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## Association of Prepregnancy Substance Use and Substance Use Disorders with Pregnancy Timing and Intention

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### Abstract

**Background:** Limited research exists on the association between substance use disorders (SUDs) and dimensions of pregnancy intention. This study sought to examine the independent relationships between prepregnancy substance use and SUDs with pregnancy timing and intentions.

**Materials and Methods:** Secondary analysis of data from three prenatal care sites in Connecticut, Massachusetts, and Michigan, 2016–2017. Associations were estimated using modified Poisson regression with robust error variance to calculate adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs), controlling for relevant covariates.

**Results:** The total sample size was 1115 women. Respectively, 61.1% and 15.5% of women used any substance in the 30 days prepregnancy or had any SUD in the past 12 months. After

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Authors' Contributions

K.C.C. and J.Y.K. designed the study and conceptualized the article. K.C.C. and K.G.-H. analyzed the data. K.C.C. drafted the article, and J.Y.K., K.Y., S.J.O., K.G.-H., and L.B.Z. contributed substantially to the writing of the article. K.Y., S.J.O., and G.C. conducted the original study. All authors reviewed the article.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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adjustment, any prepregnancy substance use was associated with a reduced likelihood of a well-timed (aPR 0.85; 95% CI: 0.77–0.93) and intended (aPR 0.80; 95% CI: 0.72–0.89) pregnancy; similarly, any SUD was associated with a reduced likelihood of a well-timed (aPR 0.66; 95% CI: 0.55–0.80) and intended (aPR 0.79; 95% CI: 0.67–0.93) pregnancy.

**Conclusions:** Women with prepregnancy substance use or SUD have decreased prevalence of well-timed and intended pregnancies. Greater efforts are needed to address substance use and family planning in routine, well-woman, prenatal, and postpartum care.

### Keywords

substance use disorders; pregnancy timing; pregnancy intention

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### Introduction

Substance use is associated with mistimed (occurred earlier than desired) or unwanted pregnancies,<sup>1</sup> often referred to as unintended pregnancies.<sup>2</sup> Unintended pregnancies are approximately half of all pregnancies in the United States<sup>2</sup> and are associated with adverse outcomes for both the mother (*e.g.*, late prenatal care, postpartum depression, and shorter breastfeeding duration<sup>3,4</sup>) and the infant (*e.g.*, preterm birth and low birth weight<sup>4,5</sup>). In a clinical trial of pregnant women trying to stop substance use, 80% of participants who reported any substance use in the past 30 days (alcohol, marijuana, cocaine, opioids, or other drugs) indicated that their pregnancy was unintended.<sup>6</sup> In a subset of women who returned for a follow-up visit within 24 months following delivery, 28% reported becoming pregnant again, with most reporting continued use of substances.<sup>6</sup>

Although this study population was pregnant women trying to cease using substances, information on substance use disorders (SUDs) was not collected; additionally, pregnancy timing was not evaluated. In another clinical study of pregnant women, those who binge drank or used marijuana two to four times in the month before pregnancy had greater odds of reporting their pregnancies as mistimed or unintended compared with women who did not use these substances.<sup>7</sup> In addition, those with prepregnancy opioid use had greater odds of reporting their pregnancies as mistimed, compared with women who did not use substances.<sup>7</sup>

These findings suggest that substance use may be a marker for risk of unintended pregnancy. After adjusting for age, race, socioeconomic status, and other sociodemographic variables, studies found increased odds of unintended pregnancy among women with alcohol, marijuana, and opioid use.<sup>7–9</sup> Substance use is prevalent in women of reproductive age, with estimates of past month use from a population-based study being 56.1% for alcohol, 7.4% for illicit drugs (cocaine, hallucinogens, heroin, inhalants, and marijuana), and 2.6% for prescription drug misuse.<sup>10</sup> The women in this study did not have depression or anxiety, and SUD was not evaluated.<sup>10</sup>

There are some gaps in the existing literature. First, there is limited research on the association between SUDs (as opposed to substance use) and unintended pregnancy. The few studies examining SUD and unintended pregnancy focused on opioid use disorder,

which found rates of unintended pregnancy exceeding 75%.<sup>11–15</sup> There is less literature on more prevalent conditions such as alcohol or marijuana use disorders. Second, some studies suggest a need to consider more nuance in the measurement of pregnancy intention, specifically, consideration of multiple dimensions, such as timing, intention or planning, wantedness, and happiness independently.<sup>3,7,16</sup>

The studies of substance use and SUDs cited above used unidimensional measures of pregnancy intention, considering either only one dimension or a composite of more than one (such as the combination of mistimed and unwanted as unintended). To build on previous literature, the present analysis uses data from a prior study of substance use screening accuracy<sup>17</sup> to evaluate associations of individual SUDs and use of individual substances with pregnancy timing and intendedness.

## Materials and Methods

This is a secondary data analysis from a cross-sectional study examining the accuracy of five self-reported screening instruments for substance use in pregnancy.<sup>17</sup> In the original study, research staff recruited and enrolled a convenience sample of pregnant women at four prenatal care clinics in three sites in Connecticut (two clinics), Massachusetts, and Michigan between 2016 and 2017 using the same study protocol. Eligibility criteria included being pregnant, at least 18 years of age, and able to understand English. Women were excluded from enrolling in the study if they were: (1) considering pregnancy termination or adoption; (2) cognitively impaired; (3) or currently institutionalized.

