Exploring the Social Determinants of Health Among Pregnant Women with Substance Use Disorder: An In-depth Analysis of the Drug Free Moms and Babies Project

by

Carly Glover

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This essay is submitted

by

Carly Glover

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and approved by

Essay Advisor: Cindy Bryce, PhD, Associate Professor, Health Policy and Management, School of Public Health, University of Pittsburgh

Essay Reader: Cynthia Salter, PhD, MPH, Assistant Professor, Behavioral and Community Health Sciences, School of Public Health, University of Pittsburgh

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Abstract

Substance use disorder (SUD) in pregnancy is a pressing public health concern that affects not only the health and well-being of the mother but also that of the infant. Using a social determinants of health framework is useful to address substance use disorder in pregnancy as it acknowledges the various interconnected social factors that influence health outcomes, including race, income, education, employment, and housing and helps to promote health equity by addressing the underlying the factors that contribute to health disparities.

This study aims to identify social determinants of health associated with urine drug screening results at delivery for program completers of the Drug Free Moms and Babies (DFMB) Project, which integrates maternal and behavioral healthcare services for pregnant and postpartum women with substance use disorder. A secondary analysis of DFMB data was conducted using bivariate statistical analysis to identify significant associations with the main outcome of interest: drug screening results at delivery. Of the 958 program completers who met inclusion criteria for the study, 434 participants (45.3%) tested positive for illicit substance use at time of delivery. Women who enrolled in prenatal care ($p<0.001$) and the DFMB Project during the first trimester ($p<0.001$) and those who entered with a planned pregnancy ($p<0.001$) were less likely to test positive. Social determinants of health, including older maternal age ($p=0.002$), lack of stable housing ($p=0.010$), Medicaid insurance coverage ($p<0.001$), no or partial employment ($p=0.001$), low income ($p<0.001$), and cohabitation ($p=0.010$), were significantly associated with urine drug

screen results. As expected, birth outcomes were significantly better for women who tested negative at time of delivery ($p<0.001$).

The findings necessitate further assessment and revision of the DFMB Project, and other similar programs. Tailoring interventions to grow statewide partnerships for referrals through the use of a helpline to engage participants in earlier trimesters, build on current program supports including the use of Peer Recovery Coaches for mentorship of younger program participants, and advocate for the expansion of services for pregnant women with Medicaid insurance enrolled in programs could aid in mitigating drug use during pregnancy.

Table of Contents

List of Tables

List of Figures

Preface

My first introduction to the Drug Free Moms and Babies (DFMB) Project was through my practicum experience at West Virginia's Office of Drug Control Policy (ODCP). As an intern on the Governor's Council on Substance Abuse Prevention and Treatment, I had the opportunity to take part in policy efforts for the state's strategic plan to reduce the prevalence of drug and alcohol abuse. Here, I was introduced to Janine Breyel, Deputy Director of the West Virginia Perinatal Partnership, who serves as the lead for the Drug Free Moms and Babies Project. Thanks to her insightful expertise, I gained a deeper understanding of the challenges faced by pregnant women with substance use disorder and found myself developing a passion for this crucial area of research.

I want to extend deep gratitude to Janine Breyel and Dr. Christa Lilly from the West Virginia Perinatal Partnership for giving me the opportunity to pursue my interests through this project. My practicum preceptor, Dr. Deborah Koester, along with the exceptional team at the West Virginia Governor's Council on Substance Abuse Prevention and Treatment, have provided me with invaluable knowledge on the subject of substance use. I am grateful for the unwavering support from my dear parents, whose encouragement has been instrumental throughout this journey, as well as Dr. Kelley Baumgartel, whose brilliance continues to drive me to become a better scientist every day. Lastly, I want to thank Taylor Alison Swift for her musical genius that helped me for all the 2 AMs in my room spent writing.

Several studies referenced in this essay utilize a gender binary system when discussing pregnant or birthing individuals. It is important to acknowledge that this language may not be inclusive of all people who become pregnant or give birth. The language used in these studies reflects the choices made by the authors. However, it is essential to recognize that not all

individuals who become pregnant or give birth identify as "women" or "mothers." The analysis conducted in this master's essay and the case study presented is not intended to exclude individuals who do not identify as female but rather to explore the social determinants of health for pregnant individuals with substance use disorder regardless of gender identity.

1.0 Introduction

Substance use disorder (SUD) is a significant public health issue in the United States. According to the National Survey on Drug Use and Health (NSDUH), an estimated 40.3 million people aged 12 or older had a SUD in 2020, representing 12.1% of the U.S. population ("2020 National Survey of Drug Use and Health (NSDUH) Releases," n.d.). Substance use disorders involve the misuse or addiction to substances such as alcohol, tobacco, prescription drugs, or illicit drugs, and can have severe health, social, and economic consequences. The prevalence of SUD varies across different populations and geographic regions, with certain vulnerable populations, including pregnant women, being at higher risk.

The prevalence of SUD among pregnant women in West Virginia particularly poses is a public health concern. The state has one of the highest rates of SUD in the country, with a disproportionately high number of pregnant women affected. According to data from the West Virginia Department of Health and Human Resources, in 2020, approximately 15% of pregnant women in the state reported using tobacco, alcohol, or illicit drugs during pregnancy (Stitely et al., 2010). Consequently, pregnant women in West Virginia have an increased risk of adverse health outcomes for both themselves and their infants, including premature birth, low birth weight, developmental delays, and neonatal abstinence syndrome (NAS). The complex interplay of social, economic, and environmental factors, including poverty, limited access to healthcare, and the opioid epidemic, contribute to the high prevalence of SUD in pregnant women in West Virginia.

Understanding the social determinants of health that may be associated with this phenomenon can provide valuable insights into the underlying factors that contribute to persistent substance use during pregnancy. Social determinants of health refer to the social, economic, and

environmental factors that shape health outcomes and contribute to health disparities. Examples include race, income, education, employment, housing, and access to healthcare, among others. Addressing social determinants of health is essential in addressing the complex and multifactorial nature of health outcomes and promoting health equity, which may be achieved through necessitating targeted interventions and support to address this pressing public health issue.

The Drug Free Moms and Babies (DFMB) Project is an initiative in West Virginia that aims to reduce substance use disorder (SUD) in pregnant and postpartum women. The project integrates maternal and behavioral healthcare services, utilizing evidence-based practices such as early intervention, counseling, referral to treatment, and supportive services. The DFMB Project focuses on promoting healthy behaviors, providing education and support, and facilitating access to appropriate care to improve maternal and infant health outcomes. Through partnerships with local and statewide agencies, the DFMB Project aims to address the social determinants of health, tailor interventions to the unique needs of pregnant women with SUD, and support long-term recovery for women and their infants. By mitigating drug use during pregnancy and promoting the health and well-being of mothers and babies, the DFMB Project plays a critical role in improving birth outcomes and reducing the impact of SUD on families in West Virginia.

This research paper describes the social determinants of health of pregnant women enrolled in a substance use disorder treatment program and examines the association of these factors with drug test results at time of delivery. By analyzing demographic information related to social determinants of health, this study seeks to identify any significant associations or correlations with persistent substance use during pregnancy. Overall, the findings from this study provide important insights into the social determinants of health for pregnant women enrolled in the DFMB program and can be used to inform short-term and long-term programmatic changes, such as expanding

existing referral services and incorporating new services, as well as implementing Peer Recovery Coach mentorship and Medicaid advocacy, with the ultimate goal of improving the health outcomes of both the mother and the newborn.

2.0 Public Health Relevance

Substance use in pregnancy, notably opioid use, has surged in the United States over the past decade. According to the National Survey on Drug Use and Health (NSDUH) conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) in 2019, approximately 17.7% of women in the reproductive age group (15 to 44) have disclosed past illicit drug use (Center for Behavioral Health Statistics and Quality, 2019 and Quarters 1 and 4, 2020). Additionally, based on the same report by the SAMSHA the percentage of pregnant women in the United States who reported past-month illicit drug use increased from 2.2% in 2007 to 5.9% in 2019. Due to the adverse effects on both maternal and fetal health, including increased risk of maternal mortality, delivering prematurely, and neonatal abstinence syndrome, the rise in pregnant women with substance use disorder has necessitated the development and implementation of integrated treatment programs that provide the perinatal care and treatment/ recovery services to achieve optimal health for mother and child. Despite the moderate availability of substance use disorder treatment programs, many pregnant women engaged in these programs still test positive for substance use at delivery, indicating that these programs may not be addressing all the underlying social factors contributing to drug use during pregnancy.

Pregnant women with substance use disorder face significant health challenges that can be viewed through the four levels of the social ecological framework for social determinants of health: (1) individual, (2) interpersonal, (3) community, and (4) institutional. The health challenges at each level of this framework create barriers to receiving the care and support needed to maintain a healthy pregnancy and reduce the risks associated with substance use during pregnancy. The connection between barriers to treatment and social determinants of health underscores the

importance of comprehending the intricate interplay of social factors that influence drug use during pregnancy. This understanding is crucial in order to develop effective interventions that can enhance treatment outcomes for pregnant women facing substance use disorder.

This essay explores the variances in social determinants of health among pregnant women with substance use disorder who are enrolled in the Drug Free Moms and Babies Project, and how these factors relate to the results of their urine drug screening tests conducted at delivery. The DFMB project is a care model that services and supports pregnant and postpartum women with substance use disorder in West Virginia. Through the identification of the associations between social determinants of health and urine drug screening results at delivery, this paper can provide insight into creating recommendations aimed at addressing these complex social, economic, and environmental factors that affect health outcomes for pregnant women with substance use disorder participating in the Drug Free Moms and Babies Program. By expanding the program's reach through the implementation of a helpline, assisting participants in completing governmental aid forms, and introducing long-term initiatives such as peer recovery mentorship and Medicaid policy changes, these recommendations aim to reduce the incidence of drug use during pregnancy and improve the overall health of pregnant women with substance use disorder in the DFMB program.

3.0 Background

3.1 Overview of Substance Use Disorder

Substance use disorder (SUD) is classified as a chronic, relapsing disease state characterized by the persistent use of substances (i.e., drugs and alcohol) despite adverse consequences ("Drug Misuse and Addiction," 2020). In 2020, approximately 40.3 million Americans aged 12 and older met the diagnostic criteria for SUD, inclusive of alcohol use disorder and illicit drug use disorder ("2020 National Survey of Drug Use and Health (NSDUH) Releases," n.d.). Illicit drug use refers to highly addictive and illegal substances including stimulants, depressants, narcotics, and hallucinogens (Houck & Siegel, 2010). According to data from the 2019 Substance Abuse and Mental Health Service Administration (SAMHSA) report, 17.7% of women of childbearing age (15 to 44) used illicit drugs ("2020 National Survey of Drug Use and Health (NSDUH) Releases," n.d.). The increasing prevalence of illicit drug use among pregnant women in the United States is alarming, as reflected by the rise in the percentage of pregnant women who reported past-month illicit drug use from 2.2% in 2007 to 5.9% in 2020. This trend is especially troubling considering that women are most vulnerable to substance abuse during their reproductive years.

During their reproductive years, particularly between the ages of 18 and 29, women face the highest risk of developing a substance use disorder that persists into their mid-40s (18 to 44) (Forray, 2016). Therefore, women who are pregnant or will become pregnant have a higher risk of developing a substance use disorder (Forray, 2016). According to Forray (2016), the opioid epidemic, which is a part of the larger substance use crisis, has resulted in a public health

emergency that has devastating consequences, including affecting pregnant women. Illicit opioid use has increased recently both in the general population and during pregnancy, with an estimated 7% of women in the population using prescription opioids while pregnant, with 1 in 5 reporting misuse of these medications, which includes obtaining them from non-healthcare sources or using them for reasons other than pain relief (News Division, 2021). This trend was accompanied by a 131% increase in opioid-related diagnoses documented at delivery between 2010 and 2017 (News Division, 2021). This presupposes that maternal opioid use has also adversely affected the lives of infants born to mothers who use opioids.

Women with Medicaid insurance are an especially vulnerable population for opioid use. For women of reproductive age, patients with Medicaid filled an annual average of 39.4% of outpatient opioid prescriptions, compared to 27.7% of patients with private insurance between 2008 and 2012 (Prince & Ayers, 2022). The same study reported that of over 1 million pregnant women with Medicaid, 21.6% filled an opioid prescription, and 2.5% of pregnant women received chronic opioid prescriptions for more than a one-month supply (Prince & Ayers, 2022). The proportion of pregnant women seeking treatment for opioid use at substance use treatment centers rose from 2% in 1992 to 28% in 2012, according to admission data spanning two decades (Prince & Ayers, 2022). To prescribe safe and effective treatment for opioids, healthcare providers must carefully consider the medical concerns of pregnant women, as well as the potential harm to the developing fetus.

Substance use during pregnancy has been linked to a number of negative health effects on both the mother and her child. Obstetric complications associated with maternal substance use include ectopic pregnancy, placenta previa, and postpartum hemorrhaging (Rayburn, 2007). For the infant, complications consist of low birth weight, birth defects, preterm birth, and neonatal

abstinence syndrome (Rayburn, 2007). Neonatal abstinence syndrome (NAS) is a withdrawal condition faced by newborns with in-utero drug exposure, prevalent among infants of maternal opioid users (Anbalagan & Mendez, 2022). NAS contains both transient and long-term health implications for infants depending on the type of drug, but symptoms typically manifest in the form of central nervous system irritability, gastrointestinal dysfunction, and temperature imbalance (Anbalagan & Mendez, 2022). As maternal opioid use continues to rise, there has been a corresponding increase in the rates of neonatal abstinence syndrome (NAS) experienced by infants, with a notable 82% rise in the occurrence of infants born with NAS (News Division, 2021). NAS acts as an indicator of poor prognosis and has been associated with childhood hospital readmissions (Patrick et al., 2015), and interventions that address the indirect effects of maternal substance use are critical to child health promotion. Considering the detrimental outcomes associated with maternal substance use, a paradigm shift towards a comprehensive approach that integrates both medical and behavioral interventions is warranted in the current standard of care for maternal substance use disorder; with the primary goal to promote maternal and child health and mitigate the risks associated with SUD.

3.2 Standard of Care for Maternal Substance Use Disorder

In response to shifting societal perceptions and medical understanding, the accepted standard of care for substance use disorder (SUD) in pregnant women has evolved over the years. Historically, during the early to mid-20th century, SUD during pregnancy was subject to stigmatization and marginalization, often leading to punitive measures instead of treatment (Stone,

2015). The associated hazards of SUD during pregnancy were also little understood by medical professionals, which reduced the number of potential treatments (Stone, 2015).

Medication-Assisted Treatment (MAT) refers to the use of opioid pharmacotherapy in combination with behavioral health counseling and currently acts as the standard of care to treat opioid use disorder during pregnancy ("Medication-Assisted Treatment (MAT)," 2022). Methadone has been used for pregnant women with opioid use disorder since the 1970s, and since then the FDA has additionally approved buprenorphine as a first-line therapy option ("What Treatment Is Available for Pregnant Mothers and Their Babies?," 2021). Both methadone and buprenorphine treatment during pregnancy bolster maternal health by decreasing substance use, providing a stable opioid dosing regimen, and reducing behaviors that raise the risk of contracting HIV and HCV infection (Krans et al., 2016). Medication-assisted treatment during pregnancy also improves neonatal health outcomes by reducing repeated prenatal withdrawal that results from opioid use (Krans et al., 2016). The effectiveness of medication-assisted treatment for pregnant women is endorsed by professional organizations, including the American College of Obstetrics and Gynecology (ACOG) (Krans et al., 2016).

Despite the endorsement of this evidence-based approach, some medical providers and addiction specialists remained skeptical of the approach and continued to advocate for abstinence-based treatment (Jarvis & Schnoll, 1994). Methadone maintenance therapy was criticized for essentially replacing one addiction with another and failing to address the underlying reasons of addiction (Jarvis & Schnoll, 1994). Concerns were also expressed over methadone's potential to impair fetal development and elevate the risk of newborn abstinence syndrome (Jarvis & Schnoll, 1994). While these claims are unfounded, pregnant women are still known to underutilize medication-assisted treatment (Krans et al., 2016). Only half of pregnant women with opioid use

disorder were admitted into substance use treatment centers in the United States underwent opioid pharmacotherapy, according to analyses of the Treatment Episodes Data Set (TEDS), which has remained mostly consistent over the previous 20 years (Krans et al., 2016). It is hypothesized that this may be due in part to a lack of access to comprehensive addiction treatment services, as well as lingering stigmatization.

The public's perception of substance use during pregnancy was significantly impacted by the 1980s and 1990s crack cocaine epidemic (Logan, 1999). The high rates of addiction and associated health risks among pregnant women who used crack cocaine led to a greater awareness of the need for interventions and treatment options. Yet, rather than concentrating on treatment and rehabilitation, the response to this epidemic was frequently punitive (Logan, 1999). The 1980s saw the start of the War on Drugs, which resulted in severe criminal punishments for drug offenses, including drug use by pregnant women (Logan, 1999). This punitive approach was criticized for being ineffective in reducing drug use and perpetuating racial and economic disparities (Logan, 1999). Studies have shown that those living in poverty are more likely to be targeted by punitive drug policies, and that these policies have a disproportionately negative impact on communities of color (Harp & Bunting, 2020). In addition, because of their concern for potential legal ramifications and the criminalization of drug use during pregnancy, women were less likely to seek prenatal care or addiction treatment (Logan, 1999). In recent years, there has been a change towards scientifically supported methods of treating SUD during pregnancy, with an emphasis on holistic care, harm reduction, and treating addiction as a medical disease as opposed to a criminal act.

The current standard of care for SUD during pregnancy emphasizes a multidisciplinary team approach that includes a range of evidence-based interventions (Metz et al., 2012). Perinatal

care is one component of this approach, as it allows healthcare providers to monitor maternal and fetal health, identify potential complications, and provide early intervention and treatment when needed. In addition to medication-assisted treatment for maternal opioid use disorder, treatment for SUD during pregnancy also includes a range of behavioral therapies, such as cognitive-behavioral therapy and motivational interviewing, that help women to develop coping skills, identify triggers for drug use, and build social support networks. Case management and support services, such as housing assistance, childcare, and transportation, are also important components of the current standard of care, as they help to address the social and economic factors that contribute to addiction and can make it more difficult for women to access and participate in treatment.

It is imperative that the current approach to caring for maternal substance use disorder is closely integrated with efforts to address the social determinants of health that contribute to substance use during pregnancy. Social determinants are closely linked barriers to treatment such as socioeconomic status, access to healthcare, education, housing, and support systems, that play a pivotal role in shaping a pregnant woman's risk of developing substance use disorder. Limited access to quality healthcare and prenatal care, low income or poverty, lack of education and awareness about the risks of substance use in pregnancy, unstable housing or homelessness, and inadequate social support can all contribute to increased rates of substance use during pregnancy. These social determinants can impact a person's ability to seek timely and appropriate care for substance use disorder, which in turn can affect the standard of care they receive. Addressing social determinants of health is crucial in improving the current standard of care for maternal substance use disorder and ensuring that pregnant individuals have equitable access to comprehensive and evidence-based interventions that prioritize both their health and the health of their baby.

