh] OR "substance use" OR opioid OR opiate OR heroin OR methadone OR cocaine OR alcohol OR methamphetamines OR tobacco OR buprenorphine) AND (intervention OR interventions OR interventional OR program OR programs OR program\*)

CINAHL:

(MH "Substance Abuse+" OR MH "Substance Use Disorders+" OR MH "Substance Dependence+" OR "substance use" OR "substance abuse" OR opioid OR opiate OR heroin OR methadone OR cocaine OR alcohol OR methamphetamines OR tobacco OR buprenorphine) AND (MH "Affective Disorders+" OR MH "Anxiety Disorders+" OR "mood disorder" OR anxiety OR depression OR "psychiatric comorbidities" OR "psychiatric co-morbidities") AND (MH "Women+" OR MH "Mothers+" OR women OR woman OR mother) AND (intervention OR interventions OR interventional OR program OR programs OR program\*)

PsychInfo:

(MAINSUBJECT.EXACT.EXPLODE("Substance Use Disorder") OR MAINSUBJECT.EXACT.EXPLODE("Substance Related and Addictive Disorders") OR MAINSUBJECT.EXACT("Opioid Use Disorder") OR "substance use" OR "substance abuse" OR opioid OR opiate OR heroin OR methadone OR cocaine OR alcohol OR methamphetamines OR tobacco OR buprenorphine) AND (MAINSUBJECT.EXACT.EXPLODE("Human Females") OR "Women" OR Mothers OR woman OR mother\*) AND (MAINSUBJECT.EXACT("Anxiety Disorders") OR MAINSUBJECT.EXACT.EXPLODE("Affective Disorders") OR "mood disorder" OR anxiety OR depression OR "psychiatric comorbidities" OR "psychiatric co-morbidities") AND (intervention OR interventions OR interventional OR program OR programs OR program\*)

## CRedit authorship contribution statement

**Caroline K. Darlington:** Conceptualization, Writing – original draft. **Peggy A. Compton:** Writing – review & editing. **Anne M. Teitelman:** Writing – review & editing. **Karen Alexander:** Conceptualization, Writing – original draft.

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