The original study had two phases. In the first phase, participants completed a demographic and health questionnaire and five substance use screening questionnaires on a tablet. For phase two, participants who completed the first phase underwent a brief diagnostic interview (Mini-International Neuropsychiatric Interview [MINI] 7.02), completed a calendar-based recall of substance use for the past 30 days and in the 30 days before pregnancy (alcohol, opioids, marijuana, cocaine, heroin, amphetamines, barbiturates, and hallucinogens), and submitted a urine sample for substance use testing (alcohol, amphetamines, barbiturates, cocaine, cotinine, marijuana, and opioids).

Detailed study methods, including recruitment, enrollment, and assessment procedures, are reported elsewhere.<sup>17</sup> Institutional review boards (IRBs) from Yale University, Wayne State University, and Partners HealthCare in Boston provided human subjects approval for the original study; the Centers for Disease Control and Prevention (CDC) IRB approval process was not applicable as CDC was not engaged in the original research and received a de-identified data set of previously collected data.

To be included in this analysis, individuals were required to have complete information on all confounders, at least one exposure, and at least one outcome; 105 were excluded due to missing information ( $n = 1115/1220$ ). Data for included individuals may not be included in all models based on availability of outcome and exposure data (*e.g.*, individual missing data on marijuana may be included in model on alcohol use). The amount of missingness in modeling variables was generally low and includes 0.8% of pregnancy

intention and pregnancy timing, 0.2%–0.3% of SUDs, and 0.6%–1.8% of substance use variables. Missingness was slightly higher in variables not included in the models and includes 1.8% of history of child and family services case and 30.4% of neighborhood safety.

## Measures

**Substance use disorder.**—Participants completed the SUD sections of the MINI, v. 7.0, which consists of a series of questions corresponding to the 11 criteria for SUDs specified in the *Diagnostic and Statistical Manual of Mental Disorders, Version 5 (DSM-5)* (Supplementary Appendix SA1).<sup>18</sup> Having two or more criteria present in the past 12 months qualified as having an SUD. Participants were assessed as having alcohol use disorder, marijuana use disorder, other SUD (cocaine or amphetamines, heroin or opioids, and prescription drugs), any SUD (criteria met for at least one SUD), and multiple SUDs (criteria met for more than one SUD). Individual SUDs were not mutually exclusive, meaning that individuals with multiple SUDs were categorized as having each SUD for which they met the criteria.

**Substance use.**—Pregnancy substance use was constructed from a combination of participant self-report (use in the month before pregnancy) and a urine drug screen (obtained at enrollment during prenatal care), consistent with assessments of using both monitoring methods.<sup>19</sup> If either the self-report or urine drug screen was positive, then the participant was considered to have used that substance; if both were negative, the participant was considered a nonuser. Opioid use was measured by self-reported misuse of prescription opioids or evidence of opioid use in the urine drug screen.

Substances were categorized as alcohol, marijuana, other (cocaine, heroin or opioids, amphetamines, barbiturates, and hallucinogens), any (use of any substances listed), and multiple (use of more than one substance). Substance use variables were not mutually exclusive, such that individuals were included in each variable for each substance they used.

**Pregnancy timing and intention.**—Pregnancy timing and intention were based on participant self-report. Pregnancy timing was assessed by the following question: “In terms of becoming a mother (first time or again), I feel that my pregnancy happened at the ... (Please select the statement which most applies to you): (A) Right time; (B) OK, but not quite the right time; (C) Wrong time.” Due to cell size limitations, responses were dichotomized as pregnancy occurring at the right time (answer A) or not at the right time (answers B and C). Pregnancy intention was assessed by the question: “Just before I became pregnant ... (Please select the statement which most applies to you): (A) I intended to get pregnant; (B) My intentions kept changing; (C) I did not intend to get pregnant.” Again, due to cell size limitations, responses were dichotomized as pregnancy intended (answer A) or changing intentions/not intended (answers B and C).

To inform the best strategy for combining the response options, for which evidence has suggested are distinct categories,<sup>16,20</sup> we compared the distributions of the outcomes by the response options and combined groups that were similar.

**Other variables.**—Sociodemographic data were obtained from the demographic and health questionnaire, including maternal age, race/ethnicity, relationship status, education, receiving public assistance in the past year, and first pregnancy. Age was categorized as 24, 25–34, and 35 years. Race/ethnicity was categorized based on self-report as white non-Hispanic, black non-Hispanic, Hispanic, and a combined category of “other” non-Hispanic race ethnicities (Arab ethnicity or American Indian/Alaska Native, Asian, Native Hawaiian or other Pacific Islander, or unknown race). Relationship status was categorized as married or living as married and not married (never married, widowed, divorced, and separated).

Education was categorized as less than high school (never attended/kindergarten only, first to 11th grade, and 12th grade with no diploma), high school degree (high school graduate and general equivalency degree), some college (some college with no degree and associate’s degree), and college degree or higher (bachelor’s degree or higher). Receiving public assistance in the past year was included as a proxy for socioeconomic status in the absence of other relevant variables and included receiving “WIC, Bridge Card, cash assistance, Section 8 Housing, disability (SSI), *etc.*”

Health questionnaire variables included self-reported depression/anxiety and self-reported pain/discomfort. These variables were categorized as yes if a participant indicated experiencing moderate or extreme symptoms and no if they indicated no symptoms. Environmental variables included living with someone using nonprescribed drugs, and having a partner, parents, or friends who have a problem with substance use. Other variables included ever having a child and family services case and perceived neighborhood safety, obtained from the question “Do you feel that your neighborhood is safe?” Tobacco use variables included tobacco and e-cigarette use in the month before pregnancy; e-cigarette use was self-reported and tobacco use was either a positive self-report or a urine drug screen on enrollment.