3.3 The Role of Social Determinants of Health in Maternal Substance Use Disorder

The social, economic, cultural, and environmental elements that affect a person's health and wellbeing are referred to as social determinants of health (Hahn, 2021). Pregnancy-related substance use disorder is a complicated issue that is frequently impacted by social determinants of health like income, race, education, and insurance, and can be used to signal access to care. While these factors can erect significant barriers for pregnant women seeking substance use treatment, they also may contribute to a lack of engagement or retention in treatment programs. By understanding how social determinants of health impact pregnant women's access to care, treatment programs can better tailor interventions to recruit, engage, and retain women; as well as identify existing gaps in care and potential solutions.

The social determinants of health can be viewed through the social ecological framework, which broadly conceptualizes health and the factors that affect health. Each level of the social ecological framework represents a different layer of influence: (1) individual, (2) interpersonal, (3) community, and (4) institutional (Short & Mollborn, 2015). By applying this framework, it is possible to gain a more comprehensive understanding of the factors that contribute to substance use disorders among pregnant women.

3.3.1 Individual Level

The individual level refers to the personal characteristics and behaviors of a person that influence their health and wellbeing. This level includes factors such as age and mental health history (Short & Mollborn, 2015) which can affect a woman's susceptibility to substance use disorders. Regardless of pregnancy status, women in their mid-to late-20s have been proven to

have a higher likelihood of using alcohol or other drugs than women in younger or older age groups (Onah et al., 2016). This is particularly notable as this age range is amidst the peak of reproductive years for women (Forray, 2016). However, maternal age was found to be inversely associated with alcohol, tobacco and cannabis use (Brown et al., 2019). This means that younger pregnant women are more likely to use these substances than older pregnant women. Younger women may be more likely to engage in substance use due to a variety of factors, such as peer pressure, social norms, and lack of knowledge about the risks involved.

This level also includes individual behaviors, such as prior substance use and mental health history (Short & Mollborn, 2015), that can impact health outcomes during pregnancy. Women who have previously engaged in substance use, including smoking tobacco and alcohol use, are more likely to experience substance use disorders during pregnancy (Vallejo et al., 2020). Continuous usage of substances during pregnancy may be further compounded by trauma or history of mental illnesses. Psychiatric disorders, notably depression and anxiety, are more prevalent among pregnant women who use drugs (Salameh & Hall, 2020). It might be challenging for pregnant women to stop using drugs since mental health problems can lead to substance usage as a coping technique. Furthermore, even after treatment, the presence of mental health problems increases the chance of relapse or continuing drug use (Moradinazar et al., 2020). Addressing social determinants of health at the individual level encompasses identification and oftentimes modification of a person's characteristics, knowledge, attitudes, and beliefs that may affect their likelihood to use substances while pregnant (Weber et al., 2021).

3.3.2 Interpersonal Level

At the interpersonal level, social determinants of health for pregnant women with substance use disorder can include factors related to their personal relationships and social support networks (Short & Mollborn, 2015). Previous studies have shown that regular contact with substance users increases the chance of overdose and high-risk behaviors like injecting drugs, even in people undergoing SUD treatment (Rapier et al., 2019). In a study of more than 300 patients who had previously used illicit drugs, network members' drug use was found to be a better indicator of future drug use than treatment adherence and demographic factors (Schroeder et al., 2001). On the other hand, removing network participants who used drugs has also been linked to a decline in drug use. Similar to non-pregnant populations, pregnancy may be a key incentive for realigning good and negative social interactions (Asta et al., 2021). These social relationships may also be more likely than individual-level factors to sustain or ameliorate pregnancy-related behavior change.

There is a growing body of literature exploring the relationship between social relationships and substance use, and specifically, how marriage and cohabitation may be associated with substance use disorder. Past studies have shown a correlation between marital status—specifically, being married or living with a partner—and reduced rates of substance use disorder (SUD) and improved treatment outcomes. When compared to patients who were not in a relationship, those who were married or living together had higher rates of finishing their treatment and longer lengths of sobriety (Duncan et al., 2006). Other studies have also found that married or cohabiting individuals are less likely to initiate substance use or experience relapse (Heinz et al., 2009). Having a partner can be beneficial for maintaining sobriety because they can offer emotional support, motivation, and accountability.

Additionally, interpersonal factors such as intimate partner violence (IPV) and/or lack of social support can contribute to the development or continuation of SUD during pregnancy. Pregnant women are at increased risk of experiencing IPV, with 3-9% reporting some form of abuse during pregnancy (Martin et al., 2001). IPV includes physical, sexual, or emotional abuse from a current or former intimate partner (Campbell, 2002). One study cited that of women who engage in cohabitation with a partner, over half of them reported cases of IPV while pregnant (Onah et al., 2016). Further, women who encounter major psychosocial stressors, including IPV, are more likely to participate in risky health behaviors including smoking, drinking, and using drugs, and less likely to seek medical attention (Bailey & Daugherty, 2007; Anderson et al., 2002; Martin et al., 2003). These behaviors put women at higher risk for unplanned pregnancy (Alhusen et al., 2015), sexually transmitted diseases, including STDs and STIS (Sierra et al., 2021), and poor maternal and neonatal outcomes (Bonomi et al., 2006).

Racism at the interpersonal level can erode the therapeutic relationship between patients and providers, leading to a breakdown in trust (Peek et al., 2010), reduced engagement, and lower retention in substance use treatment programs (Saloner & Cook, 2013). When patients from minority racial and ethnic backgrounds experience racism or discrimination from their healthcare providers, it can create a barrier to building a trusting and collaborative therapeutic relationship (Saloner & Cook, 2013). Patients may feel disrespected, dismissed, or invalidated, leading to a lack of trust in the provider's intentions or competency (Peek et al., 2010),. This can hinder their willingness to disclose important information about their substance use behaviors, mental health history, or other relevant factors (Saloner & Cook, 2013), which can impact the accuracy of assessments and treatment planning. As a consequence, the effectiveness of the treatment program may be compromised, and patients may be at increased risk of relapse or dropout from treatment.

3.3.3 Community Level

At the community level, social determinants of health for pregnant women with substance use disorder (SUD) can include factors related to the broader social, economic, and environmental conditions (Short & Mollborn, 2015) in which they live. These can include issues such as access to healthcare services, transportation, and education; which may be further compounded by racism.

The maintenance of both individual and collective health for pregnant women depends on access to healthcare services, including insurance status, availability of hospitals and clinics, and appropriate providers for pre-natal and treatment services. Since access to healthcare is difficult to measure, insurance status may be used as a proxy. Prenatal care is essential for monitoring the health of the mother and fetus, recognizing potential complications, and may be less likely to be received by women who lack insurance coverage (Medicine et al., 2002). Lack of prenatal care for SUD-afflicted women puts them at higher risk for problems such as preterm labor and low birth weight (Prince & Ayers, 2022). According to one study, about one-third of pregnant female admissions to an SUD treatment program reported having no health insurance at the time of treatment enrollment (*Women of Childbearing Age and Opioids*, n.d.). Evidence also indicates that pregnant women with opioid use disorder who lack insurance coverage heightens the risk of NAS diagnosis at birth (Umer et al., 2021). The availability of comprehensive treatments for pregnancy and SUD at this level are critical for predicting and enhancing maternal and child health outcomes.

Access to transportation is a critical factor in ensuring that pregnant women with substance use disorder can access the medical care, substance use treatment, and support services they need to maintain their health and well-being during pregnancy. Pregnant women who frequently use public transportation cite a variety of issues (Malasky, 2022), including lack of safe sidewalks and street crossings on bus routes, inadequate accessibility accommodations to board and sit on buses,

and unreliable scheduling systems. Barriers to transportation may cause missed or delayed prenatal (Bloch et al., 2018) or substance use treatment appointments (Pullen & Oser, 2014), leading to unidentified pregnancy complications, missed opportunities for education on a range of topics related to pregnancy and childbirth, and relapse. Additionally, lack of transportation can contribute to difficulties in obtaining and maintaining employment (Zeelo, n.d.), further exacerbating income disparities for individuals living below the federal poverty line. Transportation and its associated structures are fundamental to care accessibility and health outcomes for pregnant women with SUDs.

Education attainment is a crucial social determinant of health for pregnant women, as it can influence their knowledge, attitudes, and behaviors towards prenatal care, healthy lifestyle choices, and the management of pregnancy-related complications (Rasheed & Al-Sowielem, 2003). Substance usage and addiction have consistently been inversely correlated with educational attainment, as measured by both years of education and degree of education (Fothergill et al., 2008). Smoking, using marijuana, drinking, and using other illicit substances are more than twice as common among individuals who have not graduated from high school (SAMHSA, Center for Behavioral Health Statistics and Quality, 2014). Substance use among adolescents is also known to increase the risk of unplanned pregnancies. Evidence showed that women without a high school diploma had the highest unintended pregnancy rate among those of any educational level (73 per 1,000) (Singh et al., 2010), as well as higher rates of pregnancy in adolescence (Kane et al., 2013). Pregnant adolescents are more likely to experience pregnancy-related difficulties, preterm birth, and deliver babies with developmental disorders (SAMHSA, Center for Behavioral Health Statistics and Quality, n.d.-b). Prenatal maternal and child health outcomes are compounded when the mother engages in illicit substance use; as women with low educational attainment are less

likely to seek prenatal care (Kinsman & Slap, 1992) and thus, have decreased rates of monitoring as the pregnancy progresses and obstetric complications (Lee et al., 2016). Pregnant adolescents are especially at risk since they often identify their pregnancies later than adult women, and are more likely to start using drugs and binge drinking early in their pregnancies (Cornelius et al., 1994; Rome et al., 1996). Giving individuals access to family planning tools in their communities enables them to understand and make informed choices regarding their reproductive health.

Racism can also have significant implications at the community level. At the community level, racism refers to the systemic and structural barriers that intersect with other social determinants of health at this level, access to healthcare, transportation, and employment opportunities, further exacerbating the challenges faced by minority racial and ethnic groups enrolled in treatment programs. Women of color may face financial barriers, such as lack of health insurance or limited financial resources, which can hinder their ability to access healthcare services (*Health Coverage by Race and Ethnicity, 2010-2021*, 2023). According to an issue brief commissioned by the Kaiser Family Foundation, insurance coverage gaps were found to disproportionately affect Hispanic and Black women compared to White women (*Health Coverage by Race and Ethnicity, 2010-2021*, 2023). The brief revealed that 16% of White women were uninsured, whereas the rates of uninsured were higher among Black and Hispanic women, with 20% and 37% respectively lacking insurance coverage (*Health Coverage by Race and Ethnicity, 2010-2021*, 2023). High healthcare costs, including co-pays, deductibles, and out-of-pocket expenses, can be prohibitive for minority women with limited financial means, making it difficult for them to seek and receive necessary healthcare services. Additionally, women of color, particularly those living in medically underserved areas or regions with limited healthcare facilities, may face significant geographical barriers that can impede their access to healthcare

services. According to a report by the U.S. Health Research & Services Administration, in 2020, 27.4% of Black and 30.3% of Hispanic populations lived in Health Professional Shortage Areas (HPSAs), compared to 9.4% of White population (*Shortage Areas*, 2020). Additionally, data from the National Rural Health Association indicates that 20% of the U.S. population resides in rural areas, but only 9% of physicians practice in these areas (Hing & Hsiao, 2014). This disparity in healthcare infrastructure can result in limited availability of healthcare facilities, transportation challenges, and geographic isolation for minority women, making it difficult for them to access timely and appropriate healthcare. For instance, studies have shown that Black and Hispanic women in rural areas are more likely to have to travel longer distances to reach healthcare providers, face transportation challenges, and experience longer wait times for appointments, which can further hinder their ability to access healthcare services effectively (Syed et al., 2013). Racism can also have significant impacts on employment access for women of color. Statistics indicate that racial and ethnic minorities, including Black, Hispanic, and Native American women, often face discrimination and disparities in employment opportunities. According to data from the U.S. Bureau of Labor Statistics, as of 2020, the unemployment rate for Black women was 8.8%, compared to 4.8% for White women. (*Labor Force Characteristics by Race and Ethnicity, 2020*, 2021) Similarly, Hispanic women had an unemployment rate of 8.2%, higher than the rate of 4.4% for White women (*Labor Force Characteristics by Race and Ethnicity, 2020*, 2021). Native American women also face significant employment challenges, with a higher rate of unemployment compared to White women (*Labor Force Characteristics by Race and Ethnicity, 2020*, 2021). Overall, racism can compound community-level factors, including restricted access to healthcare, transportation barriers, and limited employment opportunities, for minority women

enrolled in a substance use treatment program, thereby impeding their ability to timely access appropriate care and support.

The availability, quality, impact, support, and/or involvement of institutions and resources in a person's locality or region are examples of social determinants of health at the community level. These factors can significantly impact health behaviors, access to healthcare, and overall health outcomes and are frequently entangled when assessing an individual's likelihood of substance use during pregnancy.

3.3.4 Institutional Level

Institutional level social determinants of health refer to the policies, practices, and procedures of institutions such as healthcare systems, government agencies, and educational institutions (Short & Mollborn, 2015) that impact the health and well-being of individuals and communities. For pregnant women with substance use disorder (SUD), institutional level factors can have a significant impact on their health and well-being. Examples of institutional level social determinants of health for pregnant women with SUD include stigma, structural racism and discrimination, criminalization of substance use, and income inequality.

Stigmatization of substance use disorders (SUD) portrays addiction as a moral failing and willpower failure manifested personally, and it might differ depending on the substance (Weber et al., 2021). Although there is a growing understanding that SUD is a medical illness rather than a moral failing, stigma towards individuals who use drugs, especially pregnant women, still exists and is reflected in legal provisions, child welfare service guidelines, and the distribution of social resources. Such stigmatization fuels discrimination in societal supports including insurance, work, and housing, as well as underinvestment in infrastructure for addiction treatment (Vázquez et al.,

2018). In comparison to SUD individuals who are not parents, parents with SUD report 49% higher probabilities of experiencing stigma (Stringer & Baker, 2018). There are severe repercussions for being deemed a "unfit" parent, including incarceration and termination of parental rights (Linnemann, 2010). Additionally, stigma can be ingrained into the healthcare system itself from the perspective of provider stigma. Evidence shows that healthcare providers may stigmatize pregnant women with SUD by withholding pain relief during labor and delivery (Höflich et al., 2012) or by deterring access to addiction treatment (Stone, 2015). Such exacerbated stigma makes pregnant women less likely to seek perinatal care and addiction treatment, which ultimately causes more harm to both parent and child.

Structural racism and discrimination are other important considerations to view through the social determinants of health framework for pregnant women with substance use disorder (SUD). Structural racism refers to the ways in which policies, practices, and institutions create and maintain disparities between different racial and ethnic groups (Braveman et al., 2022). In pregnant women, these disparities present in the form of wide gaps in maternal morbidity and mortality, as well as infant health outcomes between races. Compared to white women, black women have a three times higher risk of dying from a pregnancy-related cause (*Maternal Mortality Rates in the United States, 2021*, n.d.). In addition, black women experience an increased risk of giving birth to preterm babies, low birthweight births, or births for which they received late or no prenatal care. These enduring disparities are a result of institutional racism, which started with the enslavement of black people and have influenced laws and practices ever since. For instance, enslaved black women were frequently used as test subjects for experimental reproductive procedures like cesarean sections and ovariectomies (*The Impact of Institutional Racism on Maternal and Child Health*, n.d.). Health care segregation continued even after the abolition of slavery, with black

families barred from quality hospitals and care in their own neighborhoods. These injustices persisted even after the Civil Rights Act, as evidenced by the underfunding of hospitals and clinics that had previously been designated for people of color. This is a pattern that persists today, with racism and bigotry having a negative impact on the level of care provided to black families. For example, pregnant women of color are more likely to experience discriminatory practices and policies that limit their access to healthcare, including addiction treatment. According to study on a cohort of Medicaid enrollees in Pennsylvania, pregnant women of color were less likely to receive any medication to treat OUD, and among those receiving buprenorphine treatment, women of color had higher rates of early discontinuation and decreasing adherence during pregnancy compared to white non-Hispanic women (Krans, Kim, James, Kelley, & Jarlenski, 2016). Communities of color have a long history of mistrusting health care organizations due to abuse and neglect, and this mistrust has a direct impact on how they interact with those institutions today (*The Impact of Institutional Racism on Maternal and Child Health*, n.d.).

Women with substance use disorder often worry about the legal repercussions of receiving prenatal care and/or treatment for SUDs while they are pregnant. Despite the fact that no state has passed legislation specifically outlawing drug use while pregnant, prosecutors have used a number of existing criminal statutes to hold pregnant women accountable for their drug usage (*Substance Use During Pregnancy*, 2023). Pregnant women with SUD who are caught using drugs may face criminal charges and be incarcerated, which can have detrimental effects for their health and the health of their child. In addition to exposing a woman to physical and psychological hardship, being incarcerated restricts access to prenatal care and addiction treatment (Ahlbach et al., 2020). Due to the fact that many prisons are situated in rural areas, pregnant women may need to be transported if they need medical attention for delivery or medicine to treat OUD (MOUD)

(Ahlbach et al., 2020) and prenatal care (Hotelling, 2008). Evidence suggests that many jails are not adhering to these standards of care for MOUD in pregnancy, despite the existence of these established national recommendations. A nationwide assessment of 53 U.S. prisons revealed that 46% subjected pregnant inmates with OUD to withdrawal (Kelsey et al., 2017). Additionally, several jails and state prisons do not have any implemented prenatal care policies, nor do they provide screening for high-risk pregnancies (Initiative, 2021). Pregnant women in prison are more likely than pregnant women in the general population to have risk factors for poor perinatal outcomes, such as preterm birth and small-for-gestational-age children (Bard et al., 2016). Drug enforcement policies that discourage pregnant women from obtaining care are harmful to both the mother and the fetus.

