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Pre-pregnancy substance use and first trimester cardiovascular health among nulliparous pregnant people: the nuMoM2b Study

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Abstract

Background: Suboptimal pre-pregnancy health, including substance use and cardiovascular risk factors, is associated with higher risks of maternal-foetal morbidity and mortality.

Objective: To determine if pre-pregnancy substance use is associated with early pregnancy cardiovascular health (CVH). It is hypothesised that pre-pregnancy use of substances is associated with worse CVH in the first trimester of pregnancy.

Methods: This is a secondary analysis from the 2010-2015 United States nuMoM2b cohort (n=9,895). Pre-pregnancy alcohol, tobacco, marijuana, and illicit substance use were assessed through questionnaires. Latent class analysis categorised participants based on their 3-month pre-pregnancy or ever(*) substance use: [1] Illicit substances*, marijuana*, and alcohol use (n=1234); [2] marijuana* and alcohol use (n=2066); [3] tobacco and alcohol use (n=636); and [4] alcohol only use (n=3194). The referent group reported no pre-pregnancy substance use (n=2765). First trimester CVH score from 0 (least healthy) to 100 (most healthy) was calculated using a modified American Heart Association Life's Essential 8 framework and included body mass index (BMI), blood pressure, blood glucose, non-HDL cholesterol, diet, sleep, and physical activity. Multiple linear regression evaluated the relationship between pre-pregnancy substance use classes and CVH scores.

Results: CVH score varied by class: No substance use (mean 65, SD±1.3), illicit substances*, marijuana*, and alcohol use (68 ±1.3), marijuana* and alcohol use (67 ±1.3), tobacco and alcohol

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AUTHOR CONTRIBUTIONS

EM and BG developed the study idea. EM conducted statistical analyses supervised by BG and RB. DH, RS, and JC provided expertise on the nuMoM2b cohort and AM provided subject matter expertise on substance use during pregnancy. Manuscript revisions were conducted by all authors.

Conflict of interest disclosure: None to disclose.

Ethics approval statement: Each nuMoM2b clinical site and hospital's local governing Institutional Review Board(s) approved the nuMoM2b protocol and procedures.

Patient consent statement: For the nuMoM2b cohort trained study personnel administered informed consent at each study site during recruitment.

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use (62 ±1.4), and alcohol only use (67 ±1.3). In adjusted models, those who used tobacco and alcohol compared to the no substance use class had a lower CVH score (−2.82); other classes had scores ranging from 1.81-2.44 points higher than the no substance use class. Individual CVH component scores followed similar patterns.

Conclusions: All groups, but most markedly those who used tobacco and alcohol prior to pregnancy, began pregnancy with only moderate CVH and may benefit from CVH promotion efforts along with substance use treatment.

Keywords

Pregnancy; Substance-Related Disorders; Cardiovascular Diseases; Heart Disease Risk Factors

1 BACKGROUND

In the United States, 1 in 5 births are complicated by adverse pregnancy outcomes such as hypertensive disorders of pregnancy, preterm birth, foetal growth restriction, and gestational diabetes [1]. Adverse pregnancy outcomes have immediate consequences for maternal-foetal morbidity and mortality as well as long-term associations with increased risk of subsequent cardiovascular disease[2]. Although physiological cardiovascular risk factor changes occur during pregnancy, such as increase in body mass index (BMI) and cardiac output, the physiological stress of pregnancy may expose or exacerbate preexisting cardiovascular disease risk leading to adverse outcomes[3]. This latter paradigm highlights the importance of optimising preconception cardiovascular health (CVH), including having healthy behaviours and the absence of clinical risk factors, to improve pregnancy outcomes[4,5].

Frequent substance use is a health behaviour that has adverse effects on CVH and is associated with greater cardiovascular/cerebrovascular diseases in non-pregnant populations[6-10]. During pregnancy, substance use has been associated with greater incidence of adverse pregnancy outcomes[11,12]. However, it is unclear if the associations between pre-pregnancy substance and adverse pregnancy outcomes are direct or result from the co-occurrence of pre-pregnancy substance use and poor early pregnancy CVH. Therefore, we sought to address a gap in knowledge regarding whether pre-pregnancy substance use is associated with early pregnancy CVH. Addressing this gap could inform whether interventions should seek to reduce substance use individually or in combination with interventions to improve CVH prior to and early in pregnancy to optimise pregnancy health and prevent adverse pregnancy outcomes.