## Analyses

Bivariate analyses were conducted using chi-square tests to assess differences in sociodemographic and other covariates by substance use and SUD status. Modified Poisson regression with robust error variance was used to estimate adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs) of the associations between each exposure (any, multiple, alcohol, marijuana, and other substance use and any, multiple, alcohol, marijuana, and other SUD) and each outcome (pregnancy timing and intention), controlling for confounders identified by *a priori* use of directed acyclic graphs. All models were adjusted for sociodemographic variables (age, race/ethnicity, marital status, education, receiving public assistance in the past year, and first pregnancy), environmental variables (living with a drug user or having a parent, friend, or partner who has problems with alcohol or drug use), health variables (self-reported anxiety/depression and pain/discomfort), and tobacco use in the month before pregnancy.

To evaluate the independent association of specific substances used or SUDs, each model was adjusted for using a substance or substances other than the exposure (substance use models) or having an SUD other than the exposure (SUD models). Variance decomposition

proportions  $>0.5$  and condition indices  $>30$  were used to assess collinearity. Pearson's correlation was used to assess the correlation between pregnancy timing and intention.

A sensitivity analysis was conducted to assess whether individuals with an SUD were amplifying the associations between exposures and outcomes. A third group was included for comparison, defined as women with prepregnancy substance use who did not have any SUD. SAS9.4 (SAS Institute, Cary, NC, USA) was used for statistical analysis.

## Results

In our study population, 61.1% of women used at least one substance prepregnancy, most commonly alcohol (49.2%) and marijuana (22.3%); 13.7% of participants used multiple substances (Fig. 1). Based on the DSM-5 criteria, 15.5% of participants met the criteria for at least one SUD, most commonly alcohol use disorder (10.0%) and marijuana use disorder (7.5%); 3.2% met the criteria for more than one SUD (Fig. 1). The addition of a positive drug test to self-reported data slightly increased the number of identified users, with gains of 3.8% for any substance, 0.6% for alcohol, 3.6% for marijuana, and 0.9% for other substances (Fig. 2).

Women with prepregnancy substance use as well as those with an SUD were more likely to have had this pregnancy to be their first, to report depression/anxiety, and to have others in their social networks who also use substances, compared with those without substance use and/or without an SUD (Table 1). Additionally, women with prepregnancy substance use were more likely to be white non-Hispanic, married, and not receiving public assistance, whereas women with an SUD were more likely to be younger, unmarried, and receiving public assistance (Table 1).

Overall, 59.6% of pregnancies were at the right time and 51.3% were intended (Table 1). Of women with any prepregnancy substance use, 57.7% had a pregnancy at the right time and 50.7% had an intended pregnancy (Table 2). The prevalence of pregnancies self-reported to be at the right time among women who reported substance use ranged from 28.6% in women with other prepregnancy substance use to 61.7% in women with prepregnancy alcohol use. Intended pregnancies ranged from 21.3% in women with multiple prepregnancy substance use to 56.6% in women with prepregnancy alcohol use (Table 2).

Of women with any SUD, 35.5% had a pregnancy at the right time and 34.3% had an intended pregnancy (Table 2). The prevalence of pregnancies self-reported to have occurred at the right time among women with SUD ranged from 11.8% in women with other SUD to 42.7% in women with alcohol use disorder. Self-reported intended pregnancies ranged from 13.4% in women with a marijuana use disorder to 46.8% in women with an alcohol use disorder (Table 2).

In adjusted models, women with any prepregnancy substance use were 15% less likely to report their pregnancy as happening at the right time (aPR 0.85; 95% CI: 0.77–0.93) and 20% less likely to report their pregnancy as intended (aPR 0.80; 95% CI: 0.72–0.89) compared with women with no substance use (Table 2). Use of multiple substances, alcohol, and marijuana was each associated with a reduced likelihood of pregnancies occurring at

the right time and being intended. Other substance use was not associated with pregnancy timing or intention after adjustment.

Women with any SUD were 34% less likely to experience a pregnancy at the right time (aPR 0.66; 95% CI: 0.55–0.80) and 21% less likely to report a pregnancy as intended (aPR 0.79; 0.67–0.93) compared with women without SUD after adjusting for covariates (Table 2). Additionally, having more than one SUD, alcohol use disorder, and marijuana use disorder was each associated with a reduced likelihood of a pregnancy occurring at the right time; however, only marijuana use disorder was associated with a reduced likelihood of an intended pregnancy after adjustment (Table 2).

Pregnancy intention and timing were significantly correlated ( $\rho = 0.68$ ,  $p < 0.01$ ; data not shown), but not entirely concordant. Well-timed but not intended pregnancies were self-reported in 19.6% of women with prepregnancy substance use, 23.3% of women with any SUD, and 20.3% of women overall. Intended but not well-timed pregnancies were self-reported in 10.4% of women with prepregnancy substance use, 11.3% of women with any SUD, and 10.0% of women overall (data not shown). All models showed no evidence of collinearity.

