A Rural-Urban Analysis of Buprenorphine Therapy During and After Pregnancy Among the Commercially Insured

KariLynn Dowling-McClay, PharmD, MPH; Bill Brooks, DrPH, MPH; Daniel Krauss, MCS, MPP; Casey P Balio, PhD; Margaret M Francisco, DrPH(c), MPH; Robert Pack, PhD, MPH

This analysis describes the frequency of markers of evidence-based prescribing of buprenorphine-containing medications for the treatment of opioid use disorder (OUD) during and surrounding pregnancy in rural and non-rural settings among commercially insured people ages 15-44.

Background

In the U.S., estimated rates of maternal OUD documented at delivery increased more than seven-fold between 1999 and 2017, from 1.5 per 1,000 births in 1999 to 8.2 per 1,000 births in 2017.[1,2] Untreated OUD during pregnancy is associated with high-risk maternal behaviors, fetal growth restriction, preterm delivery, and severe neonatal abstinence syndrome (NAS) or neonatal opioid withdrawal syndrome (NOWS).[3,4] Overdoses related to substance use disorder contribute to maternal mortality in the U.S.[5] Without adequate OUD treatment, mother-infant dyads are more likely to experience hazardous, potentially life-threatening medical and social outcomes.[3,6] There are significant geographic disparities in maternal health resources,[7] morbidity,[8] and mortality.[9] Though rural areas have seen gains in access to providers who will prescribe medications to treat OUD in the past several years,[10] there are still significantly fewer treatment options compared to urban settings, and gaining access to medications remains a challenge.[11]

Medication therapy is recommended as the standard of care for the management of OUD during pregnancy and the postpartum period by multiple expert groups.[4] The American College of Obstetricians and Gynecologists (ACOG) recommends two opioid agonist therapy options for pregnant people with OUD as part of a comprehensive treatment plan: methadone or buprenorphine.[6] These two medications are the most robustly investigated treatment

Key Takeaways

- Treatment adherence and persistence rates for pregnant individuals with OUD stand at approximately 60%. This emphasizes the need for targeted interventions to enhance adherence and persistence throughout the course of pregnancy.
- No significant differences were observed in treatment outcomes based on rurality. Possible explanations for this finding are discussed.
- There is insufficient research on treatment outcomes for OUD during pregnancy among both commercially and publicly insured individuals. Additional research is needed for those experiencing insurance churn to inform more effective interventions.
- Evidence-based policies are needed to address the unique needs of pregnant individuals with OUD and enhance overall treatment efficacy.

options for maternal OUD within the broader categories of medication-assisted treatment (MAT) or medications for OUD (MOUD). Evidence-based MOUD treatment prevents opioid withdrawal, reduces the risk of return to use, promotes adherence to treatment programs, and reduces obstetric complications in combination with prenatal care.[6] In most cases, maintenance of MOUD during pregnancy is preferred over medically supervised withdrawal or tapering,[6] which results in high rates of OUD relapse and poor disease- and pregnancy-related outcomes.[12–14] ACOG also recommends continuation of MOUD after delivery because observed relapse rates among people with OUD are higher in the postpartum period than during pregnancy.[6,15] Evidence-based MOUD treatment recommendations for pregnant people include the following four criteria:[6]

1. MOUD is initiated (or continued, if previously in use) when a person becomes pregnant.
2. MOUD is continued during and after the postpartum period.
3. MOUD is not tapered off during pregnancy (i.e., treatment persists throughout the pregnancy and after delivery).
4. MOUD is not withdrawn abruptly during pregnancy (i.e., the patient remains adherent to therapy).

Buprenorphine and methadone are both recommended treatment options for OUD during pregnancy, however buprenorphine is the only first-line treatment option for OUD during pregnancy that can be billed to prescription insurance through a standard outpatient pharmacy and, as such, is the focus of this prescription claims analysis. Previous studies have examined MOUD prescribing during pregnancy within a variety of geographic contexts and with different insurance types, including Medicaid and commercial insurance coverage. Importantly, the literature shows that prevalence rates of pregnant people with an OUD and prevalence of people prescribed buprenorphine during pregnancy differ greatly depending on insurance status. Studies using Medicaid claims data show higher rates of OUD among pregnant people (ranging from 2.4% to 5.5%)[16–19] compared to studies using commercial insurance data (ranging from 0.2% to 0.3%).[20,21] Similarly, rates of pregnant people prescribed buprenorphine are higher in studies with a Medicaid-enrolled population (ranging from 0.5%-1.2%)[17,18,22] compared to a population enrolled in commercial insurance (ranging from 0.10%-0.11%).[20,21,23] In sum, rates of a diagnosed OUD and a buprenorphine prescription are demonstrated to be higher among pregnant people enrolled in Medicaid compared to pregnant people enrolled in commercial health insurance. Among a general non-elderly adult population, individuals with Medicaid coverage have higher rates of SUD and OUD as compared to privately insured individuals.[24,25]

While the prevalence of OUD and prescribing of buprenorphine during pregnancy is demonstrated in the existing literature, the evidence base skews more heavily toward studies using Medicaid claims data, with limited studies among the commercially insured population. Similarly, little is also known about OUD treatment patterns for pregnant people in rural and non-rural settings. Given these two factors and the demonstrated differences in the prevalence of OUD and buprenorphine prescribing among commercially and publicly insured pregnant people, additional studies using commercial insurance data are warranted.