Our purpose was to classify women based on their “ever use” of marijuana or illicit substances in combination with their recent pre-pregnancy alcohol or tobacco use; and to determine if pre-pregnancy substance use classes are associated with early pregnancy CVH (healthy behaviours and clinical risk factors). We hypothesised that pre-pregnancy use of alcohol, tobacco, marijuana, or illicit substances would be associated with worse CVH in the first trimester of pregnancy.

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2 METHODS

2.1 STUDY POPULATION

This was a secondary analysis of the Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-to-Be (nuMoM2b) prospective cohort study. nuMoM2b enrolled 10,038 racially/ethnically and geographically diverse pregnant individuals from 2010-2015 from eight clinical research sites in the US[13]. NuMoM2b cohort inclusion and exclusion criteria are described elsewhere[13]. Once enrolled, data collection began at 6-13 weeks of pregnancy (Visit 1) with three more visits through delivery. The current study only includes data collected during Visit 1.

2.1 Exposure Measures—During Visit 1, participants completed a questionnaire about substance use that was adapted from the Behavioral Risk Factor Surveillance System Questionnaire[14]. The questionnaire assessed whether alcohol or tobacco were used in the 3 months before becoming pregnant. Recreational/illicit drug use prior to pregnancy was assessed as ever-use (rather than the 3 months prior to pregnancy). Individuals answering ‘yes’ to ever using illicit drugs prior to pregnancy were then asked to report ever use of marijuana, cocaine, not prescribed narcotics, heroin, amphetamines, inhalants, hallucinogens, methadone, and other drugs. Given the increasing use and legality of marijuana, ever use of marijuana was classified separately. Methadone was not included as an illicit drug since it is a medication to treat opioid use disorder. All other illicit/recreational substance use were then classified into an umbrella category. These classifications resulted in four dichotomous variables for substance use prior to pregnancy: alcohol in past 3 months, tobacco in past 3 months, marijuana ever use, and illicit substance ever use.

Latent class analysis was used to group participants into unobserved classes with similar pre-pregnancy substance use. Best model fit was determined by Akaike’s information criteria (AIC), Bayesian information criteria (BIC), entropy, and overall model interpretability. Participants were categorised into four different classes based on item response probabilities (eTable 1). Participants who indicated no pre-pregnancy substance use were separately categorised as a ‘no substance use’ class. The name of each latent class was determined by selecting the substances with an item probability of 0.5 or higher. Figure 1 presents a radar plot that reports the proportion of participants in each class reporting each substance used. Individuals in the alcohol only use class typically did not use other substances, whereas other substance classes often reported more than one pre-pregnancy substance use inclusive of alcohol.

2.3 Outcome Measures—The American Heart Association’s Life’s Essential 8 are a group of behavioural and clinical cardiovascular risk factors known to collectively represent the absence of cardiovascular risk or CVH[15]. The framework operationalises CVH into a score that includes eight components in two categories: health behaviours (diet, physical activity, nicotine exposure, and sleep health) and health factors (BMI, non-HDL cholesterol, blood glucose, and blood pressure). Each health behaviour and factor component is scored from 0 (least healthy) to 100 (most healthy) using the published scoring algorithm[15]. The CVH score averages across all components. Average scores <50 indicate “low” CVH, 50-79

indicate “moderate” CVH, and 80 is considered “high” CVH. In the US, the average CVH score is 67 or “moderate” for adult women[16]. The nicotine exposure component was not included into the CVH scores herein due to tobacco use being an exposure of interest. Therefore, modified CVH scores for each pre-pregnancy substance use latent class was calculated for participants with at least one health factor (excluding nicotine) or health behaviour component.