Income inequality, which can be attributed to structural and historical factors, is the disparity in economic well-being between individuals and communities in a society. Despite the lack of evidence showing a clear cause and effect between addiction and poverty, research has revealed that those with lower socioeconomic status are more likely to use drugs (Patrick et al., 2012). In the US, poverty is determined by the federal poverty level, or "the amount of annualized income earned by a household, below which they would be eligible to receive certain welfare benefits" (Patrick et al., 2012). This is the minimal amount of income required to cover expenses like food, clothing, transportation, housing, and other basic needs. Someone may be categorized as living in a low-income household or in poverty if they fall below the federal poverty level. Income inequality is upheld by institutions and their policies, as low-income areas are less likely to receive funding for their schools leading to lower educational attainment (Dsalis, 2022) and higher rates of dropout (Candelaria & Shores, 2017); subsequently perpetuating lack of employment opportunities. Prior studies have linked neighborhood poverty and income inequality

to elevated rates of substance use (Karriker-Jaffe, 2013). They also show that those who experience neighborhood poverty and associated risk factors early in childhood may be more likely to be exposed to drug use and/or develop long-term maladaptive habits of drug use. Those who live in poverty frequently experience various stressors, such as financial difficulty (Perzow et al., 2018), unemployment (Renahy et al., 2018) and social marginalization (Baah et al., 2019), which can often lead to cutting off social ties and support systems. These factors can make it more likely that someone will turn to engaging in illicit substances as a coping strategy for overcoming the difficulties of poverty. Income inequality can often equate to lack of access to affordable healthcare and addiction treatment resources can also contribute to the exacerbation of substance misuse. Individuals living in poverty may not be able to afford addiction treatment and may not have access to healthcare services that can help them manage their physical and mental health (Lazar & Davenport, 2018). The multitude of factors that inextricably link poverty and substance use disorder and the institutions that perpetuate community income inequity create large barriers in breaking this cycle across generations.

It is important to consider that the four levels of social determinants of health do not exist in a vacuum; rather they are all interconnected and constantly influence each other and thus the health and wellbeing of the individuals through which we view this framework. The social determinants of health that impact pregnant women with substance use disorder is no exception. Although there is no one etiology for determining the factors that lead to the development of substance use disorder in pregnancy, we can identify the opportunities and barriers at each level that contribute. Therefore, addressing substance use during pregnancy requires a comprehensive, compassionate, and culturally-responsive approach that takes into account the social and structural

factors that contribute to substance use and prioritizes the health and well-being of both the mother and the developing fetus.

4.0 The Drug Free Moms and Babies Project

4.1 Substance Use Disorder in West Virginia

West Virginia has been uniquely impacted by the epidemic of substance use and misuse, particularly opioid abuse, surpassing other states in the severity of the issue. In 2019, West Virginia recorded a staggering drug overdose death rate of 52.8 per 100,000 people, which is more than double the national rate of 21.6 per 100,000 (*West Virginia Priority Topic Investments CDC*, n.d.). The devastating effects of this epidemic have reverberated throughout the state, affecting individuals, families, and entire communities in profound ways.

The impact of substance use disorder extends without boundaries, and West Virginia has not been spared from its effects, especially among expectant mothers and women of reproductive age. Substance use during pregnancy, including tobacco, alcohol, prescription, and illicit drugs, has been recognized by healthcare professionals in West Virginia as a significant contributing factor to poor health outcomes for both mothers and babies. Recent statistics from 2020-2021 paint a concerning picture: 14% of infants born in West Virginia have been exposed to substances in utero and 5.5% of infants in the state are diagnosed with NAS, a rate significantly higher than the national prevalence of 0.68% (*Data to Action Success Stories: West Virginia*, n.d.). Furthermore, West Virginia has the highest percentage of pregnant smokers in the nation, with approximately 23% of mothers in the state smoking during pregnancy, nearly four times the national average of 6% and well above the Healthy People 2020 target of less than 1% (*CDC - West Virginia: PRAMS Data Used to Launch the Tobacco-Free Pregnancy Initiative of West Virginia - PRAMS -*

Reproductive Health, n.d.-b). These statistics highlight the urgent need for comprehensive interventions and support for addressing substance use in pregnancy in West Virginia.

Due to the rise in maternal substance use disorder and neonatal abstinence syndrome in West Virginia (Stitely et al., 2015), the West Virginia Perinatal Partnership set out to improve perinatal health in the state (*Drug Free Moms and Babies Project*, 2017). To best meet the needs of this high-risk population, the Partnership established the Substance Use in Pregnancy Committee to provide recommendations for public policy, identify best practices, and develop collaborative and coordinated strategies for pregnant and postpartum women with substance use disorders. This committee ultimately led to the creation of the Drug Free Moms and Babies (DFMB) Project, on which efforts to establish integrated and comprehensive care models for pregnant women with substance use disorders began in 2011.

4.2 DFMB Framework

The DFMB framework is a novel approach to treating maternal substance use disorder. While each site retains some differences due to their varying structures, programs established as part of the DFMB model provide four basic components: (1) Integration of behavioral health and maternity care; (2) Placement of the Screening, Brief Intervention, and Referral to Treatment (SBIRT) Model into care delivery; (3) Long-term monitoring of participants from pregnancy through the second birthday of their child; (4) Establishment of partnerships with local and/or statewide partners to acknowledge the problem of substance use in pregnancy. The implementation and integration of the four components of DFMB into pilot sites are critical to support and maintain the recovery of women with substance use disorders.

4.2.1 Integration of Behavioral Health and Maternity Care

The integration of behavioral health and traditional maternity care has been a focus of resources, planning, and education in the past decade, as part of the DFMB care model. Unlike conventional models that separate medical care from substance misuse and mental health programs, this model takes a synergistic approach to maternal care. Pregnant women, who often receive care over an extended period, present a critical window for diagnosing and treating substance use disorders (Metz et al., 2012). Research suggests that women aware of the health risks to their infants are motivated to engage in positive behaviors, including seeking SUD treatment (Van Scoyoc et al., 2016). Integrated programs have been shown to effectively reduce maternal substance use, complications, and healthcare costs (Young-Wolff et al., 2020). The DFMB project has a core treatment team, including the patient, maternity care provider, behavioral health provider, substance abuse treatment provider, and community partners, working together with team-driven, population-focused, measurement-guided, and evidence-based approaches. Treatment teams are expected to use these values as a guide for integrated patient care, adapting as needed to meet the unique needs of individuals and communities.

4.2.2 Screening, Brief Intervention, and Referral to Treatment

The second tenet of the DFMB Project is the integration of the Screening, Brief Intervention, and Referral to Treatment (SBIRT) model into existing care structures. SBIRT is an all-encompassing, integrated, and evidence-based method for locating and treating people who have substance use disorders as well as those who are at risk of developing such disorders. The

phases of SBIRT are described as follows by the Substance Abuse and Mental Health Services Administration (SAMHSA) (Substance Abuse and Mental Health Services Administration, 2022):

- **Screening**: Screening efficiently determines the level of care that is necessary and the severity of substance use.
- **Brief Intervention**: Brief intervention increases motivation for behavioral change as well as insight and knowledge surrounding substance use.
- **Referral to Treatment**: If it is deemed necessary for an individual to undergo more intensive treatment, they can receive specialized care upon a referral system.

The integration of the SBIRT model in West Virginia for addressing substance use during pregnancy may involve modified screening methods using the state's standard maternal risk screening tool, the Prenatal Risk Screening Instrument (PRSI), which gathers data on various risk factors (Appendix Figure 1). Clinically relevant examinations are conducted by DFMB staff to identify medical needs, including substance abuse and mental health disorders. Brief interventions using motivational interviewing may be conducted by various personnel to prompt behavior change. Referral to treatment is crucial, and resources may include maternity care providers, behavioral health providers, substance abuse treatment services, and community-based resources. Tailoring patient care to individual needs is emphasized for holistic treatment addressing substance abuse and associated issues (Appendix Figure 2).

4.2.3 Long-Term Monitoring

The disease of addiction, which interferes with both brain and behavioral function, is complicated but treatable (“Addiction: A Complex Disease Requiring a Multifaceted Treatment Approach,” 2022). Therefore, even after long periods of sobriety, those who suffer from substance

use disorders are vulnerable to relapse. The third tenet of the DFMB program aims to mitigate relapse through long-term follow-up for up to two years post-delivery. The DFMB program uses a variety of follow-up techniques for participants, such as Peer Recovery Coaching, ongoing assistance from DFMB staff, and long-term social service initiatives. Peer Recovery Coaches are those who have personally dealt with substance use and who help patients overcome environmental and personal barriers to recovery through the introduction to the recovery community and associated supports. Mothers may also receive continuity of services from DFMB staff that builds upon the trust established between program staff and participants as a form of long-term follow-up. Social service programs provided by the West Virginia Office of Maternal, Child, and Family Health can serve as continued follow-up to program participants.

4.2.4 Establishment of Partnerships

The fourth and final tenet of the DFMB program focuses on collaboration with local and statewide partners to address substance use in pregnancy, disseminate information on the issue and employment of effective measures to ensure enhanced community cooperation. Established partners include the West Virginia Bureau for Behavioral Health and Health Facilities (BHHF), the West Virginia Bureau for Public Health's Office of Maternal, Child, and Family Health (OMCFH), and the Claude Worthington Benedum Foundation. These partners provide mental health and drug abuse services, maternal and child health services, and funding for health and human services. DFMB program partners are encouraged to participate in regional, municipal, and state-wide programs for the prevention, treatment, and recovery of women with substance use disorders.

4.3 DFMB Pilot Program

Four pilot sites were participated in the DFMB project in 2012, covering a wide range of geographic locations across the state with differing practice modalities. These included a rural, private practice clinic, a Federally Qualified Health Center (FQHC), a delivery hospital, and a level III tertiary care facility. Each site catered to a unique patient population and adapted their program structures to effectively address the specific needs of these patients.

Over the course of the program's implementation from 2012 to March 2018, the pilot sites provided services to a total of 550 women. This parent study was conducted to measure qualitative and quantitative results of the Drug Free Moms and Babies pilot project sites, as reported by Lilly et al. in 2019. Research personnel at the pilot sites entered de-identified participant information from medical records into a database, which was used by this study for secondary analyses. The information collected includes demographic characteristics, medical and substance abuse histories, and limited maternal and infant clinical outcomes. Investigator-developed questionnaires were administered that captured efficacy and impact of the program on enrolled maternal-infant dyads. The pilot study conducted interviews and qualitative data was reviewed annually over a three-year period (2012-2015). The interviews revealed both positive outcomes and difficulties associated with the DFMB program. The main concerns expressed by staff centered around the integration of dedicated DFMB staff positions at each site, the timeliness of program implementation, and the importance of nurturing and maintaining a collaborative treatment team.

The initial pilot sites demonstrated significant success in reducing the occurrence of positive urine screens for non-prescribed drugs at the time of delivery among women who completed the program. This rate declined from 81% in the first trimester to 22% at the time of delivery. While the parent study for this secondary data analysis (Lilly et al., 2019), reported

descriptive statistics, they conducted minimal statistical testing to explore the relationships between variables, including program completion and urine drug screening results. This proposal fills this gap with bivariate statistical models to better describe the clinical picture and relationships therein of this vulnerable population.

Despite success among most (75.5%) of participants, 86 women (21.8%) tested positive for illicit substance use at delivery despite their engagement and completion of the program. This suggests that the program may not be entirely effective in eliminating illicit substance use among all participants. Examining the social determinants of health may be useful to explore potential underlying factors contributing to the continued positive urine drug screens among this population. Social determinants of health, which encompass various social, economic, and environmental factors that influence health outcomes, could be a valuable lens through which to understand this outcome. For instance, examining the socioeconomic status of participants may shed light on the role of poverty, lack of access to stable housing, or limited employment opportunities in perpetuating illicit substance use. Further analyses in this area could contribute to a more comprehensive understanding of the intricate interplay between social determinants of health and substance use and ultimately inform strategies to optimize program efficacy to address these underlying factors.

5.0 Methods

5.1 Overview of Research Question and Current Study

The aim of this research study is to identify the social determinants of health that may be associated with pregnant women who are enrolled in a substance use treatment program but still test positive for illicit drug use at the time of delivery and their associated birth outcomes. The current study focuses on participants of the Drug Free Moms and Babies project. As a result of the success observed in the pilot sites, the Drug Free Moms and Babies (DFMB) Project has experienced significant expansion due to grant funding through state and national grants, now providing services to more than 2,000 women across 16 sites in 18 counties in West Virginia. Notably, the West Virginia Bureau for Behavioral Health was awarded a three-year block grant under the State Pilot Grant Program for Treatment for Pregnant and Postpartum Women from SAMSHA in 2021. This grant, totaling $2.7 million, will further support services for pregnant and postpartum women with substance use disorder in West Virginia, allowing for continued growth and expansion of the state's DFMB program.

The current research question of interest is to identify social determinants of health that may contribute to the persistence of illicit drug use among pregnant women despite their engagement in the DFMB program. To investigate this research question, a retrospective analysis of data collected from the DFMB program will be conducted. The data will include the same categories of information as observed in the pilot study, on participant demographics associated with social determinants of health and select maternal and infant health outcomes. By examining the social determinants of health, this study aims to identify potential underlying factors that may

contribute to continued illicit drug use during pregnancy, even among women who are enrolled in a substance use treatment program. The results may have implications for the development of targeted interventions and strategies to address the underlying social determinants of health that contribute to continued substance use in this population.

5.2 Data Sources

This study utilized a secondary data analysis design using data collected from all 16 existing Drug Free Moms and Babies project sites across 18 counties in West Virginia between the years 2018 and 2022. The initial analysis involved the examination of demographic data as related to the social determinants of health, from a total of 2350 participants. These data were compared between program completers (N=1557) and program non-completers (N=793). Demographic data was collected from maternal self-report, including trimester entering prenatal care, trimester entering the DFMB project, maternal age at time of program entry, race, housing at time of program entry, insurance, income, education, employment, marital status, cohabitation, and planned pregnancy. It is worth noting that the analysis did not include site identifiers or characteristics as part of the variables examined for participants.

A subsequent subset analysis was performed on for this study on data from women to compare the statistical relationship between the social determinants of health and urine drug screening results at delivery (Figure 1). Participants who did not complete the program (N=793) were excluded from this analysis. Further exclusions were made for participants who did not report urine drug test results at delivery (N=287), as well as those who tested positive for prescription drug use only (N=312). Participants who tested positive for prescription drug use only were

excluded, as they may potentially confound the results of the study. If the study includes data on prescribed drug use, it may be difficult to distinguish between intended and unintended drug use. For example, a mother who tests positive for a prescribed drug may have been using it as prescribed by her healthcare provider for a legitimate medical condition, or she may have been misusing it in excess. Without proper documentation or information on the purpose and dosage of the prescribed drug use, the study may misinterpret the true nature of the drug use and its relationship with the social determinants of health. The final cohort for analysis consisted of 958 program enrollees, with 524 testing negative and 434 testing positive for illicit substances on urine drug screening at delivery.

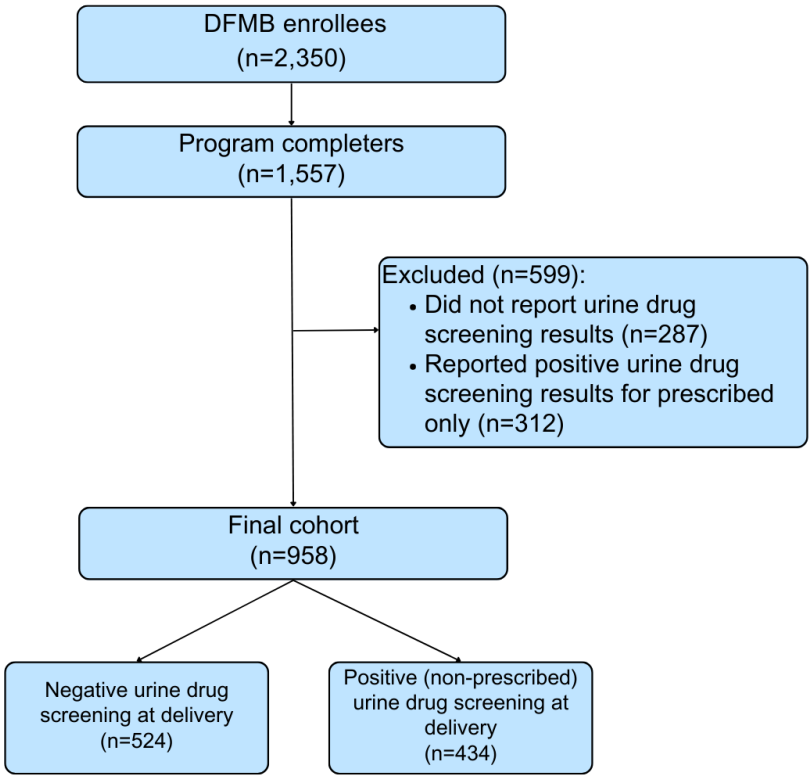


Figure 1 Sample Cohort of Program Completers (N=958)

Additionally, infant outcome data from medical records, including gestational outcome (term or preterm) and NAS diagnosis were available for some program completers included in the subset analysis. The statistical associations between urine drug screening and infant outcomes were examined, applying the same exclusion data. To further investigate the relationship between gestational outcome, NAS diagnosis, and urine drug screening results, a composite variable was created and used in the analysis. The evaluation was acknowledged by the University of Pittsburgh Institutional Review Board as Non-Human Subjects research, qualifying as an exemption for analysis of existing data with de-identification.

5.3 Statistical Analysis

The study utilized bivariate tests, including chi-square tests where applicable, to examine the relationship between each social determinant of health and the dependent variable of maternal urine drug test result at delivery. This analysis was conducted on the entire sample for both program completers and non-completers, as well as for program completers who met inclusion criteria for the subset analysis. Moreover, the subgroup analysis included bivariate tests to explore the association between social determinants of health and the dependent variable of maternal urine drug screening result at delivery. Finally, a covariate analysis was performed to examine the relationship between birth outcomes (the composite variable of gestational outcome and NAS diagnosis) and maternal urine drug screening result. Variables with missing data below 5% were considered to be normally distributed. Significance was set at $p<0.05$ for all analyses. All data management and analysis were conducted using STATA version 16.

6.0 Results

6.1 Overall Patient Demographics: Program Completion Status

Demographic information of patients pertaining to social determinants of health was collected for a total of 2350 unique individuals, which included all DFMB enrollees between 2018-2022. The enrolled individuals were classified into two groups based on program completion status: program non-completers (N=793) and program completers (N=1557). Bivariate analyses were conducted to examine the associations between social determinants of health and the identified groups.

Statistically significant associations were found between program completion or non-completion status and various variables related to the social determinants of health among DFMB enrollees (N=2350) (Appendix Table 1). Statistical analysis revealed a significant relationship between program completion status and both prenatal care attendance and enrollment in the DFMB Project, with each defined as a minimum of one visit. Among enrollees, the majority (56.6%) entered prenatal care during their first trimester with similar rates for each program completers and program non-completers ($p<0.001$). Regarding DFMB entry, there was a higher likelihood of first trimester enrollment among program non-completers (39.1%) compared to program completers (25.0%), with the majority of program completers entering in the second trimester (39.0%, $p<0.001$). Program completers tend to be slightly older, on average, compared to non-completers ($p<0.001$). Among program non-completers, a higher proportion of pregnancies that were not planned or desired (10.3%) was observed compared to completers (7.0%). The majority of enrollees were unmarried (72.2%) and cohabitating (46.2%), and among program non-

completers, there was a higher likelihood of being separated/divorced/widowed and cohabitating compared to program completers ($p=0.009$, $p=0.019$). Program completers were more likely to have a permanent residence ($p<0.001$), higher rates of private insurance ($p<0.001$), higher education levels (e.g., college graduate/graduate school; $p<0.001$), and full-time employment ($p<0.001$) compared to non-completers. Additionally, increasing income level was associated with a higher rate of program completion ($p<0.001$).

