

## RESEARCH

# The Association Between Health Insurance and Opioid Misuse in Pregnancy

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We sought to evaluate the association between insurance type and non-medical opioid use in pregnant women in the United States. We conducted a study in women aged 12 to 49 years using the 2005–2014 National Survey on Drug Use and Health (NSDUH). Though multivariable regression, we specifically analyzed the difference in non-medical opioid use during pregnancy between women covered by Medicaid versus private insurance. A total of 244,353 reproductive-aged women were included. Of those women, 8,862 (3.6%) were pregnant at the time of survey and 79 (0.03%) reported non-medical opioid use in the past month. After controlling for socioeconomic factors, we found nonmedical opioid use was greater for pregnant women on Medicaid compared to private insurance in the second trimester (adjusted odds ratio, 6.5;  $p = .015$ ), despite no significant difference in the first trimester (0.84;  $p = .656$ ). This difference may suggest a discrepancy in access to care.

**Keywords:** opioid; substance use disorder; pregnancy; Medicaid; health insurance; healthcare disparity

## Introduction

Opioid misuse in the US has increased markedly during the previous three decades [1, 2]. High rates of misuse extend to pregnant women, with maternal opioid use increasing over 480% between 2000 and 2009 [3]. By 2011, opioid exposure in pregnancy was reported to be 12.9% in the United States [4].

Opioid misuse has major health implications for the mother and neonate, including increased frequency of preterm birth, low birth weight, neonatal admission to the intensive care unit, neonatal abstinence syndrome, and maternal mortality. Given these consequences, addressing opioid use disorder, not only in the general population but specifically in pregnant women, is critical to minimize the harmful cascading impacts of the opioid epidemic [5, 6, 7].

Opioid misuse in women of reproductive age is associated with insurance type, race, and socioeconomic status. Pregnancy-related opioid use is more frequent in mothers who are aged  $\geq 21$  years, white, non-Hispanic, primigravid, nonurban, disabled, have low socioeconomic status, and have not graduated from high school, regardless of pregnancy trimester [8, 9].

Women of reproductive age on Medicaid fill a significantly higher number of opioid prescriptions than women with private insurance [10]. Moreover, the proportion of Medicaid-enrolled pregnant women filling a prescription for opioids during pregnancy increased from 18.5% in 2000 to 22.8% in 2007 [11]. A similar disparity in pregnancy outcomes is observed between Medicaid and private insurance. Women who remained on private insurance through dependent care had lower rates of preterm births compared to those who switched to public insurance (adjusted difference-in-difference,  $-0.2\%$ ,  $p < 0.05$ ) [12]. Additionally, among women who delivered preterm, neonates from mothers covered by Medicaid had higher rates of bacterial sepsis (11.6% vs 10.2%,  $p < 0.01$ ), necrotizing enterocolitis (2.9% vs 1.7%,  $p < 0.001$ ), and lower birth weights (1883g  $\pm$  659g vs. 1932g  $\pm$  690g,  $p < 0.01$ ) [13].

While insurance type may modulate quality of prenatal care, limited information is available about the effect of insurance type on nonmedical opioid use during pregnancy. Despite the known deleterious effects of the opioid epidemic on pregnancy, current policies have not specifically addressed this population. The lack of policy leaves room for inequities in care among pregnant women with less comprehensive health insurance benefits.

The purpose of this study is to evaluate differential patterns of nonmedical opioid use and opioid use disorder by insurance type as a means of elucidating gaps in healthcare coverage.

## Methods

### *Study design and data sources*

We performed a retrospective database analysis using the National Survey of Drug Use and Health (NSDUH) public use files (Substance Abuse and Mental Health Services Administration (SAMHSA), 2005–2014) [14]. The NSDUH annual surveys included self-reported assessments of substance use, including opioid and opioid derivatives, from nationally representative populations aged  $\geq 12$  years. Participants were chosen from probability samples in the United States (all 50 states), and interviews were conducted by trained study coordinators. Computer-assisted personal interviewing and audio computer-assisted self-interviewing methods were combined to increase the validity of the data given the sensitive nature of interview content [15]. All procedures were approved by Institutional Review Boards at the Research Triangle Institute [16].