Diet was evaluated with a modified Block 2005 Food Frequency Questionnaire (FFQ) assessing the consumption frequency and average serving size of 120 foods and beverages. FFQ responses were used to calculate an Healthy Eating Index 2010 (HEI-2010) score[17]. HEI-2010 scores were transformed into population percentiles using the mean HEI-2010 score of 63, then converted to the diet CVH score as recommended[15]. Physical activity was measured using questions adapted from the Behavioral Risk Factor Surveillance Survey that queried the type, frequency, and duration of up to three common physical activities during leisure time[18]. These responses were scored and converted to minutes per week of moderate-intensity and vigorous-intensity activity, then used to calculate the physical activity CVH score as recommended[15]. The sleep health score was calculated by creating a weighted average of self-reported hours of sleep during weekdays (weighted as 5/7) and weekends (weighted as 2/7), then converted to the CVH sleep score[15]. An overall modified health behaviour score was calculated as the average of these three components.

One blood pressure was measured and, if the first blood pressure reading was greater than 140/90, participants rested for 10 minutes and had a second measurement which was used for analysis. Resting systolic and diastolic blood pressure (mmHg) was used to calculate the blood pressure CVH score as recommended[15]. Blood was collected and processed to determine HDL cholesterol levels (mmol/L) and total cholesterol (mmol/L). HDL cholesterol and total cholesterol levels were used to calculate non-HDL cholesterol levels and the CVH score[15]. Blood specimens were also processed to determine participant blood glucose which was used to calculate the CVH score as recommneded[15]. Blood samples were not required to be obtained while fasting in this pregnancy cohort. Height and weight were measured during the visit, then weight was divided by height to calculate BMI (kg/m^2) which was then used to calculate the BMI CVH score[15]. If a participant was prescribed medication to control their cholesterol and/or blood glucose levels, 20 points were subtracted from their non-HDL cholesterol or fasting blood glucose CVH component score.

2.4 Covariates—Covariate information, including age, marital status, race/ethnicity, and method of paying for healthcare, were reported during an interviewer-administered questionnaire. These covariates were selected as social determinants of health and potential confounders based on previous studies related to substance use and known to affect CVH[11,19-21] (eFigure 1). Finally, self-reported pregnancy intention (planned or unplanned) was used as a covariate in a sensitivity analysis.

2.5 Statistical analysis—Unadjusted means of the modified CVH, modified health behaviour, health factor, and individual component scores were compared across latent classes. Next, multiple linear regression evaluated associations of latent classes with CVH

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scores after adjustment for covariates. The no substance use class was selected as the reference group. Omnibus model fit was determined with the regression F-test and overall effect size is reported as R^2. Cohen's f^2 evaluated pre-pregnancy substance use latent classes local effect size within the multiple linear regression. The f^2 effects were interpreted as 0.02 (small), 0.15 (medium), and 0.35 (large)[22]. Data were analysed in SAS version 9.4 (SAS Institute Inc). Covariates and demographic characteristics were summarised as means, standard deviations, or frequencies and percents across latent class groups.

2.6 Missing Data—Observations with missing values for substance use class were removed (n=143), resulting in a final sample of 9,895 (Figure 2). There were no missing data for the outcome measure. However, 0.6% of the data was missing for marital status, and 0.1% was missing for method of paying for healthcare. No methods for addressing missing data were used, as the proportion of missing data was less than 5%.

2.7 Sensitivity Analyses—Three sensitivity analyses were performed. First, a multiple linear regression analysis with pre-pregnancy substance use of alcohol, tobacco, marijuana, or illicit substances analysed each of these exposures individually as binary variables (yes/no) rather than latent classes. The second sensitivity analysis entailed new latent classes identified in a subset of the sample after excluding those who used tobacco prior to pregnancy. The last sensitivity analysis adjusted for planned pregnancy status as a possible confounder.

2.8 Ethics approval—Each clinical site and hospital's local governing Institutional Review Board(s) approved the nuMoM2b protocol and procedures and all participants provided informed consent at the time of enrolment.

3 RESULTS

Sample characteristics are reported in Table 1. Unadjusted modified CVH scores were considered 'moderate' for all latent classes (range: 63-74) but were lower for tobacco and alcohol use and higher for other groups when compared to the no substance use group (eTable 2). Unadjusted modified health behaviour scores (average of diet, physical activity, and sleep) ranged from 43-60. The tobacco and alcohol use latent class had a 'low' modified health behaviour score driven by a 'low' score for physical activity. All groups had 'high' scores for sleep and 'low' scores for diet. Unadjusted overall health factor scores, as well as individual scores for blood pressure, blood glucose, and non-HDL cholesterol, were 'high' for all groups. Only BMI scores were 'moderate' for all groups.