The results indicate that there are no significant differences in maternal race between program completers and non-completers ($p=0.209$). However, it is of note that most of the participants in both groups identified as White (91.7% completers vs 89.7% non-completers), with smaller proportions identifying as Black, Mixed race, or having missing/unknown race information.

6.2 Subset Analysis

Of the program completers who reported urine drug screening results at delivery (N=958), 524 participants were reported to have a negative urine drug screen at delivery, while 434 participants were reported to have a positive urine drug screen (for non-prescribed drugs) at delivery.

6.2.1 Social Determinants of Health

Several variables among the final cohort (N=958) showed a statistically significant association with urine drug screening results at delivery (Appendix Table 2). Women who reported a planned pregnancy were less likely to have a positive urine drug screen at delivery compared to those who reported an unplanned pregnancy, regardless of whether or not the pregnancy was desired ($p<0.001$). For each unit increase in maternal age at program entry, there was a 0.035 increase in the log-odds of having a negative urine drug screen at delivery ($p=0.0018$). Participants who were cohabitating had a higher percentage of positive urine drug screens at delivery compared to those who were not cohabitating ($p=0.010$). Participants who entered during the third trimester or postpartum period had a higher percentage of positive urine drug screens at delivery compared to those who entered during the first or second trimester ($p<0.001$). Participants who were living in temporary housing, shelters, jail/prison, or homeless at the time of program entry had higher rates of positive urine drug screens at delivery compared to those living in a permanent residence, with friends/family, or in a residential treatment program ($p=0.010$). Participants with Medicaid insurance had a higher prevalence of positive urine drug screens at delivery compared to those with private insurance ($p=0.001$). As income level increased, there was a significant reduction in the proportion of positive drug urine screens at delivery ($p<0.001$). Participants who were not employed had a higher percentage of positive urine drug screens at delivery compared to those who were employed part-time or full-time ($p=0.001$).

Results show that there is no significant difference in the proportion of women who tested positive for drug use at delivery based on race ($p=0.687$). Similarly results show that there is no significant difference in the proportion of women who tested positive for drug use at delivery based on education level ($p=0.146$) or marital status ($p=0.391$).

6.2.2 Birth Outcomes

Analysis of maternal drug screening results at delivery and infant outcomes found a positive association between drug screening results at delivery and infant gestational outcomes (Appendix Table 3). The gestational outcomes reported in this study showed that most of the births (81.7%) were live term births, while a smaller proportion (8.1%) were live preterm births. The occurrence of preterm births was significantly associated with positive urine drug screening results at delivery ($p=0.021$). Additionally, infants diagnosed with Neonatal Abstinence Syndrome (NAS) at birth were more likely to have positive urine drug screenings at delivery, indicating an association between NAS diagnosis and drug exposure during pregnancy ($p<0.001$).

Upon conducting covariate analysis (Appendix Table 4), the study found that participants who delivered at full-term without an NAS diagnosis had the highest proportion of negative urine drug screening at delivery (85.9%, $p<0.001$). However, the majority (52.3%) of positive urine drug screenings were observed among those who delivered full-term without an NAS diagnosis. Conversely, among the women who screened negative for drug use at delivery, 5.5% delivered preterm without an NAS diagnosis. In contrast, 7.6% of those who screened positive for drug use at delivery delivered preterm without an NAS diagnosis.

7.0 Discussion

7.1 Social Determinants of Health

In this section, we will discuss how the social determinants of health relate to completion rates of substance use disorder treatment programs and drug screening results for pregnant women in the Drug Free Moms and Babies Project. Specifically, we will examine how factors at the four levels of the social ecological model are associated and consider the implications of these findings to enhance the DFMB Project and its programmatic outcomes.

7.1.1 Individual Level

Younger maternal age was associated with both program non-completion and positive urine drug screening result at delivery. Younger women have been found face challenges such as lack of social support (Salas-Wright et al., 2015) and increased likelihood of financial instability (Stone, 2015). Having social support is typically essential for treating substance use disorder and achieving recovery since it can give individuals a feeling of belonging, responsibility, and motivation to participate in treatment. Additionally, financial stability is crucial for treatment programs, as they require not only supports to pay for treatment-related expenses, but also meet basic needs including the purchase of reliable housing and food. The lack of these factors for younger participants may contribute to non-completion of the DFMB program. Studies also show that pregnant adolescents have the highest illicit drug use rates, followed by young adults and then adults (Stone, 2015). Limited awareness of the harms of substance use during pregnancy, risk-

taking behaviors, and social and economic challenges may contribute to this trend. Considering these factors may explain the higher rates of positive urine drug screening results at delivery among younger program participants.

Planned pregnancy status was associated with program completion and urine drug screening results, notably that unplanned pregnancies were associated with program non-completion and positive urine drug screening results at delivery. The estimated rate of unintended pregnancy among pregnant women enrolled in DFMB of 73% is much higher than the national rate of 45% (Finer & Zolna, 2016). Unplanned pregnancies have previously been linked to inadequate prenatal care, as well as adverse birth outcomes due to increased exposure of the developing embryo and fetus to illicit drug use, alcohol consumption, smoking, and poor nutrition (Hellerstedt et al., 1998; Rosenberg et al., 2003). The obstacles that individuals with SUD encounter when accessing healthcare, such as discrimination and maltreatment, can result in limited utilization of services, potentially contributing to the high rates of unintended pregnancy. Women who use drugs, for instance, may avoid seeking medical care due to concerns about being reported to law enforcement by healthcare providers, as supported by research (Biancarelli et al., 2019; Stengel, 2014; Swan et al., 2020) which may explain higher rates of program non-completion and testing positive for drug use at delivery.

7.1.2 Interpersonal Level

Relationship breakdowns and less stable relationships may pose challenges for completing a treatment program for substance use disorder. Women who were unmarried were found to be more likely to be program non-completers compared to those who are married. This finding may be explained by the documented link between stress and substance use, suggesting that unmarried

women who are the sole provider for their family and have limited income may turn to illicit drug use as a way of coping (O'Doherty, 1991; O'Doherty and Davies, 1987), and thus disengage with treatment. On the other hand, it is possible that this result suggests the protective role of being married and having social support against substance use, as previous studies have indicated (Duncan et al., 2006; Heaman and Chalmers, 2005). This protective factor could enable these women to have the necessary support to stay engaged in DFMB and successfully finish the program. Although marital status was not found to have a statistically significant association with maternal urine drug screening results, the study's findings suggest that unmarried women may be more vulnerable to stress and limited social support, which may increase their risk of substance use and decrease their risk of testing negative for drug use upon delivery. Therefore, further research should investigate the relationship between social support, stress management, and substance use outcomes in unmarried women enrolled in substance use treatment programs.

Cohabitation is another social determinant of health that was found to be statistically associated with program non-completion and positive urine drug screening results at delivery. Research indicates that cohabitating relationships are generally less stable than married relationships in various countries, including the United States (Thomson et al., 2019; Bastin et al., 2012; Kennedy and Thomson, 2010). Additionally, some studies have suggested that cohabitating couples may have lower commitment to the relationship and more depressive symptoms than married couples (Stanley et al., 2004). Thus, cohabitating relationships may pose challenges for women completing treatment programs for substance use disorder and abstaining from drug use throughout the program. While a minimal amount of research has been performed on the association between cohabitation and substance use, one study survey data from more than 1,400 heterosexual couples who were living together between 2001 and 2016 suggested that cohabiting

partners' behaviors, particularly their drinking habits, may be influenced by living together. The data indicated that one partner's drinking patterns could significantly predict the future alcohol consumption of both partners. In the present study, this suggests that if a DFMB participant was living with a partner who also engaged in substance use or had a substance use disorder, they might be more inclined to adopt similar behaviors. Living environments with frequent exposure to substances may make it harder for these women to continue engage in their own treatment through program completion, as well as test negative for drug use at delivery.

7.1.3 Community Level

Both program completers and non-completers had a higher likelihood of entering prenatal care during the first trimester of pregnancy. While early initiation of prenatal care has been linked to better health outcomes for mothers and babies, including decreased risk of low birthweight and prematurity (El-Mohandes et al., 2003), one study found that women who used illicit substances lacked trust in healthcare providers to safeguard them from the legal and social repercussions of identification, which led them to avoid or emotionally disconnect from prenatal care (Roberts et al., 2010). Non-completion of the program for the participants who entered prenatal care early may be due to the fear that sustained engagement will lead to legal ramifications, such as loss of child custody or incarceration.

On the other hand, when it comes to enrollment in the DFMB Project, most program completers enrolled during the semester trimester, while the majority of program non-completers enrolled in the first trimester. Previous research indicates that early interventions for substance use disorders have been associated with numerous benefits, such as preventing the development of severe substance dependency and related physical, psychological, and emotional problems

associated with addiction (Abuse, 2016). Insufficient research has been conducted on the impact of enrolling in substance use treatment in a timely manner on program outcomes. Based on the findings related to disengagement from prenatal care, it is possible that similar factors may play a role in the decision of individuals to disengage from substance use treatment and not complete the DFMB Project altogether early on. Stigma and the fear of punitive measures from healthcare providers are known to be significant deterrents for those seeking treatment for their substance use disorders (Stone, 2015). However, additional research is required to examine the degree to which a participant's entry time into a treatment program affects their completion status.

Of program completers, early enrollment in prenatal care or the DFMB Project, specifically during the first or second trimester, was associated with a higher likelihood of screening negative for drug use at delivery. Studies have consistently shown that women who use substances and receive prenatal care tend to have better outcomes and more opportunities for other health-promoting interventions compared to those who do not receive care (Stone, 2015). Engagement in these programs provides the mother to a range of services, including physical examinations, fetal monitoring, and social services, as well as appropriate SUD interventions like MAT or motivational interviewing, that empower women with knowledge and skills to make informed choices for their own and their baby's health early on in their pregnancy. Again, there is limited research on how the timing of participant entry to prenatal or integrated treatment programs affects health outcomes. However, previous studies suggest that earlier entry to these programs can inform and motivate mothers early on in pregnancy to abstain from substance use, leading to better health outcomes.

Living in an unstable housing situation, including temporary housing, shelter, or homelessness, was associated with both program non-completion, as well as positive urine drug

screening at delivery. According to Cheng et al. (2014), individuals with SUD who live in unstable housing experience higher levels of stress, anxiety, and are at greater risk of relapse compared to those who reside in permanent housing. Additionally, participants with unstable housing pose unique challenges for trying to overcome substance use, as they may face difficulties accessing treatment and have limited social support networks (National Coalition for the Homeless, 2009). For example, these individuals often cite lack of transportation as a barrier to treatment, which may hinder their ability to complete the treatment program. Furthermore, mothers in unstable housing situations often struggle to meet their own and their children's basic needs and rely on substance use as a coping mechanism (Slesnick et al., 2023). Studies have reported that between 8% and 60% of samples of these mothers exhibited high rates of alcohol and substance dependence (Chambers et al., 2014; Slesnick & Erdem, 2013; Welch-Lazoritz et al., 2015). This may help clarify why women who live in unstable housing situations are more likely to test positive for drug use at the time of delivery.

Results show that participants with Medicaid insurance were associated with program non-completion and positive urine drug screening results, as compared to participants with private insurance. Medicaid insurance can serve as a proxy of an individual's income status, as it is a program specifically designed for low-income individuals. According to previous studies (Hsiang et al., 2019), individuals who have Medicaid insurance may encounter more challenges when accessing healthcare, such as having fewer treatment services available, limited provider options, and longer wait times for appointments. Additionally, Medicaid reimbursement rates for healthcare providers are generally lower than those for private insurance, making it less financially attractive for healthcare providers to serve Medicaid patients. In light of the results for participants with Medicaid insurance, it is plausible to consider that limited access to high-quality prenatal care or

SUD treatment options may have contributed to participants not completing the DFMB program or testing positive for drug use at delivery.

Higher education levels were associated with program completion. Although the present study only includes women with substance use disorder, previous research by Fothergill (2008) has shown that individuals who did not complete high school are at a 3-4 times greater risk of developing drug use disorder compared to those with a college degree. While the reasons for this remain largely unclear, higher educational attainment may increase an individual's opportunity for employment and income, which can reduce financial stress and provide a sense of stability and support. These findings suggest that participants with a higher education level may have an advantage in completing the DFMB program, as education may provide individuals with greater resources and skills to overcome challenges and achieve their goals. Although education level was not linked to maternal drug urine screening results in this study, it is still significant for program completion. Addressing educational disparities may be important for improving treatment access and success for individuals with substance use disorder. Further research is needed to comprehend the relationship between education level and substance use disorder treatment outcomes.

Unemployment was associated with program non-completion and positive urine drug screening result at delivery. A study found that individuals who were unemployed had a higher rate of illicit drug use at 18%, compared to part-time workers at 10% and full-time workers at 8% (Badel & Greaney, 2021). When individuals are not employed or are not part of the labor force, they may face financial difficulties due to a lack of income or dependence on government benefits. This financial stress may lead to increased susceptibility of drug use as a coping mechanism and may explain why participants who were unemployed tested positive for drug use at delivery. Additionally, without a structured routine or work schedule, individuals may have more free time

that they may spend engaging in drug use or other risky behaviors. The absence of a structured routine can also make it challenging for participants to comply with treatment programs, such as substance use disorder treatment programs that demand regular attendance and involvement. This may account for the finding of non-completion among these participants. It is worth mentioning that substance use can also negatively affect employment opportunities, due to gaps in employment history, criminal record, and an increased likelihood of failing drug tests necessary to obtain employment.

7.1.4 Institutional Level

Low-income was associated with program non-completion and positive urine drug screening results at delivery. While there is no conclusive proof of a causal relationship between poverty and addiction, research has found a higher incidence of substance abuse among those with lower economic status (Patrick, 2012). Consistent with prior research, one study found that individuals who reported using illicit drugs in their lifetime were 34% more likely to experience substance abuse-related issues in the previous year if their annual income was less than $20,000/year (Baptiste-Roberts, 2018). Lower household income has additionally been associated with lower health insurance coverage rates (Lee et al, 2021), increased unemployment rates (Badel & Greaney, 2021), and lower educational attainment (Fothergill, 2008), all of which impact an individual's ability to access necessities, including food, stable housing, and access to healthcare. The limited availability of basic necessities could contribute to the continuation of the poverty and addiction cycle and may explain the higher program non-completion and positive urine drug screening results at delivery among low-income DFMB participants.

The study did not find any significant association between race and program completion status or maternal urine drug screening result at delivery. However, it is important to note that the majority of the sample included in the study was White. This means that there may not have been enough diversity in the sample to fully capture any potential differences in outcomes among different racial or ethnic groups. In addition, there may be other factors related to race or ethnicity, such as discrimination, that were not measured in the study but could still impact outcomes related to substance use disorder treatment. Therefore, it is important for future research to explore these potential differences and to ensure that study samples are diverse and representative of the larger population.

7.2 Birth Outcomes

Observing birth outcomes is necessary to gauge the effectiveness of the treatment program and the gaps that still exist for the pregnant women enrolled. The analysis also adds evidence to the growing body of literature that reports a relationship between maternal substance use disorder and adverse infant health effects. These findings can support reliability and generalizability of results, which has implications for public health interventions.

Preterm birth occurred at a higher rate in those women who screened positive for drug use at delivery compared to those who did not (4.9% v. 3.2%), which is consistent with prior work (Ney et al., 1990; Vélez et al., 2008; Baer et al., 2019). Yet, even with the overall prematurity rate of 8.1% for DFMB participants is better than West Virginia's live prematurity rate statewide (12.6%) (*West Virginia Priority Topic Investments CDC*, n.d.). This difference suggests that

DFMB's approach has the potential to improve mother and fetal health outcomes, particularly given that heightened risks facing DFMB participants.

The results indicate a significant association between infant NAS diagnosis at birth and maternal urine drug screenings at delivery, with women who had a positive urine drug screen more likely to deliver infants diagnosed with NAS compared to those with a negative urine drug screening. It is worth mentioning that 59.9% of participants who tested positive for drug use during urine screenings at delivery had an infant who did not develop neonatal abstinence syndrome. This observation could be clarified by investigating the specific type of drug consumed by the mother since opioids have been found to be strongly associated with NAS, followed by antidepressants, barbiturates, and benzodiazepines compared to other types of drugs. Unfortunately, the current study did not include data on the type of drug used, and it would be beneficial to explore this variable further in conjunction with NAS diagnosis. At the same time, the findings also indicate that some women who tested positive for drug use during delivery did not have an infant diagnosed with NAS, while some women who tested negative for drug use during delivery did have an infant diagnosed with NAS. This suggests that the interpretation of negative drug screening results during pregnancy should not necessarily be taken as evidence of complete abstinence from drug use. The mother may have abstained from drug use for a period leading up to the test, but it is not a guarantee that she has abstained from drug use altogether. On the other hand, positive drug test results do not necessarily mean that the mother has been non-compliant with the program's recommendations. It is important to remember that addiction is a complex issue, and it can be challenging for individuals to stop using drugs abruptly, even with the best intentions and the support of the program.

When comparing the prevalence of NAS between the DFMB program and the statewide rate in West Virginia, it was observed that NAS prevalence in the treatment program population was approximately three percentage points higher (8.1% vs. 5.5%), which is consistent with the high- risk population enrolled in DFMB. Despite the presence of integrated treatment programs like the Drug Free Moms and Babies Project, additional support for the participants is still needed.

The analysis of covariates suggests both gestational outcome and NAS diagnosis are associated with maternal urine drug screening results at delivery. The results suggest that the occurrence of full-term delivery without an NAS diagnosis are associated with negative urine drug screening at delivery. This finding is not unexpected since mothers who abstain from drug use during pregnancy are more likely to have healthy gestational outcomes, such as full-term delivery without an NAS diagnosis. On the other hand, the majority of positive urine drug screenings were observed among those who delivered full-term without an NAS diagnosis, indicating that maternal drug use during pregnancy may not always result in neonatal complications such as NAS. This finding could be explained by the type of drug used by the mother, as some drugs have been found to have a higher correlation with NAS than others. Furthermore, the fact that some women who screened negative for drug use at delivery delivered preterm without an NAS diagnosis, and some who screened positive delivered preterm without an NAS diagnosis, suggests that maternal drug use during pregnancy is not the only factor contributing to preterm birth and the occurrence of NAS. Other factors, such as genetics, environmental factors, and access to maternal healthcare, may also play a role. Overall, the results suggest that maternal drug use during pregnancy is associated with gestational outcomes and the occurrence of NAS but is not the only factor contributing to these outcomes.