The sensitivity analysis demonstrated that the exclusion of women with SUD from the group of women with prepregnancy substance use did not change most results for pregnancy intention; results remained significant for the use of any substance, alcohol, and marijuana but were attenuated for use of multiple substances. For pregnancy timing, more changes were observed; results remained significant for use of any substance but were attenuated for use of multiple substances, alcohol, and marijuana. Smaller sample sizes resulting in wider CIs may have played a role in some instances where the association was attenuated or no longer significant (Supplementary Tables S1 and S2).

## Discussion

In this sample of pregnant women in prenatal care, those with any prepregnancy substance use (regardless of whether or not an SUD was present) and those with any SUD were each significantly less likely to self-report their pregnancies as well timed or intended. Overall, in women with prepregnancy substance use, roughly 30%–60% had a well-timed pregnancy and 20%–60% had an intended pregnancy, depending on the substance used. In women with an SUD, roughly 10%–40% had a well-timed pregnancy and 10%–50% had an intended pregnancy, depending on the SUD. First, we provide evidence of the association between SUDs and pregnancy intention and timing and contribute to the body of evidence of the association between prepregnancy substance use and these outcomes. In addition, we document variation in these associations by specific substances. Second, we contribute to the growing body of literature demonstrating differences between two different dimensions of pregnancy: timing and intention.

Prepregnancy substance use (specifically alcohol, marijuana, multiple substances, and any substances) was associated with a reduced likelihood of having a pregnancy that was self-reported to be well timed and intended. The magnitude of this association differed

by substance used, with the polysubstance use associated with the lowest likelihood of both outcomes, followed by marijuana use and alcohol use. The association between each SUD and pregnancy timing and intention also varied by substance. Alcohol, marijuana, multiple SUDs, and any SUD were each associated with a reduced likelihood of well-timed pregnancy, but only marijuana and any SUD were associated with reduced likelihood of having an intended pregnancy.

There was a relatively high prevalence of well-timed and intended pregnancy in women who used any alcohol prepregnancy; however, self-reported excessive use of alcohol (*e.g.*, binge drinking) was not assessed. Because we assessed the prevalence of pregnancies that occurred at the right time or were intended in women who used substances or had SUD prepregnancy, as opposed to typical measures of mistimed or unintended pregnancies, comparisons to other studies are challenging.<sup>16</sup> Due to the low prevalence of SUDs other than for alcohol and marijuana in this study, we were unable to isolate specific SUDs, such as heroin use disorder from stimulant use disorder and prescription drug use disorder; these relationships may be explored in population-based studies with larger sample sizes.

The associations of substance use and SUDs with pregnancy timing were different from the associations with pregnancy intention, despite significant correlation between pregnancy timing and intention. This finding supports examining multiple dimensions related to pregnancy timing and intention to better capture the nuances of reproductive decision-making and autonomy that women experience.<sup>16,20</sup> As our understanding of family planning and decision-making evolves, incorporating more nuance into clinical counseling and public health programming will be essential to creating more effective services, both for women who use substances and those who do not.<sup>16,21</sup>

These findings show that more than two times as many women with prepregnancy substance use and almost three times as many women with SUD also use tobacco (compared with those without substance use and without SUD, respectively), illustrating how common co-use of tobacco is with other substances. The co-use of tobacco with marijuana is well documented,<sup>22–24</sup> and these findings contribute additional information about use of tobacco in women with an SUD. Understanding populations with high rates of co-use may help to inform tobacco cessation and prevention programs, which is especially important because tobacco use is the primary cause of preventable death and disease in the United States and presents additional risks when used in pregnancy.<sup>22,24</sup> Additionally, mental health and social support screening could be incorporated to further mitigate these outcomes.<sup>21</sup>

Another key finding is that more than 1 in 10 women with substance use and 1 in 4 women with an SUD reported not living in a safe neighborhood. Our findings demonstrate that women with any SUD and/or with prepregnancy substance use are less likely to report living in a safe neighborhood compared with women without SUD or substance use. Neighborhood disorganization, in which neighborhoods are characterized by higher crime rates, instability, and abandoned buildings, and neighborhood quality, measured by social control, social capital, and collective efficacy, have been associated with substance use previously; however, reporting has largely focused on adolescents.<sup>25</sup>



In future research and public health programming, there is a need to assess neighborhood factors and substance use/disorders.<sup>25</sup> Another factor of interest is that women with prepregnancy substance use and SUD were two to four times as likely as to report having a partner with a problem with substance use compared with women without substance use and SUD. This finding is in line with other studies; for example, in a study of pregnant and postpartum women, women with a partner who used substances were nearly five times more likely to report substance use compared with women with a partner who did not use substances.<sup>26</sup>

The American College of Obstetricians and Gynecologists (ACOG) recommends that all women be verbally screened for substance use and SUDs, including tobacco, and prescription drug misuse with a validated screening tool and referred to appropriate treatment to reduce the risk of morbidity and mortality.<sup>27</sup> Our inclusion of universal urine drug screening resulted in only minimal increases in identified substance users, which supports verbal screening as a best practice. The ACOG further recommends providers work with women at well-woman visits to develop and discuss reproductive life plans that align with her long-term goals, including discussion of contraception, prepregnancy counseling, or infertility assessment.<sup>28</sup>

Additionally, the U.S. Preventive Services Task Force's recommendation indicates that all adults aged 18 years or older, including pregnant women, be screened for substance use when services for diagnosis, treatment, and care can be offered or referred.<sup>29</sup> Our findings and those of other recent clinical studies add further context to these recommendations.<sup>17,30</sup> Not only are unintended or mistimed pregnancies more prevalent among women of childbearing age who report substance use and/or meet the criteria for an SUD, but those pregnancies are themselves at potentially increased risk of fetal alcohol spectrum disorder<sup>31</sup> or preterm or small for gestational age birth if substance use continues during pregnancy.