Modified CVH scores, modified health behaviour scores, and health factor scores across latent class groups after adjusting for covariates are reported in Figures 3-5. Differences in modified CVH score between pre-pregnancy substance use groups and no substance use latent class are presented in Figure 3, with results from multiple linear regression analysis reported in eTable 3. The Illicit substances, marijuana, and alcohol use latent class, marijuana and alcohol use latent class, and alcohol only use latent class had modified CVH scores that were higher (β ranging from 1.81-2.45) and the tobacco and alcohol use class had a modified CVH score that was lower (β=−2.82) compared to the no substance use latent

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class. Substance use latent classes explained a small amount of variability (R^2) in all CVH scores, and the pre-pregnancy substance use latent classes local effect size within the model resulted in a $f^2 = 0.01$ (very small effect).

Differences in modified health behaviour scores across substance use latent classes were present in a similar pattern (Figure 4, eTable 4). For individual behaviours, the alcohol use only latent class was the only class that did not have a lower diet score from the no substance use class and was the only group to differ from the no substance use latent class with a better sleep score. Similarly, the tobacco and alcohol use latent class had lower scores compared to the no substance use class for diet and physical activity. Illicit substances, marijuana, and alcohol use group had worse diet scores, better physical activity scores, and similar sleep scores compared to the no substance use class.

Health factor CVH also remained lower in the tobacco and alcohol use latent class and higher in other substance use classes after adjustment (Figure 5, eTable 4). Blood pressure and blood glucose scores were higher in the illicit, marijuana, and alcohol latent class, the marijuana and alcohol use latent class, and the alcohol only use latent class as compared to the no substance use latent class, but the tobacco and alcohol use latent class was similar to the no substance use latent class. The alcohol and tobacco use latent class and the marijuana and alcohol use latent class had a similar BMI score to the no substance use latent class, though scores were lower in the tobacco and alcohol use latent class and higher in the illicit substance, marijuana, and alcohol use latent class. No differences were found between the substance use latent classes and the no substance latent class for non-HDL cholesterol score.

Sensitivity analyses demonstrated robustness of the primary analyses. First, evaluating all pre-pregnancy substance uses as individual binary (yes/no) variables rather than latent classes similarly identified that tobacco use versus non-tobacco use group had lower scores (eTable 5). Second, multiple linear regression with new latent classes constructed after excluding those who used tobacco were: (1) no substance use, (2) marijuana and alcohol use, (3) alcohol only use (item response probabilities in eTable 6). Compared to the no substance use latent class, the marijuana and alcohol latent class (β=3.29) and the alcohol only use latent class (β=1.89) had higher modified CVH scores like our primary analyses that included individuals with tobacco use prior to pregnancy (eTable 7). Lastly, adding planned pregnancy status as a covariate resulted in similar findings as the primary analyses (eTable 8).

4 COMMENT

4.1 Principal Findings

Nulliparous women who used tobacco and alcohol prior to pregnancy had marginally lower modified CVH, modified health behaviour, and health factor scores, when compared to those with no substance use. The lower score observed in the tobacco and alcohol group was primarily influenced by lower scores in the diet and BMI components. Other pre-pregnancy substance use latent classes had marginally higher modified CVH scores compared to the no substance use group. However, on average, the women in this study had a moderate CVH score. This discovery highlights the importance of prioritising efforts to enhance CVH

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among women of reproductive age, as it may yield significant benefits for pregnancy health compared to concentrating on those who use substances.

4.2 Strengths of the study

Strengths of this study include the large racially, ethnically, and geographically diverse sample of the nuMoM2b cohort that make our results applicable to diverse populations. This project utilised existing data that queried pre-pregnancy substance use early in pregnancy and from clinical assessments that provided objective measurements for body mass index, blood glucose levels, blood lipid levels, and blood pressure. Additionally, the use of the American Heart Association's Life's Essential 8 framework is novel and may be particularly relevant for young people who have yet to develop overt cardiovascular disease.