7.3 Limitations

The study has several limitations that need to be considered. First, some variables in the analysis, such as income, education, cohabitation, planned pregnancy, gestational outcome, and NAS diagnosis had missing data in over 5% of the sample. This could be due to participants not answering survey questions or healthcare institutions not reporting birth outcomes. The smaller sample size due to missing data could affect the precision and validity of the analysis, making it harder to investigate the effect of social determinants on the variables. To mitigate this issue, statistical techniques like multiple imputation or sensitivity analyses can be used to minimize the impact of missing data on the study's conclusions.

Second, data on many of the social determinants of health linked to substance use during pregnancy, including mental health history, access to transportation, and stigmatization, were either not collected and/or are difficult to measure. The lack of data on these important social determinants of health may limit the study's ability to draw comprehensive conclusions and make recommendations for improving substance use treatment programs for pregnant women.

Third, the study's conclusions on the social determinants of health related to the effectiveness of substance use treatment program are limited due to the absence of a control group and lack of information on why some participants did not complete the program. This makes it challenging to determine the impact of these factors on the outcomes of interest and identify gaps in access to treatment that need to be addressed to improve program engagement, retention, and reduce substance use disorder prevalence in this population.

Fourth, a limitation pertains to the generalizability of the program. The program was conducted in West Virginia, which has unique demographics and resources compared to other regions. For instance, West Virginia exhibits higher rates of age-adjusted overdose mortality (90.9

per 100,000 vs. 28.3 per 100,000) and poverty (15.8% vs. 11.6%) compared to the national average and may possess distinct resources aimed at addressing these challenges (Drug Overdose Mortality by State, 2021.; US Census Bureau, 2022). Therefore, the recommendations set out for the Drug Free Moms and Babies Project in this study may not be applicable to other integrated treatment programs in regions with different demographic and socioeconomic characteristics.

Fifth, the study is limited by the absence of data on the quantity and nature of maternal healthcare and substance use treatment services received by pregnant women in DFMB. This makes it challenging to accurately evaluate engagement and participation in the treatment program and assess the impact of each intervention on outcomes of interest. Treatment intensity is an important factor that can influence treatment outcomes, but the lack of information on the number of services received hinders the ability to measure it accurately. This limitation could impact the validity of the findings and hinder the ability to draw conclusive evidence about the effectiveness of the interventions provided.

Finally, the study's limitations include the absence of data on the location of program participants and the services they received. Over 64% of the West Virginia population lives in rural areas, where healthcare infrastructure is limited. The type of site where treatment is received can also affect the resources and care available. The study may not accurately capture the impact of limited access and resources for maternal and infant outcomes without site-by-site data.

Future studies should aim to address these limitations and incorporate a broader range of social determinants of health, while also considering the unique characteristics of different populations and regions, to ultimately improve the effectiveness of substance use treatment programs and promote better health outcomes for pregnant women and their infants.

7.4 Contributions

This research study has made significant contributions to the growing body of work that highlights the role of social determinants of health as barriers to seeking treatment for pregnant women with substance use disorder. Through the statistical analyses conducted in this study, I have identified associations between social determinants of health and test results at delivery among pregnant women enrolled in the Drug Free Moms and Babies (DFMB) program, a substance use treatment program for pregnant women.

My findings have demonstrated that social determinants of health, such as trimester entering prenatal care and the DFMB program, maternal age, housing, income, insurance status, employment, cohabitation, and planned pregnancy, are important factors that can influence the persistence of illicit drug use at the time of delivery, despite engagement in a substance use treatment program. This provides further evidence that social determinants of health play a significant role in shaping health outcomes for pregnant women with substance use disorder. Furthermore, this study has examined the relationships between birth outcomes and test results at delivery, shedding light on the potential impact of persistent illicit drug use during pregnancy on maternal and infant health outcomes. This adds to the existing literature by providing valuable insights into the adverse effects of continued substance use during pregnancy, even among women enrolled in a treatment program.

The findings of this study have important implications for integrated treatment programs that aim to reduce barriers to seeking treatment for pregnant women with substance use disorder. By identifying the social determinants of health that contribute to persistent illicit drug use during pregnancy, interventions and strategies can be developed to address these underlying factors and provide more comprehensive care for this vulnerable population. Integrated treatment programs

that consider and address social determinants of health may have the potential to improve treatment outcomes, reduce health disparities, and promote positive birth outcomes for pregnant women with substance use disorder.

7.5 Future Directions

Among the recommendations for a treatment program for pregnant women with substance use disorder, several are more feasible for implementation in the short-term, while others may require more time and resource intensive to implement effectively. Expanding the program's referral services could aid in recruiting more individuals in the short-term. Engaging women earlier in pregnancy through local substance abuse hotlines can be implemented relatively quickly by establishing partnerships with local hotlines and integrating them into the referral process for the treatment program. Hotlines may act as the first point of contact for individuals seeking help with substance use disorder and integrating the treatment program into the referral process of these hotlines can increase the program's visibility and accessibility to pregnant women in need. While research on the effectiveness of helplines aimed to address substance use is limited, one study supported that participants with increased utilization were more likely to be referred and access treatment services compared to those who did not use the helpline (Gates, 2015). The Drug Free Moms and Babies Project could specifically benefit by forming a partnership with HELP4WV, a 24-hour helpline for West Virginians seeking help for substance use or mental illness. In the year 2021, the organization effectively dispensed over 1,300 doses of naloxone to individuals who called the helpline, offering just a glimpse of the wide range of services provided (Benda, 2021). The creation of services and resources specific to pregnant women under this helpline would allow

the Drug Free Moms and Babies Project to expand its recruitment efforts to support early program and/or prenatal care entry to improve programmatic outcomes.

Another short-term recommendation for strengthening program capacity is to designate a key personnel or device within each DFMB site or region to aid in applying for governmental assistance programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and Temporary Assistance for Needy Families (TANF). Applying for governmental assistance programs can be complex and overwhelming since the application process often involves navigating various forms, eligibility requirements, and documentation. Additionally, the language used in these applications can sometimes be technical and difficult to understand, and the requirements may vary by program and jurisdiction. Implementing this step would entail securing additional funding to recruit dedicated staff members or devices for offering assistance in accessing governmental assistance programs. However, the infrastructure for this system is already in place in several West Virginia jails and prisons, where kiosks are specifically designated for signing up for Medicaid upon release from incarceration. Therefore, leveraging the existing infrastructure in these facilities can potentially streamline the implementation process for this recommendation, making it more feasible to establish similar assistance programs within the DFMB sites or regions.

Once the program has gained traction in terms of dissemination and support for current enrollees, additional recommendations can be explored for potential implementation in the future, including expanding current program capacity. Establishing a mentorship program with past program completers who have maintained sobriety could be a future direction for the DFMB program but may require additional resources and planning. This could involve identifying and training mentors, developing a framework, and coordinating ongoing support. The program may

involve educational and skill-building workshops to aid in the development of life skills and coping mechanisms in younger women, so they are better equipped to handle the difficulties of pregnancy, parenthood, and recovery. Although the implementation of such a program may require a more established patient population and oversight by additional DFMB staff members, it has the potential to provide valuable peer support and guidance for younger enrollees, ultimately enhancing participant retention and reducing the risk of relapse.

Additionally, long-term recommendations can be made to further support the program's Medicaid population. Referrals to family planning services could be added to the DFMB program to prevent future unplanned pregnancies. This could involve providing access to affordable and effective birth control choices, educating women about contraceptive options, and may be particularly beneficial for women enrolled in DFMB with Medicaid insurance, as West Virginia Medicaid covers family planning services statewide. Further, the Drug Free Moms and Babies Project could assume a more prominent role in participant advocacy for Medicaid enrollees at the state level. This could entail coordinating with Medicaid providers to provide adequate coverage for treatment services for substance use disorders. However, it should be acknowledged that incorporating family planning services into the program would necessitate policy changes, including navigating regulatory and administrative processes. Similarly, advocating for Medicaid reimbursement for treatment services for substance use disorders would require coordination with multiple stakeholders, including the Center for Medicare and Medicaid Services and the West Virginia State Legislature, as well as advocacy efforts to ensure adequate coverage.

Overall, continued efforts to address social determinants of health and expand access to integrated treatment programs can help to reduce the barriers to care for pregnant women with substance use disorder and improve outcomes for both mothers and babies. Further research and

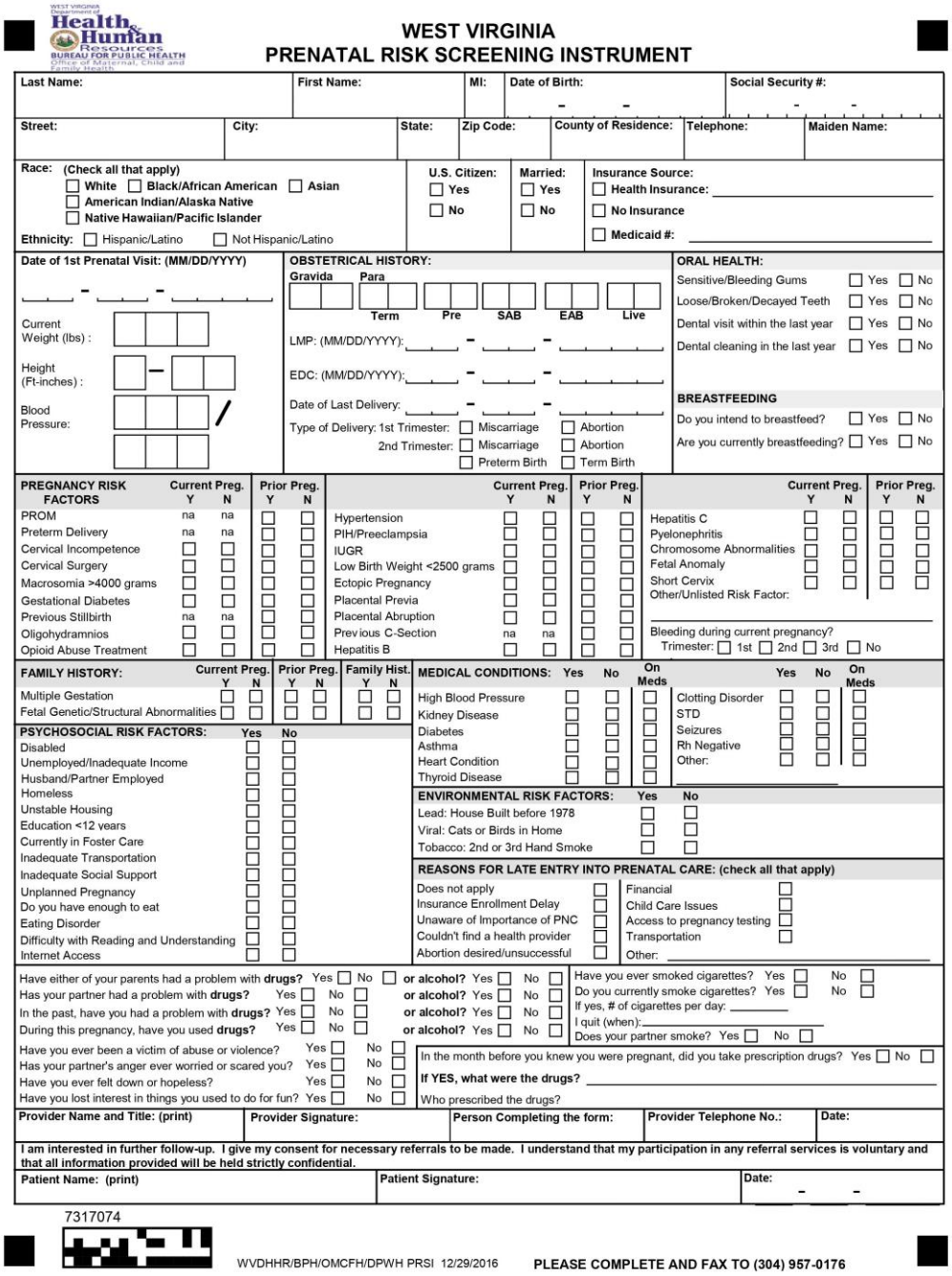
interventions aimed at strengthening referral services to engage women earlier in pregnancy, expand the capacity of current program supports, and advocacy for enrollees with Medicaid insurance can help mitigate the negative effects of substance use disorder in pregnancy and improve maternal and fetal health outcomes. This underscores the importance of a comprehensive public health approach to addressing substance use disorder in pregnancy and promoting the health and well-being of both the mother and the baby.

8.0 Conclusion

Substance use during pregnancy is a significant public health concern that results in severe and costly harms for both mothers and infants, leading to adverse obstetric and birth complications. This study's findings highlight the contribution of social determinants of health such as time of prenatal care and program entry, maternal age, housing, insurance status, income, employment status, cohabitation, and planned pregnancy to persistent drug use among pregnant women. Thus, a multidisciplinary approach is needed to address substance use among this population, considering their broader social and economic context. Drug Free Moms and Babies (DFMB), an integrated treatment program in West Virginia, exemplifies such an approach by providing tailored services, including substance use treatment and medical care, to address the physical, mental, and social needs of participants. While DFMB has made notable strides in reducing maternal substance use disorder, there is potential to further address social determinants of health by incorporating services such as housing assistance or employment services, expanding Peer Recovery Coaches for specific demographics, and advocating for policy changes to address stigma and societal barriers. Future efforts should capture data on reasons for program non-completion to understand the impact of social determinants of health in this population. By taking an inclusive approach, integrated treatment programs like DFMB can continue to improve outcomes for pregnant women with substance use disorder and their infants.

Appendix A

Appendix Figure 1 Image of West Virginia Prenatal Risk Screening Instrument



WEST VIRGINIA
PRENATAL RISK SCREENING INSTRUMENT

Last Name: | First Name: | MI: | Date of Birth: | Social Security #:

Street: | City: | State: | Zip Code: | County of Residence: | Telephone: | Maiden Name:

Race: (Check all that apply) White; Black/African American; Asian; American Indian/Alaska Native; Native Hawaiian/Pacific Islander
Ethnicity: Hispanic/Latino; Not Hispanic/Latino
U.S. Citizen: Yes; No
Married: Yes; No
Insurance Source: Health Insurance: ____; No Insurance; Medicaid #: ____

Date of 1st Prenatal Visit: (MM/DD/YYYY)
Current Weight (lbs) :
Height (Ft-inches) :
Blood Pressure: /

OBSTETRICAL HISTORY:
Gravida | Para (Term | Pre | SAB | EAB | Live)
LMP: (MM/DD/YYYY):
EDC: (MM/DD/YYYY):
Date of Last Delivery:
Type of Delivery: 1st Trimester: Miscarriage; Abortion
2nd Trimester: Miscarriage; Abortion; Preterm Birth; Term Birth

ORAL HEALTH:
Sensitive/Bleeding Gums: Yes; No
Loose/Broken/Decayed Teeth: Yes; No
Dental visit within the last year: Yes; No
Dental cleaning in the last year: Yes; No

BREASTFEEDING
Do you intend to breastfeed? Yes; No
Are you currently breastfeeding? Yes; No

PREGNANCY RISK FACTORS	Current Preg. Y	Current Preg. N	Prior Preg. Y	Prior Preg. N
PROM	na	na		
Preterm Delivery	na	na		
Cervical Incompetence				
Cervical Surgery				
Macrosomia >4000 grams				
Gestational Diabetes				
Previous Stillbirth	na	na		
Oligohydramnios				
Opioid Abuse Treatment				

	Current Preg. Y	Current Preg. N	Prior Preg. Y	Prior Preg. N
Hypertension				
PIH/Preeclampsia				
IUGR				
Low Birth Weight <2500 grams				
Ectopic Pregnancy				
Placental Previa				
Placental Abruption				
Previous C-Section	na	na		
Hepatitis B				

	Current Preg. Y	Current Preg. N	Prior Preg. Y	Prior Preg. N
Hepatitis C				
Pyelonephritis				
Chromosome Abnormalities				
Fetal Anomaly				
Short Cervix				
Other/Unlisted Risk Factor:				

Bleeding during current pregnancy?
Trimester: 1st; 2nd; 3rd; No

FAMILY HISTORY:	Current Preg. Y	Current Preg. N	Prior Preg. Y	Prior Preg. N	Family Hist. Y	Family Hist. N
Multiple Gestation						
Fetal Genetic/Structural Abnormalities						

PSYCHOSOCIAL RISK FACTORS:	Yes	No
Disabled		
Unemployed/Inadequate Income		
Husband/Partner Employed		
Homeless		
Unstable Housing		
Education <12 years		
Currently in Foster Care		
Inadequate Transportation		
Inadequate Social Support		
Unplanned Pregnancy		
Do you have enough to eat		
Eating Disorder		
Difficulty with Reading and Understanding		
Internet Access		

MEDICAL CONDITIONS:	Yes	No	On Meds
High Blood Pressure			
Kidney Disease			
Diabetes			
Asthma			
Heart Condition			
Thyroid Disease			

	Yes	No	On Meds
Clotting Disorder			
STD			
Seizures			
Rh Negative			
Other:			

ENVIRONMENTAL RISK FACTORS:	Yes	No
Lead: House Built before 1978		
Viral: Cats or Birds in Home		
Tobacco: 2nd or 3rd Hand Smoke		

REASONS FOR LATE ENTRY INTO PRENATAL CARE: (check all that apply)
Does not apply; Insurance Enrollment Delay; Unaware of Importance of PNC; Couldn't find a health provider; Abortion desired/unsuccessful
Financial; Child Care Issues; Access to pregnancy testing; Transportation
Other: ____

Have either of your parents had a problem with **drugs?** Yes No **or alcohol?** Yes No
Has your partner had a problem with **drugs?** Yes No **or alcohol?** Yes No
In the past, have you had a problem with **drugs?** Yes No **or alcohol?** Yes No
During this pregnancy, have you used **drugs?** Yes No **or alcohol?** Yes No

Have you ever been a victim of abuse or violence? Yes No
Has your partner's anger ever worried or scared you? Yes No
Have you ever felt down or hopeless? Yes No
Have you lost interest in things you used to do for fun? Yes No

Have you ever smoked cigarettes? Yes No
Do you currently smoke cigarettes? Yes No
If yes, # of cigarettes per day: ____
I quit (when): ____
Does your partner smoke? Yes No

In the month before you knew you were pregnant, did you take prescription drugs? Yes No
If YES, what were the drugs? ____
Who prescribed the drugs?

Provider Name and Title: (print) | Provider Signature: | Person Completing the form: | Provider Telephone No.: | Date:

I am interested in further follow-up. I give my consent for necessary referrals to be made. I understand that my participation in any referral services is voluntary and that all information provided will be held strictly confidential.