For this current analysis, women aged 12 to 49 were sampled from NSDUH surveys, and results were pooled for the years 2005 to 2014 to create a sufficient sample of opioid-using pregnant women [17]. Opioid and opioid derivative pain reliever use in the past month was used as a proxy for current opioid use. These data were correlated with pregnancy trimester data to determine if opioids were used during pregnancy. The NSDUH provided sample weight data to ensure that sample responses were consistent with United States Census Bureau estimates. The weighted interview responses varied from 71% to 77% between 2005 and 2014.

### *Measures*

The primary outcome was non-medical opioid and opioid derivative pain reliever use in the past month, including heroin use. Past month use was derived from the interview question “When was the last time you used any prescription pain reliever that was not prescribed for you or that you took only for the experience or feeling it caused?” Heroin use in the past month was derived from the question: “How long has it been since you last used heroin?” This question was asked twice to ensure validity given the sensitive nature of the content.

### *Exposure*

The exposure of interest was pregnancy. Pregnancy status was queried for women between 12 and 44 years. In our analysis, women were considered to be “not pregnant” if they answered no or pregnancy status was unknown. We also utilized trimester data to capture if women later in pregnancy had discontinued opioid use.

### *Modifier*

The effect modifier was health insurance status. In the NSDUH survey, this variable was collected as follows: private insurance, Medicaid/Children’s Health Insurance Program (CHIP), Medicare, Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), Veterans Affairs (VA), CHAMPUSVA, Military, other insurance, or uninsured. We combined the CHAMPUS, VA, CHAMPUSVA, and Military groups, later referred to as “VA/CHAMPUS” due to similarities in insurance benefits.

To assess the combined influence of insurance status and trimester on nonmedical opioid use, we assessed the interaction of Medicaid/CHIP insurance and trimester and Medicaid/CHIP vs private insurance and trimester. Participants were considered to be covered by Medicaid/CHIP if they had Medicaid/CHIP coverage and did not have private insurance coverage. Participants were considered to have private insurance only when they had private insurance coverage and did not have Medicaid/CHIP coverage.

### *Participant characteristics*

We restricted the population to women ages 12 to 49, thereby limiting the reference group to women of reproductive age. The NSDUH collection guidelines restricted the population to non-homeless individuals.

We examined various patient demographic covariates including age, race/ethnicity, education, marital status, and income. Our income variable was defined as above or below 200% of the federal poverty line (FPL). This decision was made since the initial dataset delineated this income cutoff and due to a lack for further stratification of results among income groups less than 200% of the federal poverty line in the dataset. Education was defined as completing a high school education/GED or greater versus not completing high school. Survey participants who were missing any of these data points were not included in the analysis.

### *Statistical analysis*

We used descriptive statistics to examine the demographic characteristics by pregnancy status. We performed two separate logistic regressions for women of reproductive age and pregnant women alone to assess nonmedical opioid use in the previous month by pregnancy and trimester status. Both analyses included covariates for insurance type, income, age, education, race/ethnicity, and marital status and generated adjusted odds ratios.

Effect modification of insurance type on the relationship between trimester of pregnancy and opioid use was assessed using an interaction factor between insurance type and trimester; this regression model included all interaction terms, main effects, and covariates assessed. In these analyses, opioid and heroin use were combined due to the small number of pregnant heroin users.

Data were analyzed using statistical software (Stata/IC Version 15, StataCorp, College Station, TX) with weighting as outlined in the NSDUH codebook to account for variation in composition of survey respondents for analyses of the entire reproductive age population. However, since the weighting was designed for the general US population rather than the sub-population of pregnant women, we felt it was inaccurate to apply these weight adjustments for the sub-analyses of the pregnant population [18].