4.3 Limitations of the data

Limitations of the study include that the data are cross-sectional; therefore, we are unable to assess temporality or draw strong inferences regarding causality. Another limitation is that pre-pregnancy substance use was self-reported. This could have resulted in underreporting and misclassification due to social desirability or recall bias. Information on marijuana and illicit substance use in the three months prior to pregnancy was not available; therefore, ever use of these substances had to be used as a proxy. Additionally, frequency and quantity of substances used were also unavailable. Further, recruitment of individuals in their first trimester may have resulted in a lower prevalence of substance use, as those who use substances are more likely to enter prenatal care later [23] . Also, individuals with severe substance use disorder may not have enrolled in this complex and high burden study. Only 4,392 participants (43.8% of the sample) had total cholesterol and HDL cholesterol assessed for an ancillary study of nuMoM2b. This resulted in most of the sample having only three or less of the health factor components available to calculate the CVH score. Lastly, participants were not required to be fasting when they had their blood drawn, a common practice when obtaining blood samples in pregnancy cohorts[24-26]. This may have inflated values of cholesterol and glucose and lowered health factor scores in some participants.

4.4 Interpretation

Results on the association between tobacco usage and lower modified CVH score are substantiated by existing epidemiologic studies demonstrating that females are vulnerable to experiencing adverse cardiovascular effects from smoking tobacco [27]. Nicotine in tobacco increases heart rate and blood pressure[28] and tobacco damages blood vessels and makes blood proteins sticky, leading to blood clots[29]. Nicotine also lowers tolerance for physical activity and decreases HDL cholesterol[30]. Literature also suggests that smoking tobacco increases the risk of insulin resistance and type 2 diabetes mellitus[27]. Taken together, our finding that women with pre-pregnancy tobacco and alcohol use had the worst CVH in early pregnancy is not surprising given the established negative health consequences of tobacco use in this population and more generally.

A more unexpected finding was that women in other pre-pregnancy substance use latent classes had marginally higher CVH scores as compared to non-users. For alcohol only users, the majority had commercial health insurance (a proxy for higher socioeconomic

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status). Research has indicated that those with a higher socioeconomic status may consume similar or more alcohol than those with lower socioeconomic status but do not have as many negative alcohol-related health consequences[31]. There is also evidence that light-to-moderate alcohol consumption is associated with lower risk of cardiovascular disease mortality, coronary heart disease, and stroke for women[32]. Though we used covariate adjustment in recognition of this potential phenomenon, it is possible that residual confounding may explain the higher score in our alcohol only latent class.

The higher modified CVH scores of latent classes that included marijuana and illicit substances were not as we hypothesised. It is known that cocaine has vasoconstrictive effects that can lead to pregnancy loss and can mimic preeclampsia/eclampsia later in pregnancy [33,34]. Other studies have found that cocaine use further complicates pregnancy CVH by increasing the risk for hypertension, myocardial infarction, and ischemia[35]. The association between hallucinogen use prior to pregnancy and maternal CVH is unclear, but Lysergic acid diethylamide (LSD) is known to have sympathomimetic effects after ingestion, such as an increase in blood pressure, tachycardia, and has the potential to compromise placental blood flow and increase the risk of spontaneous abortion[36]. Additionally, a positive correlation between narcotic use and acute cardiac events has been observed during pregnancy and childbirth[37]. Therefore, one explanation for our findings is that those who frequently used cocaine, hallucinogens, or narcotics at the time of conception may have had pregnancy loss and subsequently were not enrolled in the cohort. Another possible explanation for the higher CVH scores for our latent class that included illicit drugs, marijuana, and alcohol is difference in measurement. Only ‘ever use’ of these substances was available rather than use in the 3 months prior to pregnancy that we have for alcohol and tobacco; this may have resulted in misclassification. Individuals in this latent class may have experimented with these substances once or used these substances years, months, or days ago, limiting temporal conclusions. Residual confounding remains a possible explanation for our findings due to the observational nature of the study. However, our findings for marijuana use do agree with the results of a systematic review and meta-analysis of observational studies of primarily of females (~80%), including pregnant women. This study concluded that cannabis exposure was not associated with an increased risk of adverse cardiovascular events[38]. Marijuana was the most commonly used illicit drug in this cohort, followed by cocaine, hallucinogens, and prescription narcotics that were not prescribed[39]. Though further research interrogating the possible alternative explanations is needed, our data do not suggest that women who reported ever using illicit drugs or marijuana and consumed alcohol in the prior 3 months have a worse CVH score in early pregnancy.