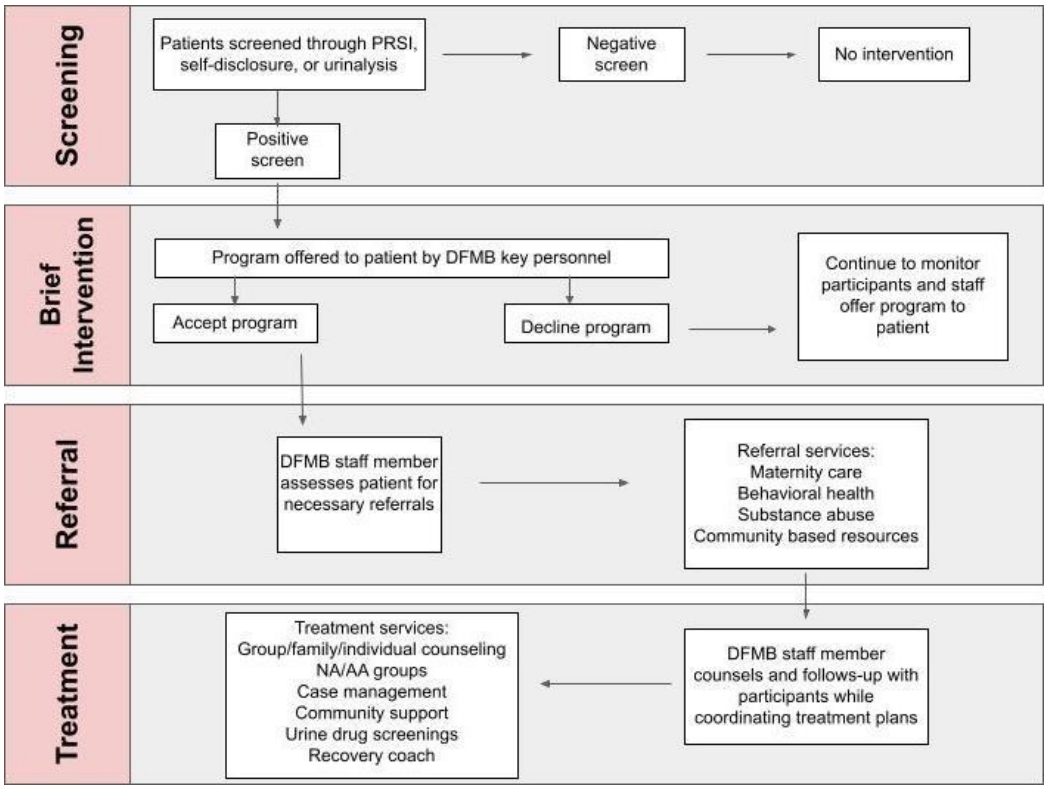
Patient Name: (print) | Patient Signature: | Date:

7317074

WVDHHR/BPH/OMCFH/DPWH PRSI 12/29/2016 **PLEASE COMPLETE AND FAX TO (304) 957-0176**

Note. From West Virginia Department of Health and Human Services. (2016). *West Virginia Prenatal Risk Screening Instrument.* Retrieved from: http://www.wvdhhr.org/mcfh/wv_prentalriskscreeninginstrument2016.pdf

Appendix Figure 2 Standard Screening, Brief Intervention, and Referral to Treatment Model



Note: Adapted from Lilly et al. (2019). *Drug Free Moms and Babies: Qualitative and quantitative program evaluation results from a rural Appalachian state.* Retrieved from PubMed: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6580012/

Appendix Table 1 Social Determinants of Health and Program Completion Status, 2018-2022

Results for cell size < 5 suppressed
(N=2350)

Variable	N	Valid Percent	Program Non-Completers (N=793)	Program Completers (N=1557)	Significance
Individual Level					
Planned pregnancy					p=0.002 (X^2=14.9)
Planned	363	15.5%	127 (16.0%)	236 (15.2%)	
Not planned, but desired	1529	64.9%	515 (65.0%)	1014 (65.0%)	
Not planned, not desired	191	8.1%	82 (10.3%)	109 (7.0%)	
Missing/unknown	267	11.4%	69 (8.7%)	198 (12.8%)	
Interpersonal Level					
Marital status					p=0.009 (X^2=15.2)
Not married	1699	72.2%	546 (68.9%)	1153 (74.0%)	
Married	393	16.7%	136 (17.2%)	257 (16.5%)	
Separated/divorced/widowed	179	7.6%	72 (9.1%)	107 (6.9%)	
Missing/unknown	79	3.4%	39 (4.9%)	40 (2.6%)	
Cohabitation					p=0.019 (X^2=7.9)
Cohabitating	1089	46.3%	347 (43.8%)	742 (47.6%)	
Not cohabitating	693	29.5%	227 (28.6%)	466 (29.9%)	
Missing/unknown	568	24.2%	219 (27.6%)	349 (22.4%)	
Community Level					
Trimester entering prenatal care					p<0.001 (X^2=57.6)
1	1330	56.6%	457 (57.6%)	873 (56.0%)	
2	496	21.1%	182 (22.9%)	314 (20.2%)	
3	138	5.9%	62 (7.8%)	76 (4.9%)	

Postpartum	228	9.7%	29 (3.6%)	199 (12.8%)	
Missing/unknown	158	6.7%	63 (7.9%)	95 (6.1%)	
Trimester entering DFMB Project					p<0.001 (X^2=96.9)
1	700	28.0%	310 (39.1%)	390 (25.0%)	
2	888	35.5%	281 (35.4%)	607 (39.0%)	
3	426	17.4%	120 (15.1%)	306 (19.7%)	
Postpartum	248	9.9%	36 (4.5%)	212 (13.6%)	
Missing/unknown	88	3.5%	46 (5.8%)	42 (2.7%)	
Housing					p<0.001 (X^2=42.1)
Permanent residence	1643	69.9%	508 (64.0%)	1135 (72.8%)	
Friends and family	514	21.8%	206 (26.0%)	308 (19.8%)	
Homeless	20	<1%	7 (<1%)	13 (<1%)	
Residential program	42	1.8%	13 (1.6%)	29 (1.9%)	
Temporary housing/ Shelter / Jail/Prison	86	3.7%	28 (3.5%)	58 (3.7%)	
Missing/unknown	45	1.9%	31 (3.9%)	14 (<1%)	
Insurance status					p<0.001 (X^2=30.5)
Medicaid	2052	87.4%	714 (89.9%)	1338 (86.0%)	
Private	222	9.5%	42 (5.3%)	180 (11.6%)	
Other	28	1.2%	13 (1.6%)	15 (<1%)	
Self-pay	10	<1%	5 (<1%)	5 (<1%)	
Missing/unknown	38	1.6%	19 (2.4%)	19 (1.2%)	
Education					p<0.001 (X^2=38.8)
Less than HS diploma	462	19.7%	178 (22.4%)	284 (18.2%)	
HS diploma/GED	1172	49.9%	407 (51.3%)	765 (49.2%)	
Technical training/some college	423	18.0%	123 (15.5%)	300 (19.3%)	
College graduate/graduate school	123	5.2%	18 (2.3%)	105 (6.8%)	

Missing/unknown	170	7.2%	67 (8.4%)	103 (6.6%)	
Employment					p<0.001 (X^2=27.0)
Not employed	1480	63.0%	509 (64.1%)	971 (62.3%)	
Employed part time	327	13.9%	103 (13.0%)	224 (14.4%)	
Employed full time	462	19.7%	134 (16.9%)	328 (21.1%)	
Missing/unknown	81	3.5%	47 (5.9%)	34 (2.2%)	
Institutional Level					
Maternal race					p=0.209 (X^2=7.16)
White	2142	91.1%	712 (89.7%)	1430 (91.7%)	
Black	126	5.4%	46 (5.8%)	80 (5.1%)	
Mixed race	34	1.5%	12 (1.5%)	22 (1.4%)	
Missing/unknown	44	1.9%	22 (2.8%)	22 (1.4%)	
Income					p<0.001 (X^2=35.5)
< 15k	1266	53.8%	398 (50.2%)	868 (55.8%)	
15k - < 25k	484	20.6%	188 (23.7%)	296 (19.0%)	
25k - < 35k	181	7.7%	76 (9.6%)	105 (6.8%)	
35k - < 75k	112	4.8%	26 (3.3%)	86 (5.5%)	
> 75k	38	1.6%	4 (<1%)	34 (2.2%)	
Missing/unknown	269	11.5%	101 (12.7%)	168 (10.8%)	

Variable	**Program non-completer Mean (SD)**	**Program completer Mean (SD)**	**Significance**
Individual Level			
Maternal age (N=955)	27.1 (5.68)	27.8 (5.79)	p=0.002 (X^2=9.76)

Appendix Table 2 Social Determinants of Health and Urine Drug Screening Results of Program Completers, 2018-2022

Results for cell size < 5 suppressed
(N=958)

Variable	N	Valid Percent	Negative Urine Drug Screen at Delivery (N=524)	Positive* Urine Drug Screen at Delivery (N=434)	Significance
Individual Level					
Planned pregnancy					p<0.001 (X^2=49.2)
Planned	152	15.9%	109 (20.8%)	43 (9.9%)	
Not planned, but desired	643	67.1%	361 (68.9%)	282 (65.0%)	
Not planned, not desired	46	4.8%	17 (3.2%)	29 (6.7%)	
Missing/unknown	117	12.2%	37 (7.1%)	80 (18.4%)	
Interpersonal Level					
Marital status					p=0.391 (X^2=5.20)
Not married	735	76.7%	409 (78.1%)	326 (75.1%)	
Married	147	15.3%	80 (15.3%)	67 (15.4%)	
Separated/divorced/widowed	52	5.4%	27 (5.2%)	25 (5.8%)	
Missing/unknown	24	2.5%	8 (1.5%)	16 (3.7%)	
Cohabitation					p=0.010 (X^2=9.14)
Cohabitating	480	50.1%	248 (47.3%)	232 (53.5%)	
Not cohabitating	290	30.2%	180 (34.4%)	110 (25.3%)	
Missing/unknown	188	19.6%	96 (18.3%)	92 (21.2%)	
Community Level					
Trimester entering prenatal care					p<0.001 (X^2=46.7)
1	592	61.8%	367 (70.0%)	225 (51.8%)	
2	166	17.3%	87 (16.6%)	79 (18.2%)	
3	43	4.5%	13 (2.5%)	30 (6.9%)	
Postpartum	102	10.6%	33 (6.3%)	69 (15.9%)	

Missing/unknown	55	5.7%	24 (4.6%)	31 (7.1%)	
Trimester entering DFMB Project					p<0.001 (X^2=45.4)
1	264	27.6%	171 (32.6%)	93 (21.4%)	
2	384	40.1%	227 (43.3%)	157 (36.2%)	
3	190	19.8%	88 (16.8%)	102 (23.5%)	
Postpartum	103	10.8%	34 (6.5%)	69 (15.9%)	
Missing/unknown	17	1.8%	4 (<1%)	13 (3.0%)	
Housing					p=0.010 (X^2=18.5)
Permanent residence	725	75.6%	411 (78.4%)	314 (72.4%)	
Friends and family	184	14.4%	94 (17.9%)	90 (20.7%)	
Homeless	17	1.8%	5 (<1%)	12 (2.8%)	
Residential program	16	1.7%	13 (2.5%)	3 (<1%)	
Temporary housing/ Shelter/ Jail/Prison	12	1.3%	5 (<1%)	7 (1.6%)	
Missing/unknown	4	<1%	1 (<1%)	3 (<1%)	
Insurance status					p=0.001 (X^2=18.2)
Medicaid	794	82.9%	419 (80.0%)	375 (86.4%)	
Private	139	14.5%	96 (18.3%)	43 (9.9%)	
Other	12	1.3%	6 (1.1%)	6 (1.4%)	
Missing/unknown	13	1.4%	5 (<1%)	8 (1.8%)	
Education					p=0.146 (X^2=10.8)
Less than HS diploma	167	17.4%	92 (17.6%)	75 (17.3%)	
HS diploma/GED	468	48.9%	256 (48.9%)	212 (48.8%)	
Technical training/some college	185	19.3%	105 (20.0%)	80 (18.4%)	
College graduate/graduate school	63	6.6%	39 (7.4%)	24 (5.5%)	
Missing/unknown	75	7.8%	32 (6.1%)	43 (9.9%)	
Employment					p=0.001 (X^2=16.6)

Not employed	574	59.9%	284 (54.2%)	290 (66.8%)	
Employed part time	148	15.4%	88 (16.8%)	60 (13.8%)	
Employed full time	214	22.3%	138 (26.3%)	76 (17.5%)	
Missing/unknown	22	2.4%	14 (2.7%)	8 (1.8%)	
Institutional Level					
Maternal race					p=0.621 (X^2=3.51)
White	867	90.5%	470 (89.7%)	397 (91.5%)	
Black	60	6.3%	36 (6.9%)	24 (5.5%)	
Mixed race	17	1.8%	9 (1.7%)	8 (1.8%)	
Missing/unknown	14	1.5%	7 (1.3%)	5 (1.2%)	
Income					p<0.001 (X^2=27.1)
< 15k	510	53.2%	251 (47.9%)	259 (59.7%)	
15k - < 25k	185	19.3%	106 (20.2%)	79 (18.2%)	
25k - < 35k	78	8.1%	53 (10.1%)	25 (5.8%)	
35k - < 75k	66	6.9%	48 (9.2%)	18 (4.1%)	
> 75k	23	2.4%	17 (3.2%)	6 (1.4%)	
Missing/unknown	96	10%	49 (9.4%)	47 (10.8%)	

Variable	**Negative Urine Drug Screen at Delivery Mean (SD)**	**Positive* Urine Drug Screen at Delivery Mean (SD)**	**Significance**
Maternal age (N=955)	26.6 (5.67)	25.4 (5.81)	p=0.002 (X^2=9.76)

Non-prescribed drugs

Appendix Table 3 Birth Outcomes and Urine Drug Screening Results of Program Completers, 2018-2022

(N=958)
Results for cell size < 5 suppressed

Variable	N	Valid Percent	Negative Urine Drug Screen at Delivery (N=524)	Positive* Urine Drug Screen at Delivery (N=434)	Significance
Gestational outcome					p=0.021 (X=7.69)
Live, term birth	781	81.7%	465 (88.7%)	316 (73.3%)	
Live, preterm birth	79	8.1%	31 (5.9%)	48 (10.8%)	
Missing/unknown	98	10.1%	28 (5.3%)	70 (15.9%)	
Infant NAS diagnosis					p<0.001 (X=133.6)
No	739	77.1%	479 (91.4%)	260 (59.9%)	
Yes	94	9.8%	6 (1.1%)	88 (20.2%)	
Missing/unknown	125	13.0%	39 (7.4%)	86 (19.8%)	

Non-prescribed drugs

Appendix Table 4 Gestational Outcome, NAS Diagnosis and Urine Drug Screening Results of Program Completers, 2018-2022

(N=958)

Variable	N	Valid Percent	Negative Urine Drug Screen at Delivery (N=524)	Positive* Urine Drug Screen at Delivery (N=434)	Significance
Gestational Outcome + NAS					p<0.001 (X^2=157.4)
Full term, NAS yes	83	8.7%	6 (1.2%)	77 (17.7%)	
Full term, NAS no	677	70.7%	450 (85.9%)	227 (52.3%)	
Full term, NAS unknown	21	2.2%	9 (1.7%)	12 (2.8%)	
Pre-term, NAS yes	11	1.2%	0 (0%)	11 (2.5%)	
Pre-term, NAS no	62	6.5%	29 (5.5%)	33 (7.6%)	
Pre-term, NAS unknown	6	<1%	2 (<1%)	4 (<1%)	

Non-prescribed drugs

Bibliography

2020 National Survey of Drug Use and Health (NSDUH) Releases. (n.d.). Retrieved from https://www.samhsa.gov/data/release/2020-national-survey-drug-use-and-health-nsduh-releases

Addiction: A Complex Disease Requiring a Multifaceted Treatment Approach. (2022, September 15). Retrieved from https://americanaddictioncenters.org/our-research/addiction-insights/multifaceted-treatment-approach

Ahlbach, C., Sufrin, C., & Shlafer, R. (2020). Care for Incarcerated Pregnant People With Opioid Use Disorder: Equity and Justice Implications. *Journal of Obstetrics and Gynecology*.