## Results

The data set contained information on 244,353 reproductive-aged women who completed the NSDUH in years from 2005–2014. Of those women, 8,862 (3.6%) were pregnant at the time of survey. Among pregnant women, 0.92% (79) used opioids in the past month compared to 2.53% (5,970) of non-pregnant women. There was no statistically significant difference in heroin use among pregnant women vs. non-pregnant women, 0.17% (14) vs. 0.09% (217),  $p < 0.08$ .

Demographics among reproductive age women from 2005 to 2014 are listed in **Table 1**. The majority of pregnant women were between ages 26 and 34 (46.8%), non-Hispanic white (58.18%), married (59.71%), completed a high school diploma or above (80.26%), and earned an income higher than 200% of the federal poverty line (55.57%). Among pregnant women, 89.57% had insurance coverage. Of those with coverage, 52.13% (4,437) were covered by private insurance, 34.66% (2,948) were covered by Medicaid and/or CHIP, 3.73% (318) had VA/CHAMPUS coverage, 0.86% (42) had Medicare, and 21.81% (224) of women had another form of insurance coverage.

Logistic regression, controlling for demographic characteristics and pregnancy trimester, showed that Medicaid/CHIP, VA/CHAMPUS, Medicare, other insurance, and no insurance were significantly associated with increased odds of non-medical opioid or heroin use compared with private insurance (**Table 2**). Pregnancy, regardless of trimester, and African American and Hispanic race or ethnicity were protective against nonmedical opioid or heroin use as previously shown (**Table 2**) [19].

Comparing Medicaid to private health insurance, we found no significant difference between Medicaid and privately-insured women during the first trimester. However, during the second trimester those on Medicaid had significantly higher odds of non-medical opioid or heroin use compared to those with private insurance (aOR = 6.50,  $p = 0.015$ ) (**Table 3**). The trend was also present in the third trimester (aOR = 4.66,  $p = 0.082$ ), though it fell short of being statistically significant at the  $p = 0.05$  level.

To determine if the overall pattern observed translated to pregnant women with opioid use disorder rather than solely women with one-time or rare opioid use, we performed a parallel analysis on frequent users. Frequent users were defined as women using opioids for 30 days or more in the past year based on research by Jones et. al. (see supplemental table for participant data) [20]. In this regression we found a similar pattern of higher use among Medicaid patients in the second and third trimester compared to privately insured individuals (aOR = 6.24 and aOR = 7.05, respectively) (**Table 4**). However, due to the small sample size of pregnant frequent opioid misusers ( $n = 264$ ), our results were not statistically significant ( $p = 0.102$  and  $p = 0.082$ , respectively).

## Discussion

The present study demonstrated that pregnant women who have public insurance are significantly more likely to self-report using opioids than those on private insurance, and that this difference varies across the trimesters. We found that nonmedical opioid use in the second trimester among women insured by Medicaid was 6.5-fold higher than for those who carried private insurance. Similarly, in the third trimester we observed a parallel trend with an odds ratio of 4.66 for publicly-insured women, though this result did not achieve statistical significance. These findings suggest that the Medicaid population is receiving differential screening and/or treatment of nonmedical opioid use during pregnancy.

We controlled for the aforementioned socioeconomic covariates: income, level of education, marital status, race/ethnicity, and age, which we anticipated could impact baseline differences in non-medical opioid use between Medicaid and private insurance populations. After minimizing confounding due to the above variables, there was no statistically significant difference in non-medical opioid use between the Medicaid and privately insured populations for women in the first trimester of pregnancy.

Demographically, the results are consistent with prior trends of non-medical opioid use; non-medical use was less common in pregnant women, and black and Hispanic individuals, while more common among individuals with Medicaid insurance.

The NSDUH survey question used in our study asked about opioid use in the prior month. As half of pregnancies are unplanned, women may not know that they are pregnant in the first trimester or may need time to adjust pre-pregnancy behaviors. Therefore, the first trimester results may reflect nonmedical opioid use in women of reproductive age, which, based on our results and previous findings, is primarily driven by socioeconomic factors.