Our findings underscore the importance of life-course approaches that seek to prevent substance-exposed pregnancies by reducing harmful or inappropriate substance use, including tobacco use, and/or by increasing access to and use of effective contraception for women not desiring pregnancy.<sup>32</sup> Interventions using these approaches have shown reduced risk of substance-exposed pregnancy.<sup>33,34</sup>

The sensitivity analysis demonstrated some attenuation of associations between prepregnancy substance use and pregnancy timing when individuals with SUD were excluded. This may indicate that disordered use of substances is driving the observed effect of substance use on pregnancy timing, which provides additional evidence to the importance of screening to identify problematic use.

## Limitations

Several limitations should be noted. First, despite the inclusion of urine drug testing, actual substance use and SUD frequency is probably higher than that was captured using our methods because of underreporting and the short window of detection for urine drug screens for most substances. Additionally, detection windows vary based on the metabolism of different substances; because marijuana has a larger detection window than cocaine, alcohol,

and some other substances, it is more likely to be captured in urine toxicology tests.<sup>35</sup> Urine drug screens captured all opioid use, and misuse is unable to be separated from prescribed use.

We did not assess frequency or amount of alcohol consumed; because of this, we are only able to assess any alcohol use. Because we included urine drug screens at study enrollment, and substance use has been documented to taper off throughout pregnancy, we were more likely to capture use among women enrolled in the first trimester than in the third using the urine drug screens.<sup>36</sup> Second, this convenience, clinic-based study used data from four clinics in three sites and only included women receiving prenatal care and may not be generalizable to a broader population of women during pregnancy.

In addition, the neighborhood safety variable should be interpreted with caution due to high missingness. Third, pregnancy timing and intention were retrospective and may be subject to recall bias. Additionally, due to limited sample size, we were unable to independently consider women who described their pregnancy timing or intention as ambivalent. Furthermore, the women in this study all stated an intention to carry their pregnancies, so the experiences of women with other intentions were not captured. Finally, the sample size of women with SUDs was small, which did not allow for specific analyses of women with heroin, stimulant, or prescription drug use disorder.

## Conclusions

Given the prevalence of prepregnancy substance use and SUDs, delivery of recommended care in the preconception, prenatal, and postpartum period may help women decrease or cease substance use. Verbal screening for and discussions about substance use and SUDs are important components of quality family planning, preventative, and obstetric health care.<sup>21</sup>

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Funding Information

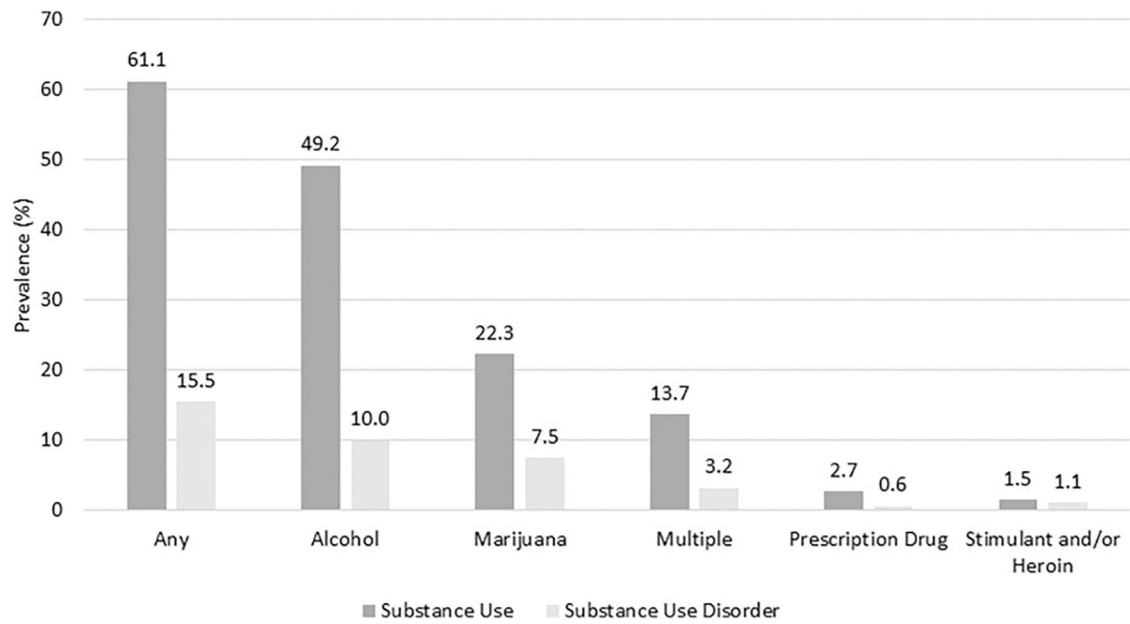
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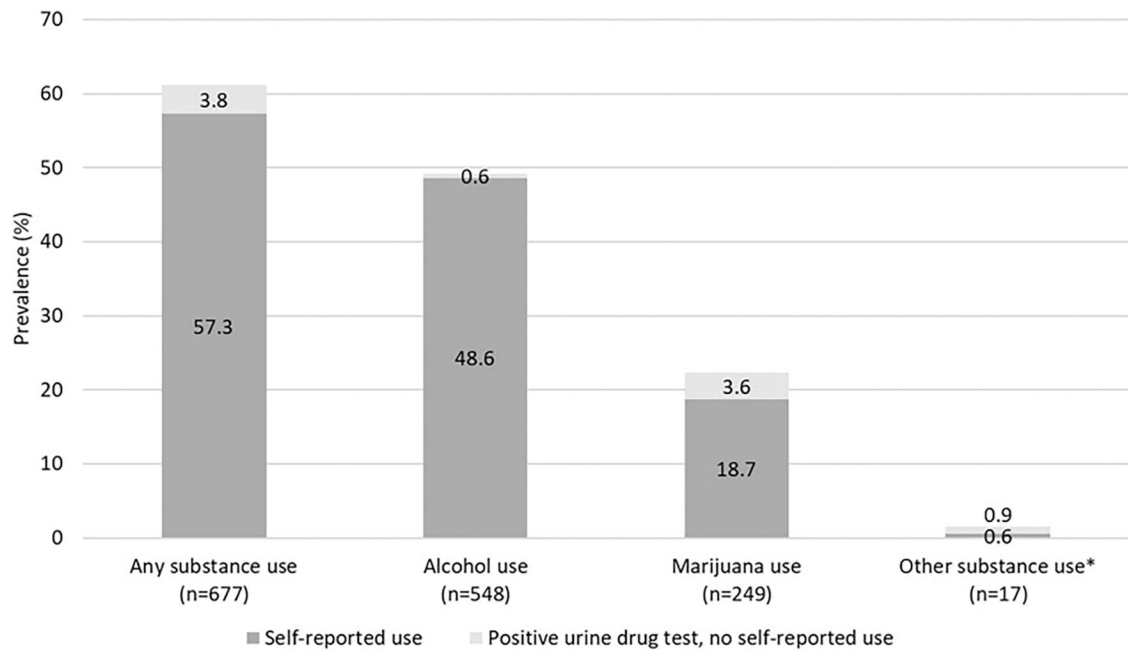
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**FIG. 1.**