Alhusen, J. L., Ray, E., Sharps, P., & Bullock, L. (2015). Intimate Partner Violence During Pregnancy: Maternal and Neonatal Outcomes. *Journal of Womens Health*, *24*(1), 100–106. https://doi.org/10.1089/jwh.2014.4872

Anbalagan, S., & Mendez, M. (2022). *Neonatal Abstinence Syndrome* [Internet]. StatPearls. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK551498/#_NBK551498_pubdet_

Anderson, B. A., Marshak, H. H., & Hebbeler, D. (2002). IDENTIFYING INTIMATE PARTNER VIOLENCE AT ENTRY TO PRENATAL CARE: CLUSTERING ROUTINE CLINICAL INFORMATION. *Journal of Midwifery & Women's Health*, *47*(5), 353–359. https://doi.org/10.1016/s1526-9523(02)00273-8

Asta, D. M., Davis, A., Krishnamurti, T., Klocke, L., Abdullah, W., & Krans, E. E. (2021). The influence of social relationships on substance use behaviors among pregnant women with opioid use disorder. *Drug and Alcohol Dependence*, *222*, 108665. https://doi.org/10.1016/j.drugalcdep.2021.108665

Auerbach, S., Agbemenu, K., Ely, G. E., & Lorenz, R. A. (2021). A Review of Unintended Pregnancy in Opioid-Using Women. *Journal of Addictions Nursing*, *32*(2), 107–114. https://doi.org/10.1097/jan.0000000000000396

Baah, F. O., Teitelman, A. M., & Riegel, B. (2019). Marginalization: Conceptualizing patient vulnerabilities in the framework of social determinants of health-An integrative review. *Nursing Inquiry*, *26*(1), e12268. https://doi.org/10.1111/nin.12268

Badel, A., & Greaney, B. (2021, December 9). Exploring the Link between Drug Use and Job Status in the U.S. *Federal Reserve Bank of St. Louis*. https://www.stlouisfed.org/publications/regional-economist/july-2013/exploring-the-link-between-drug-use-and-job-status-in-the-us

Baer, R. J., Chambers, C. D., Ryckman, K. K., Oltman, S. P., Rand, L., & Jelliffe-Pawlowski, L. L. (2019). Risk of preterm and early term birth by maternal drug use. *Journal of Perinatology*, *39*(2), 286–294. https://doi.org/10.1038/s41372-018-0299-0

Bailey, B. A., & Daugherty, R. R. (2007). Intimate Partner Violence During Pregnancy: Incidence and Associated Health Behaviors in a Rural Population. *Maternal and Child Health Journal*, *11*(5), 495–503. https://doi.org/10.1007/s10995-007-0191-6

Baptiste-Roberts, K., & Hossain, M. B. (2018). Socioeconomic Disparities and Self-reported Substance Abuse-related Problems. *Addiction and Health*, *10*(2), 112–122. https://doi.org/10.22122/ahj.v10i2.561

Bard, E., Knight, M., & Plugge, E. (2016). Perinatal health care services for imprisoned pregnant women and associated outcomes: a systematic review. *BMC Pregnancy and Childbirth*, *16*(1). https://doi.org/10.1186/s12884-016-1080-z

Benda, H. (2021, June 14). *Help4WV helps residents obtain free naloxone*. 12WBOY. https://www.wboy.com/news/west-virginia/help4wv-helps-residents-obtain-free-naloxone/

Bergen, S. E., Gardner, C. O., Aggen, S. H., & Kendler, K. S. (2008). Socioeconomic Status and Social Support Following Illicit Drug Use: Causal Pathways or Common Liability? *Twin Research and Human Genetics*, *11*(3), 266–274. https://doi.org/10.1375/twin.11.3.266

Birkeland, B., Weimand, B. M., Ruud, T., Maybery, D., & Vederhus, J. (2021). Perceived family cohesion, social support, and quality of life in patients undergoing treatment for substance use disorders compared with patients with mental and physical disorders. *Addiction Science & Clinical Practice*, *16*(1). https://doi.org/10.1186/s13722-021-00252-8

Bloch, J. R., Cordivano, S., Gardner, M., & Barkin, J. L. (2018). Beyond bus fare: deconstructing prenatal care travel among low-income urban mothers through a mix methods GIS study. *Contemporary Nurse*, *54*(3), 233–245. https://doi.org/10.1080/10376178.2018.1492349

Bonomi, A. E., Thompson, R. W., Anderson, M. L., Reid, R. L., Carrell, D., Dimer, J. a. S., & Rivara, F. P. (2006). Intimate Partner Violence and Women's Physical, Mental, and Social Functioning. *American Journal of Preventive Medicine*, *30*(6), 458–466. https://doi.org/10.1016/j.amepre.2006.01.015

Brown, R. M., Dakkak, H., Gilliland, J. A., & Seabrook, J. A. (2019). Predictors of drug use during pregnancy: The relative effects of socioeconomic, demographic, and mental health risk factors. *Journal of Neonatal-Perinatal Medicine*, *12*(2), 179–187. https://doi.org/10.3233/npm-1814

Burgard, S. A., & Lin, K. Y. (2013). Bad Jobs, Bad Health? How Work and Working Conditions Contribute to Health Disparities. *American Behavioral Scientist*, *57*(8), 1105–1127. https://doi.org/10.1177/0002764213487347

Byerley, B. M., & Haas, D. M. (2017). A systematic overview of the literature regarding group prenatal care for high-risk pregnant women. *BMC Pregnancy and Childbirth*, *17*(1). https://doi.org/10.1186/s12884-017-1522-2

Campbell, J. C. (2002). Health consequences of intimate partner violence. *The Lancet*, *359*(9314), 1331–1336. https://doi.org/10.1016/s0140-6736(02)08336-8

Candelaria, C., & Shores, K. (2017). Court-Ordered Finance Reforms in the Adequacy Era: Heterogeneous Causal Effects and Sensitivity. *Education Finance and Policy*, *14*(1), 31–60. https://doi.org/10.1162/edfp_a_00236

CDC - West Virginia: PRAMS Data Used to Launch the Tobacco-Free Pregnancy Initiative of West Virginia - PRAMS - Reproductive Health. (n.d.-b). https://www.cdc.gov/prams/state-success-stories/West-Virginia.html

Center for Behavioral Health Statistics and Quality. (2021). 2020 National Survey on Drug Use and Health (NSDUH): Methodological summary and definitions. Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Chaiyachati, K. H., Hubbard, R. A., Yeager, A., Mugo, B., Shea, J. A., Rosin, R., & Grande, D. (2018). Rideshare-Based Medical Transportation for Medicaid Patients and Primary Care Show Rates: A Difference-in-Difference Analysis of a Pilot Program. *Journal of General Internal Medicine*, *33*(6), 863–868. https://doi.org/10.1007/s11606-018-4306-0

Cheng, T., Wood, E., Nguyen, P. L., Kerr, T., & DeBeck, K. (2014). Increases and decreases in drug use attributed to housing status among street-involved youth in a Canadian setting. *Harm Reduction Journal*, *11*(1). https://doi.org/10.1186/1477-7517-11-12

Compton, W. M., Gfroerer, J., Conway, K. P., & Finger, M. S. (2014). Unemployment and substance outcomes in the United States 2002–2010. *Drug and Alcohol Dependence*, *142*, 350–353. https://doi.org/10.1016/j.drugalcdep.2014.06.012

Compton, W. M., Cottler, L. B., Jacobs, J. J., Ben-Abdallah, A., & Spitznagel, E. L. (2003). The Role of Psychiatric Disorders in Predicting Drug Dependence Treatment Outcomes. *American Journal of Psychiatry*, *160*(5), 890–895. https://doi.org/10.1176/appi.ajp.160.5.890

Cornelius, M. D., Richardson, G. A., Day, N. P. J., Cornelius, J. R., Geva, D., & Taylor, P. C. (1994). A comparison of prenatal drinking in two recent samples of adolescents and adults. *Journal of Studies on Alcohol*, *55*(4), 412–419. https://doi.org/10.15288/jsa.1994.55.412

Data to Action Success Stories: West Virginia. (n.d.). https://www.cdc.gov/prams/state-success-stories/west-virginia-contraception.html

Daley, D. C. (2013). Family and social aspects of substance use disorders and treatment. *Journal of Food and Drug Analysis*, *21*(4), S73–S76. https://doi.org/10.1016/j.jfda.2013.09.038

Department of Health and Human Services, U.S. (2017). *A Collaborative Approach to the Treatment of Pregnant Women With Opioid Use Disorders* (null). lulu.com.

Drug Free Moms and Babies Project: Program Development Manual. (2017). [Internet]. West Virginia Perinatal Partnership. Retrieved from https://secureservercdn.net/198.12.144.78/k0l.ef0.myftpupload.com/wp-content/uploads/2019/10/DFMB-Manual-10.11.17-002.pdf

Desai, R., Brogly, S., & Yazdy, M. (2015). Prescription Opioids in Pregnancy and Birth Outcomes: A Review of the Literature. *Journal of Pediatric Genetics*, *04*(02), 056–070. https://doi.org/10.1055/s-0035-1556740

Dibaba, Y., Fantahun, M., & Hindin, M. J. (2013). The effects of pregnancy intention on the use of antenatal care services: systematic review and meta-analysis. *Reproductive Health*, *10*(1). https://doi.org/10.1186/1742-4755-10-50

Drug Misuse and Addiction. (2020, July 13). Retrieved from https://nida.nih.gov/publications/drugs-brains-behavior-science-addiction/drug-misuse-addiction

Druss, B. G., & Von Esenwein, S. A. (2006). Improving general medical care for persons with mental and addictive disorders: systematic review. *General Hospital Psychiatry*, *28*(2), 145–153. https://doi.org/10.1016/j.genhosppsych.2005.10.006

Dsalis, (2022, October 27). *Inequality in Public School Funding | American University*. School of Education Online. https://soeonline.american.edu/blog/inequality-in-public-school-funding/

Duffy, M. E. (1993). Social Networks and Social Support of Recently Divorced Women. *Public Health Nursing*, *10*(1), 19–24. https://doi.org/10.1111/j.1525-1446.1993.tb00015.x

Duncan, G. J., Wilkerson, B., & England, P. (2006). Cleaning up their act: The effects of marriage and cohabitation on licit and illicit drug use. *Demography*, *43*(4), 691–710. https://doi.org/10.1353/dem.2006.0032

Ersöğütçü, F., & Karakaş, S. (2016). Social Functioning and Self-Esteem of Substance Abuse Patients. *Archives of Psychiatric Nursing*. https://doi.org/10.1016/j.apnu.2016.03.007

Espinet, S. D., Motz, M., Jeong, J. J., Jenkins, J. M., & Pepler, D. (2016). 'Breaking the Cycle' of maternal substance use through relationships: a comparison of integrated approaches. *Addiction Research &Amp; Theory*, *24*(5), 375–388. https://doi.org/10.3109/16066359.2016.1140148

Forray, A. (2016). Substance use during pregnancy. *F1000Research*, *5*, 887. https://doi.org/10.12688/f1000research.7645.1

Forray, A., & Foster, D. W. (2015). Substance Use in the Perinatal Period. *Current Psychiatry Reports*, *17*(11). https://doi.org/10.1007/s11920-015-0626-5

Fothergill, K. E., Ensminger, M. E., Green, K. M., Crum, R. M., Robertson, J. A., & Juon, H. S. (2008). The impact of early school behavior and educational achievement on adult drug use disorders: A prospective study. *Drug and Alcohol Dependence*, *92*(1–3), 191–199. https://doi.org/10.1016/j.drugalcdep.2007.08.001

Gates, P. (2015). The effectiveness of helplines for the treatment of alcohol and illicit substance use. *Journal of Telemedicine and Telecare*, *21*(1), 18–28. https://doi.org/10.1177/1357633x14555643

Gipson, J. D., Koenig, M. E. D., & Hindin, M. J. (2008). The Effects of Unintended Pregnancy on Infant, Child, and Parental Health: A Review of the Literature. *Studies in Family Planning*, *39*(1), 18–38. https://doi.org/10.1111/j.1728-4465.2008.00148.x

Hahn, R. W. (2021). What is a Social Determinant of Health? Back to Basics. *Journal of Public Health Research*, *10*(4), jphr.2021.2324. https://doi.org/10.4081/jphr.2021.2324

Hall, K. S., Dalton, V. K., Zochowski, M. K., Johnson, T. P., & Harris, L. (2017). Stressful Life Events Around the Time of Unplanned Pregnancy and Women's Health: Exploratory Findings from a National Sample. *Maternal and Child Health Journal*, *21*(6), 1336–1348. https://doi.org/10.1007/s10995-016-2238-zHarp, K. L., & Bunting, A. M. (2020). The Racialized Nature of Child Welfare Policies and the Social Control of Black Bodies. *Social Politics*, *27*(2), 258–281. https://doi.org/10.1093/sp/jxz039

Health Coverage by Race and Ethnicity, 2010-2021. (2023, April 12). KFF. https://www.kff.org/racial-equity-and-health-policy/issue-brief/health-coverage-by-race-and-ethnicity/

Heinz, A. J., Wu, J., Witkiewitz, K., Epstein, D. H., & Preston, K. L. (2009). Marriage and relationship closeness as predictors of cocaine and heroin use. *Addictive Behaviors*, *34*(3), 258–263. https://doi.org/10.1016/j.addbeh.2008.10.020

Hellerstedt, W. L., Pirie, P. L., Lando, H. A., Curry, S. J., McBride, C. M., Grothaus, L. C., & Nelson, J. C. (1998). Differences in preconceptional and prenatal behaviors in women with intended and unintended pregnancies. *American Journal of Public Health*, *88*(4), 663–666. https://doi.org/10.2105/ajph.88.4.663

Hing, E., & Hsiao, C. (2014). State variability in supply of office-based primary care providers: United States, 2012. *NCHS Data Brief*, *151*, 1–8.

Höflich, A., Langer, M. R., Jagsch, R., Bäwert, A., Winklbaur, B., Fischer, G., & Unger, A. (2012). Peripartum pain management in opioid dependent women. *European Journal of Pain*, *16*(4), 574–584. https://doi.org/10.1016/j.ejpain.2011.08.008

Hotelling, B. A. (2008). Perinatal Needs of Pregnant, Incarcerated Women. *The Journal of Perinatal Education*, *17*(2), 37–44. https://doi.org/10.1624/105812408x298372

Houck, M. M., & Siegel, J. A. (2010). Illicit Drugs. *Fundamentals of Forensic Science*, 305–340. https://doi.org/10.1016/b978-0-12-374989-5.00013-2

Hsiang, W., Lukasiewicz, A. M., Gentry, M., Kim, C., Leslie, M. P., Pelker, R. R., Forman, H. P., & Wiznia, D. H. (2019). Medicaid Patients Have Greater Difficulty Scheduling Health Care Appointments Compared With Private Insurance Patients: A Meta-Analysis. *Inquiry*, *56*, 004695801983811. https://doi.org/10.1177/0046958019838118

Hubberstey, C., Rutman, D., Schmidt, R. A., Van Bibber, M., & Poole, N. (2019). Multi-Service Programs for Pregnant and Parenting Women with Substance Use Concerns: Women's Perspectives on Why They Seek Help and Their Significant Changes. *International Journal of Environmental Research and Public Health*, *16*(18), 3299. https://doi.org/10.3390/ijerph16183299

Initiative, P. P. (2021, August 19). *Unsupportive environments and limited policies: Pregnancy, postpartum, and birth during incarceration*. Prison Policy Initiative. https://www.prisonpolicy.org/blog/2021/08/19/pregnancy_studies/

Jarvis, M. S., & Schnoll, S. H. (1994). Methadone Treatment During Pregnancy. *Journal of Psychoactive Drugs*, *26*(2), 155–161. https://doi.org/10.1080/02791072.1994.10472263

Jinga, N., Mongwenyana, C., Moolla, A., Malete, G., & Onoya, D. (2019). Reasons for late presentation for antenatal care, healthcare providers' perspective. *BMC Health Services Research*, *19*(1). https://doi.org/10.1186/s12913-019-4855-x

Kane, J. B., Morgan, S. E., Harris, K. M., & Guilkey, D. K. (2013). The Educational Consequences of Teen Childbearing. *Demography*, *50*(6), 2129–2150. https://doi.org/10.1007/s13524-013-0238-9

Karriker-Jaffe, K. J. (2013). Neighborhood socioeconomic status and substance use by U.S. adults. *Drug and Alcohol Dependence*, *133*(1), 212–221. https://doi.org/10.1016/j.drugalcdep.2013.04.033

Kelsey, C., Medel, N., Mullins, C., Dallaire, D. H., & Forestell, C. A. (2017). An Examination of Care Practices of Pregnant Women Incarcerated in Jail Facilities in the United States. *Maternal and Child Health Journal*, *21*(6), 1260–1266. https://doi.org/10.1007/s10995-016-2224-5

Khoury, B. S. L., Tang, Y., Bradley, B., Cubells, J. F., & Ressler, K. J. (2010). Substance use, childhood traumatic experience, and Posttraumatic Stress Disorder in an urban civilian population. *Depression and Anxiety*, *27*(12), 1077–1086. https://doi.org/10.1002/da.20751

Kinsman, S. B., & Slap, G. B. (1992). Barriers to adolescent prenatal care. *Journal of Adolescent Health*, *13*(2), 146–154. https://doi.org/10.1016/1054-139x(92)90082-m

Kost, K., & Lindberg, L. D. (2015). Pregnancy Intentions, Maternal Behaviors, and Infant Health: Investigating Relationships With New Measures and Propensity Score Analysis. *Demography*, *52*(1), 83–111. https://doi.org/10.1007/s13524-014-0359-9

Krans, E., Kim, J., James, A., Kelley, D., & Jarlenski, M. (2016). Medication-Assisted Treatment Utilization Among Pregnant Women With Opioid Use Disorder. *Obstetrics and Gynecology*, *133*(5), 943–951. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6483844/

Labor force characteristics by race and ethnicity, 2020. (2021, November). U.S. Bureau of Labor Statistics. https://www.bls.gov/opub/reports/race-and-ethnicity/2020/

Lander, L., Howsare, J., & Byrne, M. (2013). The Impact of Substance Use Disorders on Families and Children: From Theory to Practice. *Social Work in Public Health*, *28*(3–4), 194–205. https://doi.org/10.1080/19371918.2013.759005

Laudet, A. B. (2012). Rate and Predictors of Employment Among Formerly Polysubstance Dependent Urban Individuals in Recovery. *Journal of Addictive Diseases*, *31*(3), 288–302. https://doi.org/10.1080/10550887.2012.694604

Lazar, M., & Davenport, L. M. (2018). Barriers to Health Care Access for Low Income Families: A Review of Literature. *Journal of Community Health Nursing*, *35*(1), 28–37. https://doi.org/10.1080/07370016.2018.1404832

Lee, M. M., Rohn, M. C., Tanda, G., & Leggio, L. (2016). Targeting the Oxytocin System to Treat Addictive Disorders: Rationale and Progress to Date. *CNS Drugs*, *30*(2), 109–123. https://doi.org/10.1007/s40263-016-0313-z

Lee, M. L., Rohn, M. R., & Tanda, G. T. (2017). Neonatal Abstinence Syndrome: Treatment and Pediatric Outcomes. *Clinical Obstetrics and Gynecology*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4815424/

Lee, S. Y., Lee, S. H., Lim, N., Kim, H., Bae, S. C., Ock, M., Kim, U. J., Lee, J. Y., & Jo, M. (2016). Differences in pregnancy outcomes, prenatal care utilization, and maternal complications between teenagers and adult women in Korea. *Medicine*, *95*(34), e4630. https://doi.org/10.1097/md.0000000000004630

Leech, A. A., Cooper, W. O., McNeer, E., Scott, T. A., & Patrick, S. W. (2020). Neonatal Abstinence Syndrome In The United States, 2004–16. *Health Affairs*, *39*(5), 764–767. https://doi.org/10.1377/hlthaff.2019.00814

Leslie, L. A., & Grady, K. (1985). Changes in Mothers' Social Networks and Social Support following Divorce. *Journal of Marriage and Family*, *47*(3), 663. https://doi.org/10.2307/352267

Lewis, B., Hoffman, L. A., Garcia, C. K., & Nixon, S. J. (2018). Race and socioeconomic status in substance use progression and treatment entry. *Journal of Ethnicity in Substance Abuse*, *17*(2), 150–166. https://doi.org/10.1080/15332640.2017.1336959

Lilly, C. L., Ruhnke, A. M., Breyel, J., Umer, A., & Leonard, C. E. (2019). Drug Free Moms and Babies: Qualitative and quantitative program evaluation results from a rural Appalachian state. *Preventive Medicine Reports*. https://doi.org/10.1016/j.pmedr.2019.100919

Linnemann, T. (2010). Mad Men, Meth Moms, Moral Panic: Gendering Meth Crimes in the Midwest. *Critical Criminology*, *18*(2), 95–110. https://doi.org/10.1007/s10612-009-9094-8

Logan, E. (1999). The Wrong Race, Committing Crime, Doing Drugs, and Maladjusted for Motherhood: The Nation's Fury over "Crack Babies." *Social Justice*, *26*(1), 115–138. https://www.jstor.org/stable/29767115

Malasky, A. (2022). Analysis of Challenges Facing Pregnant Women Riding Public Transit. *U.S. Department of Transportation*. https://www.transit.dot.gov/sites/fta.dot.gov/files/2022-02/FTA-Report-No-0211.pdf

Marshall, S. K., Charles, G., Hare, J., Ponzetti, J. J., & Stokl, M. (2005). Sheway's Services for Substance Using Pregnant and Parenting Women: Evaluating the Outcomes for Infants. *Canadian Journal of Community Mental Health*, *24*(1), 19–33. https://doi.org/10.7870/cjcmh-2005-0002

Martin, S. L., Beaumont, J. L., & Kupper, L. L. (2003). Substance Use Before and During Pregnancy: Links to Intimate Partner Violence. *American Journal of Drug and Alcohol Abuse*, *29*(3), 599–617. https://doi.org/10.1081/ada-120023461

Martin, S. L., Mackie, L. H., Kupper, L. L., Buescher, P. A., & Moracco, K. E. (2001). Physical Abuse of Women Before, During, and After Pregnancy. *JAMA*, *285*(12), 1581. https://doi.org/10.1001/jama.285.12.1581

Maternal Mortality Rates in the United States, 2021. (n.d.). https://www.cdc.gov/nchs/data/hestat/maternal-mortality/2021/maternal-mortality-rates-2021.htm

Maternity Care Desert: West Virginia, 2020. (n.d.). March of Dimes | PeriStats. https://www.marchofdimes.org/peristats/data?reg=99&top=23&stop=641&lev=1&slev=4&obj=9&sreg=54

McLellan, A. T., McKay, J. R., Forman, R., Cacciola, J., & Kemp, J. (2005). Reconsidering the evaluation of addiction treatment: from retrospective follow-up to concurrent recovery monitoring. *Addiction*, *100*(4), 447–458. https://doi.org/10.1111/j.1360-0443.2005.01012.x

Medication-Assisted Treatment (MAT). (2022, July 25). Retrieved from https://www.samhsa.gov/medication-assisted-treatment

Medicine, I. O., Services, B. O. H. C., & Uninsurance, C. O. T. C. O. (2002). *Health Insurance is a Family Matter*. National Academies Press.