Our study has implications for public health. Low and moderate CVH scores for diet and BMI indicate that these are critical public health concerns among women of reproductive age. Individuals of reproductive age that use tobacco and alcohol prior to pregnancy may especially benefit from CVH promotion interventions before and during pregnancy. Given the high prevalence of unplanned pregnancies making preconception interventions challenging, such approaches may be most feasible during early pregnancy[40]. Pregnancy is typically accompanied by increased access to care for the underinsured, increased healthcare interactions for most individuals, and increased motivation to make health behaviour changes to benefit the offspring. Additional, longitudinal research that carefully measure

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confounding, addresses the shifting landscape of substance use, and provides temporal measurements of substance use and CVH beginning before and spanning to after pregnancy is needed.

5 CONCLUSIONS

This study provides evidence that women begin pregnancy with only moderate CVH; those who use tobacco and alcohol prior to pregnancy, as opposed to other substance use subgroups, begin pregnancy with slightly worse CVH. Pre-conception substance use prevention and cessation interventions for tobacco are warranted and could also consider promoting other CVH components as a strategy to optimise pregnancy health outcomes for all women of reproductive age.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data availability statement:

Data from the nuMoM2b cohort is available for public release on BioData Catalyst.

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Social Media Quote:

This study provides evidence that women begin pregnancy with only moderate CVH and those who use tobacco and alcohol prior to pregnancy, begin pregnancy with slightly worse CVH.

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Synopsis

Study Question:

What is the association between pre-pregnancy substance use and early pregnancy cardiovascular health (CVH)?

What is already known:

Optimising preconception CVH through healthy behaviours and mitigating clinical risk factors improves pregnancy outcomes. However, no study examined how pre-pregnancy substance use and early pregnancy behaviours are related to early pregnancy CVH.

What this study adds:

Though women on average began pregnancy with only moderate CVH, those who used tobacco and alcohol three months prior to pregnancy began pregnancy with worse cardiovascular health risk, compared to those with no substance use. Those who used tobacco and alcohol had marginally worse early pregnancy diet and BMI as opposed to those who did not use substances.

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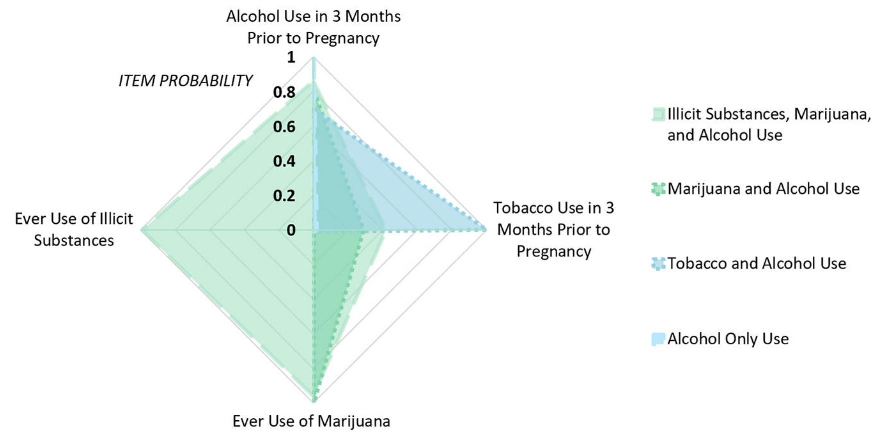

Figure 1:

Item response probabilities of participants' self-reported pre-pregnancy use of alcohol, tobacco, marijuana, and illicit substances by the four classes identified through latent class analysis: (1) illicit substances [a], marijuana [a], and alcohol use, (2) marijuana [a] and alcohol use, (3) tobacco and alcohol use, and (4) alcohol only use. Latent classes were named after substance(s) with item response probabilities of 0.50 or greater. [a] Indicates ever use of substances.