Prevalences of prepregnancy substance use and substance use disorders in the past 12 months in participants from three prenatal care sites, 2016–2017 ( $n = 1115$ ). Any substance use includes either self-report of use in the month before pregnancy or positive urine drug test at the prenatal visit of study enrollment of alcohol, marijuana, prescription drug misuse, and stimulant and/or heroin (includes amphetamines, cocaine, and heroin or opioids).



**FIG. 2.**

Prevalences of self-reported pre-pregnancy substance use adjusted with positive urine drug screens in participants from three prenatal care sites, 2016–2017 ( $n = 1115$ ). \*Includes amphetamines, barbiturates, cocaine, and opioids. Opioid use was measured by self-report of misuse of prescription opioids or evidence of opioid use in the urine drug screen.

**Table 1.** Participant Characteristics Overall and by Substance Use Disorder in the Past 12 Months and Prepregnancy Substance Use from Four Prenatal Care Clinics in Three Sites, 2016–2017

| Maternal characteristic                      | Total (n = 1115), % | Pregpregnancy substance use <sup>a,b</sup> |              | Substance use disorder <sup>b,c</sup> |              |
|--|---------------------|--|--------------|---------------------------------------|--------------|
|  |                     | Yes (n = 677)                              | No (n = 431) | Yes (n = 172)                         | No (n = 941) |
| Age (years)                                  |                     |  |              |                                       |              |
| 24   | 24.3                | 22.3                                       | 27.4         | 34.9                                  | 22.3         |
| 25–34  | 56.1                | 57.0                                       | 54.3         | 52.3                                  | 56.8         |
| 35   | 19.6                | 20.7                                       | 18.3         | 12.8                                  | 20.9         |
| Race/ethnicity                               |                     |  |              |                                       |              |
| White non-Hispanic                           | 38.7                | 44.9                                       | 29.5         | 34.3                                  | 39.6         |
| Black non-Hispanic                           | 39.0                | 37.4                                       | 41.3         | 46.5                                  | 37.6         |
| Hispanic                                     | 15.3                | 12.1                                       | 20.2         | 12.8                                  | 15.6         |
| Other <sup>d</sup>                           | 7.0                 | 5.6  | 9.1          | 6.4                                   | 7.1          |
| Education                                    |                     |  |              |                                       |              |
| Less than high school                        | 10.0                | 10.6                                       | 9.1          | 17.4                                  | 8.6          |
| High school degree                           | 27.5                | 21.7                                       | 36.0         | 26.2                                  | 27.7         |
| Some college                                 | 26.0                | 24.4                                       | 29.0         | 27.9                                  | 25.7         |
| College degree or higher                     | 36.4                | 43.3                                       | 26.0         | 28.5                                  | 37.9         |
| Married or living as married                 | 50.6                | 53.8                                       | 46.2         | 34.9                                  | 53.6         |
| Received public assistance in the past year  | 43.3                | 37.7                                       | 51.7         | 54.1                                  | 41.3         |
| First pregnancy                              | 29.6                | 32.9                                       | 24.6         | 36.6                                  | 28.4         |
| Child and family services case <sup>b</sup>  | 6.5                 | 8.4  | 3.6          | 14.9                                  | 4.9          |
| Depression or anxiety (self-report)          | 27.4                | 32.1                                       | 20.7         | 44.8                                  | 24.3         |
| Pain or discomfort (self-report)             | 49.2                | 52.4                                       | 44.3         | 64.0                                  | 46.4         |
| Neighborhood is safe <sup>b</sup>            | 88.9                | 86.1                                       | 92.6         | 74.1                                  | 91.5         |
| Lives with someone using nonprescribed drugs | 5.5                 | 6.9  | 3.3          | 13.4                                  | 4.0          |
| Partner has a problem with substance use     | 7.7                 | 9.8  | 4.6          | 20.9                                  | 5.3          |
| Friends have a problem with substance use    | 23.6                | 27.9                                       | 16.9         | 49.4                                  | 18.8         |
| Parents have a problem with substance use    | 28.5                | 30.9                                       | 24.6         | 43.6                                  | 25.8         |