Metz, V., Köchl, B., & Fischer, G. (2012). Should pregnant women with substance use disorders be managed differently? *Neuropsychiatry*, *2*(1), 29–41. https://doi.org/10.2217/npy.11.74

Mitchell, B. F., Aguilar, H. C., Mosher, A., Wood, S. A., & Slater, D. C. (2013). The uterine myocyte as a target for prevention of preterm birth. *Facts, Views & Vision in Obgyn*.

Moradinazar, M., Farnia, V., Alikhani, M., Karyani, A. K., Rezaei, S., Rezaeian, S., Matin, B. K., & Najafi, F. (2020). Factors Related to Relapse in Patients with Substance-related Disorders under Methadone Maintenance Therapy: Decision Tree Analysis. *Oman Medical Journal*, *35*(1), e89. https://doi.org/10.5001/omj.2020.07

News Division. (2021, January 22). Nationwide Study Shows Continued Rise in Opioid Affected Births. Retrieved from https://www.hhs.gov/about/news/2021/01/12/nationwide-study-shows-continued-rise-in-opioid-affected-births.html

Ney, J. A., Dooley, S. L., Keith, L. G., Chasnoff, I. J., & Socol, M. L. (1990). The prevalence of substance abuse in patients with suspected preterm labor. *American Journal of Obstetrics and Gynecology*, *162*(6), 1562–1567. https://doi.org/10.1016/0002-9378(90)90921-s

Onah, M. N., Field, S., Van Heyningen, T., & Honikman, S. (2016). Predictors of alcohol and other drug use among pregnant women in a peri-urban South African setting. *International Journal of Mental Health Systems*, *10*(1). https://doi.org/10.1186/s13033-016-0070-x

Patrick, S. W., Burke, J. F., Biel, T. J., Auger, K. A., Goyal, N. K., & Cooper, W. O. (2015). Risk of Hospital Readmission Among Infants With Neonatal Abstinence Syndrome. *Hospital Pediatrics*, *5*(10), 513–519. https://doi.org/10.1542/hpeds.2015-0024

Patrick, M. E., Wightman, P., Schoeni, R. F., & Schulenberg, J. E. (2012). Socioeconomic Status and Substance Use Among Young Adults: A Comparison Across Constructs and Drugs. *Journal of Studies on Alcohol and Drugs*, *73*(5), 772–782. https://doi.org/10.15288/jsad.2012.73.772

Peek, M. E., Odoms-Young, A., Quinn, M. A., Gorawara-Bhat, R., Wilson, S., & Chin, M. H. (2010). Racism in healthcare: Its relationship to shared decision-making and health disparities: A response to Bradby. *Social Science & Medicine*, *71*(1), 13–17. https://doi.org/10.1016/j.socscimed.2010.03.018

Perzow, S. E. D., Bray, B. C., & Wadsworth, M. E. (2018). Financial stress response profiles and psychosocial functioning in low-income parents. *Journal of Family Psychology*, *32*(4), 517–527. https://doi.org/10.1037/fam0000403

Price, J. H., Khubchandani, J., McKinney, M. R., & Braun, R. (2013). Racial/Ethnic Disparities in Chronic Diseases of Youths and Access to Health Care in the United States. *BioMed Research International*, *2013*, 1–12. https://doi.org/10.1155/2013/787616

Prince, M., & Ayers, D. (2022). *Substance Use in Pregnancy* [Internet]. StatPearls. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK542330/#_NBK542330_pubdet_

Pullen, E., & Oser, C. B. (2014). Barriers to Substance Abuse Treatment in Rural and Urban Communities: Counselor Perspectives. *Substance Use & Misuse*, *49*(7), 891–901. https://doi.org/10.3109/10826084.2014.891615

Rapier, R., McKernan, S., & Stauffer, C. S. (2019). An inverse relationship between perceived social support and substance use frequency in socially stigmatized populations. *Addictive Behaviors Reports*, *10*, 100188. https://doi.org/10.1016/j.abrep.2019.100188

Rasheed, P., & Al-Sowielem, L. S. (2003). Health education needs for pregnancy: a study among women attending primary health centers. *Journal of Family and Community Medicine*.

Rayburn, W. F. (2007). Maternal and Fetal Effects from Substance Use. *Clinics in Perinatology*, *34*(4), 559–571. https://doi.org/10.1016/j.clp.2007.09.001

Renahy, E., Mitchell, C., Molnár, Á., Muntaner, C., Ng, E., Ali, F., & O'Campo, P. (2018). Connections between unemployment insurance, poverty and health: a systematic review. *European Journal of Public Health*, *28*(2), 269–275. https://doi.org/10.1093/eurpub/ckx235

Rhoades, G. K., Stanley, S. D., & Markman, H. J. (2012). The impact of the transition to cohabitation on relationship functioning: Cross-sectional and longitudinal findings. *Journal of Family Psychology*, *26*(3), 348–358. https://doi.org/10.1037/a0028316

Rome, E. S., Rybicki, L., & DuRant, R. H. (1996). Pregnancy and other risk behaviors among adolescent girls in Ohio. *Journal of Adolescent Health*, *22*(1), 50–55. https://doi.org/10.1016/s1054-139x(97)00160-2

Rosenberg, K. V., Gelow, J. M., & Sandoval, A. P. (2003). Pregnancy Intendedness and the Use of Periconceptional Folic Acid. *Pediatrics*, *111*(Supplement_1), 1142–1145. https://doi.org/10.1542/peds.111.s1.1142

Sachdeva, P., Patel, D., & Patel, B. K. C. (2009). Drug use in pregnancy; a point to ponder! *Indian Journal of Pharmaceutical Sciences*, *71*(1), 1. https://doi.org/10.4103/0250-474x.51941

Salameh, T. N., & Hall, L. (2020). Depression, Anxiety, and Substance Use Disorders and Treatment Receipt Among Pregnant Women in the United States: A Systematic Review of Trend and Population-Based Studies. *Issues in Mental Health Nursing*, *41*(1), 7–23. https://doi.org/10.1080/01612840.2019.1667460

Salas-Wright, C. P., Vaughn, M. G., Ugalde, J., & Todic, J. (2015). Substance use and teen pregnancy in the United States: Evidence from the NSDUH 2002–2012. *Addictive Behaviors*, *45*, 218–225. https://doi.org/10.1016/j.addbeh.2015.01.039

Saloner, B., & Cook, B. I. (2013). Blacks And Hispanics Are Less Likely Than Whites To Complete Addiction Treatment, Largely Due To Socioeconomic Factors. *Health Affairs*, *32*(1), 135–145. https://doi.org/10.1377/hlthaff.2011.0983

SAMHSA, Center for Behavioral Health Statistics and Quality. (2014). *The NSDUH Report: Substance Use and Mental Health Estimates from the 2013 National Survey on Drug Use and Health: Overview of Findings*. https://www.samhsa.gov/data/sites/default/files/NSDUH-SR200-RecoveryMonth-2014/NSDUH-SR200-RecoveryMonth-2014.htm

SAMHSA, Center for Behavioral Health Statistics and Quality. (n.d.-b). *The TEDS Report: Characteristics of Pregnant Teen Substance Abuse Treatment Admissions*. https://www.samhsa.gov/data/sites/default/files/CharacteristicsOfPregnantTeenSubstanceAbuseTreatmentAdmissions/CharacteristicsOfPregnantTeenSubstanceAbuseTreatmentAdmissions/CharacteristicsOfPregnantTeenSubstanceAbuseTreatmentAdmissions.htm

Schroeder, J. R., Latkin, C. A., Hoover, D. R., Curry, A. D., Knowlton, A. R., & Celentano, D. D. (2001). Illicit drug use in one's social network and in one's neighborhood predicts individual heroin and cocaine use. *Annals of Epidemiology*, *11*(6), 389–394. https://doi.org/10.1016/s1047-2797(01)00225-3

Shafer, K., Jensen, T. M., & Larson, J. H. (2014). Relationship Effort, Satisfaction, and Stability: Differences Across Union Type. *Journal of Marital and Family Therapy*, *40*(2), 212–232. https://doi.org/10.1111/jmft.12007

Short, S. E., & Mollborn, S. (2015). Social determinants and health behaviors: conceptual frames and empirical advances. *Current Opinion in Psychology*, *5*, 78–84. https://doi.org/10.1016/j.copsyc.2015.05.002

Shortage Areas. (2020). https://data.hrsa.gov/topics/health-workforce/shortage-areas

Sierra, J. C., Arcos-Romero, A. I., Álvarez-Muelas, A., & Cervilla, O. (2021). The Impact of Intimate Partner Violence on Sexual Attitudes, Sexual Assertiveness, and Sexual Functioning in Men and Women. *International Journal of Environmental Research and Public Health*, *18*(2), 594. https://doi.org/10.3390/ijerph18020594

Sigurdsson, S., Ring, B. M., O'Reilly, K., & Silverman, K. (2012). Barriers to Employment among Unemployed Drug Users: Age Predicts Severity. *American Journal of Drug and Alcohol Abuse*, *38*(6), 580–587. https://doi.org/10.3109/00952990.2011.643976

Singh, S., Sedgh, G., & Hussain, R. (2010). Unintended Pregnancy: Worldwide Levels, Trends, and Outcomes. *Studies in Family Planning*, *41*(4), 241–250. https://doi.org/10.1111/j.1728-4465.2010.00250.x

Sinha, R. (2008). Chronic Stress, Drug Use, and Vulnerability to Addiction. *Annals of the New York Academy of Sciences*, *1141*(1), 105–130. https://doi.org/10.1196/annals.1441.030

Smedley, B. D., Stith, A. Y., & Nelson, A. R. (2003). Unequal treatment: confronting racial and ethnic disparities in health care. *Choice Reviews Online*, *40*(10), 40–5843. https://doi.org/10.5860/choice.40-5843

Snider, J. T., Duncan, M. E., Gore, M., Seabury, S. A., Silverstein, A. R., Tebeka, M. G., & Goldman, D. P. (2019). Association Between State Medicaid Eligibility Thresholds and Deaths Due to Substance Use Disorders. *JAMA Network Open*, *2*(4), e193056. https://doi.org/10.1001/jamanetworkopen.2019.3056

Stitely, M.L., Calhoun, B., Maxwell S., Nerhood R., & Chaffin D. (2010). Prevalence of drug use in pregnant West Virginia patients. *The West Virginia Medical Journal*, *106*(4 Spec No), 48–52.

Stone, R. L. (2015). Pregnant women and substance use: fear, stigma, and barriers to care. *Health & Justice*, *3*(1). https://doi.org/10.1186/s40352-015-0015-5

Substance Abuse and Mental Health Services Administration. (2022, August 12). Screening, Brief Intervention, and Referral to Treatment (SBIRT). Retrieved from https://www.samhsa.gov/sbirt

Substance Use During Pregnancy. (2023, March 23). Guttmacher Institute. https://www.guttmacher.org/state-policy/explore/substance-use-during-pregnancy

Substance Use during Pregnancy Varies by Race and Ethnicity. (2012, May 12). Center for Behavioral Health Statistics and Quality. https://www.samhsa.gov/data/sites/default/files/Spot062PregnantRaceEthnicity2012/Spot062PregnantRaceEthnicity2012.pdf

Staples, A. (2020). Divorce hits women harder financially: Here's how to survive it. *CreditCards.com*. https://www.creditcards.com/to-her-credit/surviving-divorce-financially/

Stringer, K. L., & Baker, E. A. (2018). Stigma as a Barrier to Substance Abuse Treatment Among Those With Unmet Need: An Analysis of Parenthood and Marital Status. *Journal of Family Issues*, *39*(1), 3–27. https://doi.org/10.1177/0192513x15581659

Suntai, Z. (2021). Substance use among women who are pregnant: Examining treatment completion by race and ethnicity. *Journal of Substance Abuse Treatment*, *131*, 108437. https://doi.org/10.1016/j.jsat.2021.108437

Sword, W., Jack, S., Niccols, A., Milligan, K., Henderson, J., & Thabane, L. (2009). Integrated programs for women with substance use issues and their children: a qualitative meta-synthesis of processes and outcomes. *Harm Reduction Journal*, *6*(1), 32. https://doi.org/10.1186/1477-7517-6-32

Syed, S. T., Gerber, B. S., & Sharp, L. K. (2013). Traveling Towards Disease: Transportation Barriers to Health Care Access. *Journal of Community Health*, *38*(5), 976–993. https://doi.org/10.1007/s10900-013-9681-1

The Impact of Institutional Racism on Maternal and Child Health. (n.d.). NICHQ - National Institute for Children's Health Quality. https://www.nichq.org/insight/impact-institutional-racism-maternal-and-child-health

Thompson, K., Homel, J., & Leadbeater, B. J. (2015). The Relationship of Higher Education to Substance Use Trajectories: Variations as a Function of Timing of Enrollment. *Journal of Studies on Alcohol and Drugs*, *76*(1), 95–105. https://doi.org/10.15288/jsad.2015.76.95

Trivedi, J. R., Sareen, H., & Dhyani, M. (2009). Psychological Aspects of Widowhood and Divorce. *Mens Sana Monographs*, *7*(1), 37. https://doi.org/10.4103/0973-1229.40648

Umer, A., Lilly, C. L., Hamilton, C., Breyel, J., Allen, L. H., Rompala, A., Moore, C., O'Dierno, P., & John, C. (2021). Disparities in neonatal abstinence syndrome and health insurance status: A statewide study using non–claims real-time surveillance data. *Paediatric and Perinatal Epidemiology*, *35*(3), 330–338. https://doi.org/10.1111/ppe.12728

United States Census Bureau QuickFacts. (n.d.). *U.S. Census Bureau QuickFacts: West Virginia*. Census Bureau QuickFacts. https://www.census.gov/quickfacts/fact/table/WV/PST045221

US Census Bureau. (2022, September 13). *Poverty in the United States: 2021*. Census.gov. https://www.census.gov/library/publications/2022/demo/p60-277.html

Vallejo, M. C., Shapiro, R., Lippy, M. W., Lilly, C. L., & Brancazio, L. R. (2020). Independent risk factors for chronic illicit substance use during pregnancy. *Journal of Opioid Management*, *16*(5), 351–356. https://doi.org/10.5055/jom.2020.0590

Van Scoyoc, A., Harrison, J. A., & Fisher, P. A. (2016). Beliefs and Behaviors of Pregnant Women with Addictions Awaiting Treatment Initiation. *Child and Adolescent Social Work Journal*, *34*(1), 65–79. https://doi.org/10.1007/s10560-016-0474-0

Vázquez, D., Zaller, N., Martino, S., Cloud, D. H., McCauley, E., Heise, A. G., & Seal, D. W. (2018). Criminal justice continuum for opioid users at risk of overdose. *Addictive Behaviors*, *86*, 104–110. https://doi.org/10.1016/j.addbeh.2018.02.024

Vélez, N. M., García, I., García, L. R., & Valcárcel, M. (2008). The use of illicit drugs during pregnancy among mothers of premature infants. *Puerto Rico Health Sciences Journal*, *27*(3), 209–212.

Wadland, W. C., & Ferenchick, G. S. (2004). Medical comorbidity in addictive disorders. *Psychiatric Clinics of North America*, *27*(4), 675–687. https://doi.org/10.1016/j.psc.2004.06.006

What treatment is available for pregnant mothers and their babies? (2021, April 13). Retrieved from https://nida.nih.gov/publications/research-reports/medications-to-treat-opioid-addiction/what-treatment-available-pregnant-mothers-their-babies

Weber, A., Miskle, B., Lynch, A. J., Arndt, S., & Acion, L. (2021). Substance Use in Pregnancy: Identifying Stigma and Improving Care. *Substance Abuse and Rehabilitation*, *Volume 12*, 105–121. https://doi.org/10.2147/sar.s319180

West Virginia Priority Topic Investments | State Snapshots | Budget | Injury | CDC. (n.d.). https://www.cdc.gov/injury/budget/policystatesnapshots/WestVirginia.html

Women of Childbearing Age and Opioids. (n.d.). https://www.samhsa.gov/data/sites/default/files/report_2724/ShortReport-2724.html

Young, N., Gardener, S., Otero, C., Dennis, K., Chang, R., Earle, K., & Amatetti, S. (2009). Substance-Exposed Infants: State Responses to the Problem. *Substance Abuse and Mental Health Services Administration*, *09–4369*. Retrieved from https://ncsacw.acf.hhs.gov/files/Substance-Exposed-Infants.pdf

Young-Wolff, K. C., Tucker, L. Y., Armstrong, M. A., Conway, A., Weisner, C., & Goler, N. (2020). Correlates of Pregnant Women's Participation in a Substance Use Assessment and

Counseling Intervention Integrated into Prenatal Care. *Maternal and Child Health Journal*, *24*(4), 423–431. https://doi.org/10.1007/s10995-020-02897-4

Zeelo. (n.d.). *Breaking Down Barriers: The Impact of Transportation On Employment Opportunities In The US*. https://zeelo.co/blog/breaking-down-barriers-the-impact-of-transportation-on-employment-opportunities-in-the-us