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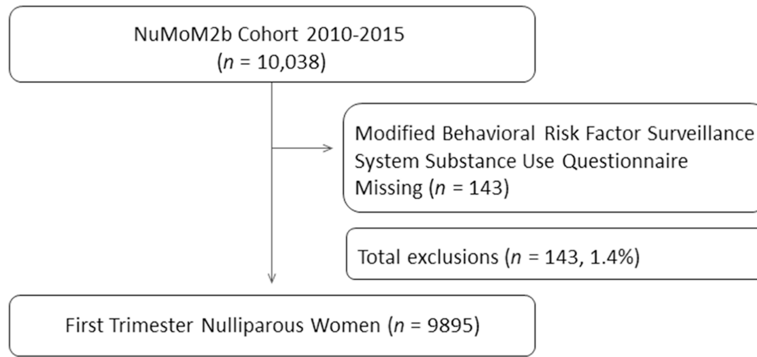

Figure 2:
Flow diagram of included NuMoM2b participants and reasons for exclusion

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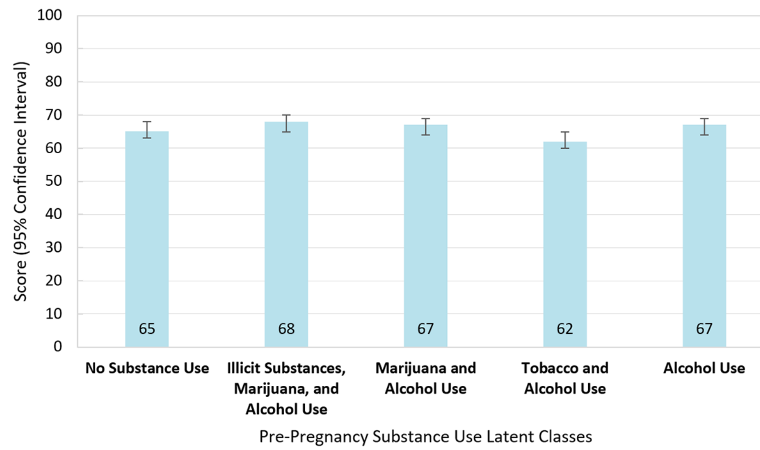

Figure 3:
Bars represent adjusted mean CVH scores of the 5-pre-pregnancy substance use latent classes and 95% confidence intervals (CI), Adjusted for age, race/ethnicity, marital status, and method of paying for healthcare. [a] Illicit substances and marijuana use were categorized as ever use.

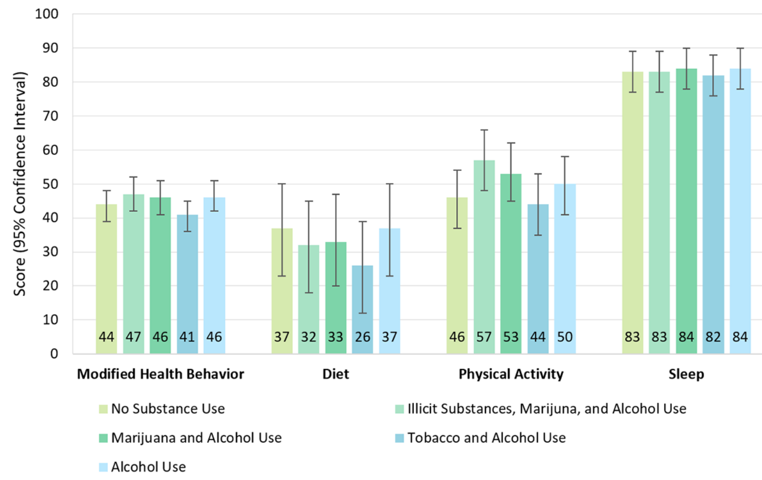

Figure 4:
Bars represent adjusted means of health behavior and component scores of the 5-pre-pregnancy substance use latent classes and 95% confidence intervals (CI). The modified health behavior score is an average of the three health behavior component scores (diet, physical activity, and sleep). Adjusted for age, race/ethnicity, marital status, and method of paying for healthcare. [a] Illicit substances and marijuana use were categorized as ever use.