| <i>Maternal characteristic</i>                                | <i>Total (n = 1115), %</i> | <i>Prepregnancy substance use<sup>a,b</sup></i> |                     | <i>Substance use disorder<sup>b,c</sup></i> |                     |
|---|----------------------------|---|---------------------|---|---------------------|
|   |                            | <i>Yes (n = 677)</i>                            | <i>No (n = 431)</i> | <i>Yes (n = 172)</i>                        | <i>No (n = 941)</i> |
| Tobacco use   | 21.9                       | <b>28.1</b>                                     | <b>11.8</b>         | <b>44.8</b>                                 | <b>17.5</b>         |
| Pregnancy characteristics                                     |                            |   |                     |   |                     |
| Pregnancy self-reported to be:                                |                            |   |                     |   |                     |
| At the right time (vs. OK or wrong time) <sup>b</sup>         | 59.6                       | 57.7  | 62.1                | <b>35.5</b>                                 | <b>63.9</b>         |
| Intended (vs. changing intentions or unintended) <sup>b</sup> | 51.3                       | 50.7  | 51.8                | <b>34.3</b>                                 | <b>54.2</b>         |
| Pregnancy trimester at study enrollment                       |                            |   |                     |   |                     |
| First   | 34.9                       | 35.6  | 34.3                | <b>35.5</b>                                 | <b>34.8</b>         |
| Second  | 32.7                       | 33.2  | 31.3                | <b>32.0</b>                                 | <b>32.7</b>         |
| Third   | 32.5                       | 31.2  | 34.3                | <b>32.6</b>                                 | <b>32.5</b>         |

Bold indicates significance at the  $p < 0.05$  level; table displays row percentages and the total row displays column percentages.

<sup>a</sup>Includes either self-report of use in the month before pregnancy or positive urine drug test at the prenatal visit of study enrollment of alcohol, amphetamines, barbiturates, cocaine, marijuana, and opioids.

<sup>b</sup>Missing data include 20 child and family services case, 339 neighborhood safety, 9 pregnancy timing, 9 pregnancy intention in the total column; additionally, 2 individuals are missing all data in the SUD column and 7 individuals are missing all data in the substance use column.

<sup>c</sup>Includes alcohol, marijuana, heroin, prescription drug, and stimulant use disorders.

<sup>d</sup>Includes Arab ethnicity or American Indian/Alaska Native, Asian, Native Hawaiian or other Pacific Islander, or unknown race.

SUD, substance use disorder.



**Table 2.** Association of Pregnancy Timing and Intention with Prepregnancy Substance Use and Substance Use Disorders, 2016–2017