These findings highlight a difference in rates of opioid use disorder as women progress through pregnancy. Although there was no significant difference in non-medical use during first trimester, a disparity between Medicaid/CHIP and private insurance was observed by the second trimester. It seems unlikely that this difference is due to

**Table 1:** Descriptive characteristics by pregnancy status among US women of reproductive age.

Category	Not Pregnant (n = 235,491) (%)	Total	Pregnant (n = 8,862) (%) <sup>a</sup>	Total	P-value
<b>Age category****</b>					<0.0001
12–17 years	18.39	43,370.65	3.42	291.86	
18–25 years	24.04	56,695.91	37.23	3,181.51	
26–34 years	25.93	61,134.45	46.8	3,999.17	
35–49 years	31.64	74,606.91	12.55	1,072.56	
<b>Race category</b>					0.076
African American (non-Hispanic)	14.12	33,303.50	14.29	1,221.24	
Hispanic	17.93	42,282.76	19.77	1,689.71	
Other <sup>b</sup>	8.02	18,913.45	7.76	662.95	
White (non-Hispanic)	59.93	141,308.20	58.18	4,971.19	
<b>Education****</b>					<0.0001
High school diploma or above	71.15	167,769.20	80.26	6,858.66	
Less than high school diploma <sup>c</sup>	28.85	68,038.66	19.74	1,686.43	
<b>Marital status****</b>					<0.0001
Married	37.35	88,066.75	59.71	5,102.48	
Unmarried	62.65	147,741.20	40.29	3,442.61	
<b>Poverty**</b>					0.0012
Less than 100% of threshold	20.39	48,069.62	22.81	1,949.33	
100%–199% of threshold	21.63	51,011.98	21.62	1,847.59	
200% or more of threshold	57.98	136,726.30	55.57	4,748.17	
<b>Insurance coverage****</b>					<0.0001
No	17.99	42,111.96	10.43	886.90	
Yes	82.01	191,996.20	89.57	7,616.96	
<b>Insurance coverage, by type</b>					
Medicare**	1.45	2,572.77	0.86	41.93	0.0077
Medicaid/CHIP****	16.67	39,038.73	34.66	2,948.00	<0.0001
VA/CHAMPUS****	2.29	5,383.10	3.73	317.85	<0.0001
Private insurance****	62.41	146,229.26	52.13	4,437.22	<0.0001
Other****	10.82	4,625.46	21.81	224.12	<0.0001
<b>Pain reliever use – past month****</b>					<0.0001
No	97.47	229,837.50	99.08	8,466.24	
Yes	2.53	5,970.36	0.92	78.86	
<b>Heroin use – past month</b>					
No	99.91	235,591.1	99.83	8530.89	0.077
Yes	0.09	216.77	0.17	14.20	

\*\* p < 0.05 \*\*\*\* p < 0.0001.

Number of observations = 243,353.

Data is from the NSDUH 2005–2014. Sampling weights were provided by NSDUH.

<sup>a</sup> Women whose pregnant status were unknown were grouped in the not pregnant group.

<sup>b</sup> Other race category includes non-Hispanic Native American/Alaskan Natives, non-Hispanic Hawaiians/other Pacific Islanders, non-Hispanic Asians, and people reporting more than one race.

<sup>c</sup> Persons aged 12–17 were included in the less than high-school group.