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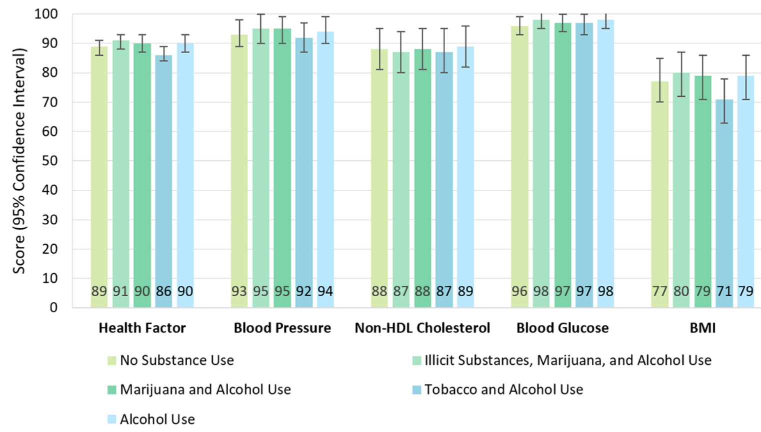

Figure 5:

Bars represent adjusted means of health factor and component scores of the 5-pre-pregnancy substance use latent class and 95% confidence intervals (CI). The health factor score is an average of the four health factor component scores (blood pressure, non-HDL cholesterol, blood glucose, and BMI). Adjusted for age, race/ethnicity, marital status, and method of paying for healthcare. [a] Illicit substances and marijuana use were categorized as ever use.

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Table 1.

Descriptive Characteristics of NuMom2b Participants by Pre-Pregnancy Substance Use Latent Classes [a]

	Overall (N= 9896)	No Substance Use (n= 2765, 27.9%)	Illicit Substances, Marijuana, and Alcohol Use [b] (n= 1234, 12.5%)	Marijuana and Alcohol Use [b] (n= 2066, 20.9%)	Tobacco and Alcohol Use (n= 636, 6.4%)	Alcohol Only Use (n= 3194, 32.3%)
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Age	27.0 (5.7)	24.8 (5.3)	28.5 (5.6)	27.4 (6.0)	24.6 (5.4)	28.5 (5.1)
	Number (%)	**Number (%)**	**Number (%)**	**Number (%)**	**Number (%)**	**Number (%)**
Race/Ethnicity						
Non-Hispanic White	5921 (59.8)	1503 (54.4)	940 (76.2)	1193 (57.7)	335 (52.7)	1950 (61.1)
Non-Hispanic Black	1401 (14.2)	438 (15.8)	47 (3.8)	403 (19.5)	163 (25.6)	350 (11.0)
Hispanic	1663 (16.8)	562 (20.3)	141 (11.4)	277 (13.4)	91 (14.3)	592 (18.6)
Asian	404 (4.1)	142 (5.1)	27 (2.2)	58 (2.8)	6 (0.9)	171 (5.4)
Other	506 (5.1)	120 (4.3)	79 (6.4)	135 (6.5)	41 (6.5)	131 (4.1)
Marital Status						
Single, never married	3871 (39.1)	989 (35.8)	538 (43.6)	941 (45.6)	454 (71.4)	949 (29.7)
Married	5896 (59.6)	1749 (63.3)	672 (54.5)	1095 (53.0)	171 (26.9)	2209 (69.2)
Divorced, Separated, or Widowed	118 (1.2)	19 (0.7)	34 (1.9)	29 (1.4)	10 (1.6)	36 (1.1)
Missing	10 (0.1)	8 (0.3)	0 (0.0)	1 (0.1)	1 (0.2)	0 (0.0)
Method of Paying for Healthcare						
Commercial	5172 (52.3)	1373 (49.7)	571 (46.3)	979 (47.4)	247 (38.8)	2002 (62.7)
Government	2771 (28.0)	913 (33.0)	326 (26.4)	624 (30.2)	319 (50.2)	589 (18.5)
Military	61 (0.6)	17 (0.6)	5 (0.4)	11 (0.5)	4 (0.6)	24 (0.8)
Personal household income	1695 (17.1)	387 (14.0)	310 (25.1)	412 (19.9)	47 (7.4)	539 (16.9)
Other	130 (1.3)	46 (1.7)	17 (1.4)	22 (1.1)	13 (2.0)	32 (1.0)
Missing	66 (0.7)	29 (1.1)	5 (0.4)	18 (0.9)	6 (0.9)	8 (0.3)

[a] Data are presented as mean (SD) or number (%)

[b] Indicates one or more substances in the group was categorized as ever use.