|  | Pregnancy self-reported to be |                                 |                           |                   |  |                           |
|--|-------------------------------|---------------------------------|---------------------------|-------------------|--|---------------------------|
|  | At the right time<br>n (%)    | At an OK or wrong time<br>n (%) | aPR (95% CI) <sup>a</sup> | Intended<br>n (%) | Changing intentions or unintended<br>n (%) | aPR (95% CI) <sup>a</sup> |
| Pregpregnancy substance use <sup>b</sup> |                               |                                 |                           |                   |  |                           |
| Any substance use <sup>c</sup>           |                               |                                 |                           |                   |  |                           |
| Yes                                      | 388 (57.7)                    | 284 (42.3)                      | <b>0.85 (0.77–0.93)</b>   | 341 (50.7)        | 331 (49.3)                                 | <b>0.80 (0.72–0.89)</b>   |
| No                                       | 265 (62.1)                    | 162 (37.9)                      | Ref                       | 221 (51.8)        | 206 (48.2)                                 | Ref                       |
| Use of multiple substances               |                               |                                 |                           |                   |  |                           |
| Yes                                      | 48 (31.8)                     | 103 (68.2)                      | <b>0.68 (0.54–0.86)</b>   | 32 (21.3)         | 118 (78.7)                                 | <b>0.61 (0.46–0.82)</b>   |
| No                                       | 611 (64.0)                    | 344 (36)                        | Ref                       | 535 (56.0)        | 421 (44.0)                                 | Ref                       |
| Alcohol use                              |                               |                                 |                           |                   |  |                           |
| Any                                      | 337 (61.7)                    | 209 (38.3)                      | <b>0.87 (0.79–0.96)</b>   | 308 (56.6)        | 236 (43.4)                                 | <b>0.85 (0.76–0.95)</b>   |
| None                                     | 322 (57.5)                    | 238 (42.5)                      | Ref                       | 259 (46.1)        | 303 (53.9)                                 | Ref                       |
| Marijuana use                            |                               |                                 |                           |                   |  |                           |
| Yes                                      | 89 (36.3)                     | 156 (63.7)                      | <b>0.81 (0.67–0.97)</b>   | 56 (22.9)         | 189 (77.1)                                 | <b>0.69 (0.54–0.88)</b>   |
| No                                       | 570 (66.2)                    | 291 (33.8)                      | Ref                       | 511 (59.4)        | 350 (40.7)                                 | Ref                       |
| Other substance use <sup>d</sup>         |                               |                                 |                           |                   |  |                           |
| Yes                                      | 12 (28.6)                     | 30 (71.4)                       | 0.65 (0.42–1.02)          | 11 (26.2)         | 31 (73.8)                                  | 0.79 (0.48–1.30)          |
| No                                       | 636 (60.9)                    | 408 (39.1)                      | Ref                       | 547 (52.4)        | 497 (47.6)                                 | Ref                       |
| SUDs <sup>e</sup>                        |                               |                                 |                           |                   |  |                           |
| Any SUD <sup>e</sup>                     |                               |                                 |                           |                   |  |                           |
| Yes                                      | 60 (35.5)                     | 109 (64.5)                      | <b>0.66 (0.55–0.80)</b>   | 58 (34.3)         | 111 (65.7)                                 | <b>0.79 (0.67–0.93)</b>   |
| No                                       | 597 (63.9)                    | 338 (36.2)                      | Ref                       | 507 (54.2)        | 428 (45.8)                                 | Ref                       |
| Multiple SUD                             |                               |                                 |                           |                   |  |                           |
| Yes                                      | 8 (22.9)                      | 27 (77.1)                       | <b>0.56 (0.32–0.98)</b>   | 8 (22.2)          | 28 (77.8)                                  | 0.72 (0.41–1.25)          |
| No                                       | 651 (60.8)                    | 420 (39.2)                      | Ref                       | 559 (52.2)        | 511 (47.8)                                 | Ref                       |
| Alcohol use disorder                     |                               |                                 |                           |                   |  |                           |
| Yes                                      | 47 (42.7)                     | 63 (57.3)                       | <b>0.80 (0.66–0.96)</b>   | 51 (46.8)         | 58 (53.2)                                  | 0.97 (0.82–1.14)          |

|   | <i>Pregnancy self-reported to be</i> |              |                                  |              |                 |              |  |
|---|--------------------------------------|--------------|----------------------------------|--------------|-----------------|--------------|--|
|   | <i>At the right time</i>             |              | <i>At an OK or wrong time</i>    |              | <i>Intended</i> |              | <i>Changing intentions or unintended</i> |
|   | <i>n (%)</i>                         | <i>n (%)</i> | <i>aPR (95% CI) <sup>a</sup></i> | <i>n (%)</i> | <i>n (%)</i>    | <i>n (%)</i> | <i>aPR (95% CI) <sup>a</sup></i>         |
| No  | 609 (61.3)                           | 384 (38.7)   | Ref                              | 514 (51.7)   | 480 (48.3)      |              | Ref                                      |
| Marijuana use disorder                    |                                      |              |                                  |              |                 |              |  |
| Yes                                       | 19 (23.8)                            | 61 (76.3)    | <b>0.63 (0.43–0.92)</b>          | 11 (13.4)    | 71 (86.6)       |              | <b>0.49 (0.30–0.81)</b>                  |
| No  | 638 (62.3)                           | 386 (37.7)   | Ref                              | 554 (54.2)   | 468 (45.8)      |              | Ref                                      |
| Other substance use disorder <sup>f</sup> |                                      |              |                                  |              |                 |              |  |
| Yes                                       | 2 (11.8)                             | 15 (88.2)    | 0.29 (0.08–1.12)                 | 4 (23.5)     | 13 (76.5)       |              | 0.74 (0.29–1.90)                         |
| No  | 657 (60.3)                           | 432 (39.7)   | Ref                              | 563 (51.7)   | 526 (48.3)      |              | Ref                                      |

Bold indicates significance at  $p < 0.05$ ; aPRs model the likelihood of having a well-timed or intended pregnancy in women with substance use/SUD compared with women without.

<sup>a</sup> All models are adjusted for sociodemographic variables (age, race, marital status, education, receiving public assistance in the past year, and first pregnancy), environmental variables (living with a drug user or having a parent, friend, or partner who have problems with alcohol or drug use), health variables (self-reported anxiety/depression and pain/discomfort), and tobacco use in the month before pregnancy; and using a substance or substances other than the exposure (substance use models) or having an SUD other than the exposure (SUD models).

<sup>b</sup> Includes either self-report of use in the month before pregnancy or positive urine drug test at the prenatal visit of study enrollment of alcohol, marijuana, heroin or opioids, and stimulants or other illicit substances.

<sup>c</sup> Includes alcohol, marijuana, heroin, stimulants, or other illicit substances.

<sup>d</sup> Includes heroin, stimulants, or other illicit substances.

<sup>e</sup> Includes alcohol, marijuana, heroin, prescription drug, and stimulant use disorders.

<sup>f</sup> Includes heroin, prescription drug, and stimulant use disorders.

aPR, adjusted prevalence ratio; CI, confidence interval.