**Table 2:** Association between health insurance type and past-month opioid use by pregnancy trimester.

	Odds ratio	P-value
Medicaid/CHIP****	1.783	<0.0001
VA/CHAMPUS**	1.308	0.037
Medicare**	1.466	0.031
Other insurance**	1.367	0.007
Uninsured****	1.849	<0.0001
Pregnant status, by trimester (ref: non-pregnant women)		
First trimester**	0.709	0.033
Second trimester****	0.344	<0.0001
Third trimester****	0.256	<0.0001
Income less than 200% of the poverty threshold****	1.085	<0.0001
Age	0.965	0.218
Race/ethnicity (ref: non-Hispanic white)		
African American (non-Hispanic)****	0.586	<0.0001
Hispanic****	0.563	<0.0001
Other****	0.492	<0.0001
Unmarried****	2.170	<0.0001
Education**	0.962	0.038

\*\* p < 0.05 \*\*\*\* p < 0.0001.

Number of observations = 241,994.

**Table 3:** Comparison of Medicaid vs private insurance on past-month opioid use during pregnancy.

	Odds ratio	P-value
Medicaid/CHIP versus Private insurance****	1.725	<0.0001
Pregnant status, by trimester (ref: not pregnant women)		
First trimester	0.779	0.433
Second trimester****	0.064	<0.0001
Third trimester****	0.524	<0.0001
Income less than 200% of the poverty threshold**	1.134	0.022
Age	1.031	0.374
Race/ethnicity (ref: non-Hispanic white)		
African American (non-Hispanic)****	0.628	<0.0001
Hispanic****	0.706	<0.0001
Other****	0.516	<0.0001
Unmarried****	2.174	<0.0001
Education**	0.936	0.003
Interaction effects		
First trimester and Medicaid/CHIP versus Private insurance interaction	0.843	0.656
Second trimester and Medicaid/CHIP versus Private insurance interaction**	6.498	0.015
Third trimester and Medicaid/CHIP versus Private insurance interaction	4.664	0.082

\*\* p < 0.05 \*\*\*\* p < 0.0001.

Number of observations = 187,541.

**Table 4:** Comparison of Medicaid vs private insurance on long term opioid use during pregnancy\*.

	Odds ratio	P-value
Medicaid/CHIP versus Private insurance	1.258	0.101
Pregnant status, by trimester (ref: not pregnant women)		
First trimester	1.293	0.639
Second trimester**	0.046	0.004
Third trimester****	0.017	<0.0001
Income less than 200% of the poverty threshold	0.863	0.251
Age	1.039	0.65
Race/ethnicity (ref: non-Hispanic white)		
African American (non-Hispanic)	0.925	0.63
Hispanic	1.193	0.331
Other	0.982	0.942
Unmarried	1.084	0.654
Education	0.985	0.785
Interaction effects		
First trimester and Medicaid/CHIP versus Private insurance interaction	0.286	0.058
Second trimester and Medicaid/CHIP versus Private insurance interaction	6.240	0.102
Third trimester and Medicaid/CHIP versus Private insurance interaction	7.053	0.082

\*\*  $p < 0.05$  \*\*\*\*  $p < 0.0001$ .

Number of observations = 4,114.

\* Long term opioid use is defined as opioid use  $\geq 30$  days in the last 365 days.

an increase in opioid use in the second trimester among women on Medicaid; rather, it may reflect an inequality in screening and treatment of opioid misuse. Privately insured women may receive more effective care that is successfully curtailing nonmedical opioid use in the second trimester. Granted, these results are limited by the socio-economic covariates present in the data set. Other factors not accounted for in this model such as baseline health status, medical use of opioids, health literacy, and language fluency, may influence or better explain this disparity in nonmedical opioid use among Medicaid-covered patients. Future research is needed to determine the root causes of the disparity in opioid misuse during second trimester to inform meaningful solutions to expanding screening and treatment during pregnancy.

### **Policy Implications**

In order to address the differential treatment identified by our study, interventions could be targeted at outpatient obstetric and family medicine clinics that predominately provide care to patients with Medicaid/CHIP insurance, thus not adjusting individual treatment based on insurance status but rather focusing solutions at a wider population level. Upon reviewing the literature, there were several solutions to potentially address these disparities. First, increase education of Obstetrics and Gynecology physicians (Ob/Gyns) and Family Medicine physicians on screening and treatment for opioid use during pregnancy, through implementation of tools such as the Substance Use Risk Profile-Pregnancy scale [19] and the Screening, Brief Intervention, and Referral to Treatment model [20]. Secondly, decrease barriers to buprenorphine prescription for Ob/Gyns and primary care providers. Though the MOTHER study demonstrated superior neonatal outcomes with buprenorphine compared to methadone treatment [21], prior studies have indicated that Medicaid coverage is negatively associated with buprenorphine prescriptions among opioid misusers [22]. This is suspected to be a result of required prior authorization and cash only treatment for buprenorphine, which limits the availability for Medicaid patients [23, 24]. Additionally, current opioid treatment policy includes strict patient caps for providers and provider groups, limiting the number of patients who can receive buprenorphine through a given physician, hospital, or clinic [25]. Elimination of these caps would significantly expand access to treatment, thereby improving maternal and neonatal outcomes in pregnant women with opioid use disorder.

Lastly, we propose expansion of proven interdisciplinary care models to encourage cross-specialty collaboration between primary care and addiction medicine specialists. Given that Medicaid patients are less likely to receive a specialist referral for treatment of opioid misuse compared to patients with private insurance, we recommend employing an integrated system [26], such as the proven hub and spoke model. This could provide a substance use specialist as a consultant for primary care and Ob/Gyns in the community, from whom they could seek guidance and to whom they could refer particularly complex patients [27].

### Limitations

There are several limitations to our analysis. Shortcomings were related to the structure of the NSDUH dataset. First, the survey is a cross-sectional rather than longitudinal study, limiting the inferences of causality. To address this, we overlaid opioid use in the past month to pregnancy and trimester data to infer that these women were actively using opioids during pregnancy. However, this design incorporates a maximal one-month time lag. Relatedly, due to the cross-sectional nature of the survey, there is a possibility that a single individual may be represented multiple times in the combined dataset used in our analysis. In addition, because opioid use in the past month was binary and not quantified, opioid dosage and frequency of consumption could not be assessed.

There were also several limitations related to the challenges of interviewing. The opioid use data were self-reported; therefore the data are subject to recall bias and/or underreporting due to the stigma associated with using opioids. Pregnancy status was also self-reported, which can be an inaccurate assessment of pregnancy status or gestational age. Additionally, there is potential for ambiguity in the definition of non-medical use. The NSDUH authors classified non-medical use as an opioid “used for the experience or feeling it caused”; however, this definition could be differentially interpreted amongst interviewees, interviewers, and researchers. Lastly, the dataset contained a very small number of pregnant women who were using heroin.

### Conclusion

Nonmedical opioid use by pregnant women in the second trimester was 6.5-fold higher for women on Medicaid than private insurance. The detrimental effects of nonmedical opioid use during pregnancy necessitate the development of treatment guidelines and policies to target this vulnerable population. The development of standardized opioid substance use disorder treatment may serve to eliminate the disparity observed between Medicaid and privately-insured pregnant women. Further work is needed to determine the efficacy of provider education, decreased systemic barriers to substance abuse treatment, and interdisciplinary models with substance abuse specialists to eliminate opioid use disorder in pregnancy.

### Appendix

**Supplemental Table 1:** Total number of reproductive aged women by opioid use frequency in the past 365 days.

Number of Days of Use in the Past 365 days	Number	Percent
1–29 days	11,654	4.49
30–99 days	3,430	1.32
100–199 days	1,687	0.65
200–365 days	1,057	0.41
Bad data	2,832	1.09

Number of observations = 259,465.

**Supplemental Table 2:** Number of pregnant women by opioid use frequency in the past 365 days.

Number of Days of Use in the Past 365 days	Number	Percent
1–29 days	349	3.94
30–99 days	134	1.51
100–199 days	64	0.72
200–365 days	48	0.54
Bad data	99	1.12

Number of observations = 8,862.

## Competing Interests

The authors have no competing interests to declare.

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