The purpose of this study is to characterize evidence-based buprenorphine treatment during the peri-pregnancy period among commercially insured individuals ages 15-44 and by rurality. This study utilizes a national database of commercial insurance claims from 2015-2019. We define peri-pregnancy as the pregnancy period plus 12 weeks before conception and 12 weeks after delivery. We consider the use of any buprenorphine treatment as well as measures of persistence and adherence overall and by rurality. Our aim is to advance the understanding of buprenorphine treatment practices in rural areas burdened by high rates of OUD and guide policymakers in prioritizing programs that support access to high-quality, evidence-based OUD treatment for peri-pregnant people.

Methods

Data source and case selection

A retrospective analysis of commercial insurance claims was conducted via a query of the Merative™ MarketScan® Commercial and Medicare Supplemental Research Database.* The MarketScan® database contains deidentified private-sector health data, including patient demographic information, medical claims, and prescription drug claims, and is provided voluntarily by approximately 100 participating national commercial insurance plans. The query identified 1,331,040 people ages 15 to 44 with diagnosis codes for pregnancy and labor/delivery from January 1, 2015 to December 31, 2019. The following criteria were then applied to identify eligible cases (pregnancies) in the MarketScan® dataset:

- People ages 15 to 44 with medical claim(s) indicating at least one live birth between 2015 and 2019;
- Who had any instance of an OUD diagnosis at any time during the 5-year period;
- Who had continuous plan coverage during the peri-pregnancy period;
- Whose calculated conception date fell on or after January 1, 2015 and calculated completion of the 12-week postpartum period fell on or prior to December 31, 2019;
- Who had any history of buprenorphine prescription claims during a peri-pregnancy period between 2015 and 2019; and
- Who had continuous plan coverage during the peri-pregnancy period.

Live births and OUD diagnoses were identified by ICD-9 and ICD-10 diagnosis and procedure codes associated with claims. Gestational age was imputed based on presence or absence of diagnosis and procedure codes indicating normal delivery, C-section, preterm delivery, long gestation, and delivery of multiples as has been done in other literature. The pregnancy start date was estimated based on the gestational age, the imputation method for which was modeled on previous work by Venkatesh et al.[19]

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Outcome Measures of Buprenorphine Treatment

Several measures of buprenorphine treatment were considered, including those related to any buprenorphine prescription during peri-pregnancy, treatment persistence, and treatment adherence. Any buprenorphine treatment during the peri-pregnancy period was measured by any claim for a buprenorphine product filled during the peri-pregnancy period. Treatment persistence was measured by any treatment in either preconception/early pregnancy (between 12 weeks preconception and end of 1st trimester) or late pregnancy/postpartum (any treatment between beginning of 3rd trimester and 12 weeks postpartum), and full duration treatment was defined as treatment in both preconception/early pregnancy and late pregnancy/postpartum. Lastly, adherence measures included: mean days supply filled during pregnancy, mean adherence rate (calculated as the total days supply of all peri-pregnancy buprenorphine prescription claims divided by the length of the peri-pregnancy in days), and adherence below 80% or at least 80%. Note that there were instances of treatment adherence above 100% which indicates greater numbers of buprenorphine days supply filled in relation to the calculated per-pregnancy length in days. Because of limitations in the data, these were combined into at least 80% adherence. All treatment measures were based on commercial prescription claims. Included prescription claims were inclusive of all formulations of the buprenorphine mono product and buprenorphine/naloxone combination product that are FDA-approved for treatment of OUD.

Measure of Rurality

Rural and non-rural classification of patient residence was determined by presence or absence of a Metropolitan Statistical Area (MSA) code associated with the claims, with all designated MSAs considered non-rural and all areas not part of an MSA considered rural according to the U.S. Office of Management and Budget classification system.[20]

Analysis

A descriptive analysis was performed to describe and compare measures of buprenorphine treatment during peri-pregnancy by rurality. Analyses were conducted using measures of central tendency, Chi square, and independent sample t-tests in SPSS version 25.

Results

Buprenorphine prescription claims were filed during the peri-pregnancy period for 694 pregnancies, with similar rates among rural and non-rural pregnancies in the sample (66.8% vs 62.1%, respectively; p=0.241, Table 1). All individuals in this sample were categorized in the data as female. Mean age at first buprenorphine claim during peri-pregnancy was 26.3 years ± 5.1 years and age at first claim during peri-pregnancy did not differ between rural and non-rural groups (26.3 years vs. 26.2 years; p=0.865). Presence of any buprenorphine treatment in either preconception/early pregnancy or late pregnancy/postpartum and among rural and non-rural individuals were all above 82%, however full duration treatment persistence throughout peri-pregnancy was lower, ranging from 70.2% among non-rural individuals to 76.0% for rural individuals. The mean adherence to buprenorphine during the pregnancy and postpartum period was approximately 60% for both rural and non-rural populations. About 40% of the sample had high buprenorphine adherence (at least 80% adherence), while nearly three-fifths

of the population had adherence below 80%. There were no significant differences in any of the buprenorphine treatment measures between rural and non-rural groups.

Table 1: Treatment Characteristics among Individuals with Any Buprenorphine Filled during Pregnancy

	Total (%)	Rural (%)	Non-Rural (%)	P Value
Total	694 (63.3%)	125 (66.8%)	510 (62.1%)	0.241
Buprenorphine Treatment Persistence During Peri-Pregnancy				
Any treatment between 12 weeks preconception and end of 1st trimester	600 (85.5%)	112 (89.6%)	440 (86.3%)	0.376
Any treatment between beginning of 3rd trimester and 12 weeks postpartum	581 (83.7%)	107 (85.6%)	420 (82.4%)	0.428
Full durat6ion treatment throughout pregnancy (preconception/1st trimester through 3rd trimester/postpartum)	498 (71.8%)	95 (76.0%)	358 (70.2%)	0.225
Adherence to Buprenorphine During Pregnancy				
Mean days supply filled during pregnancy (days)	217± 132	222 ± 123	213 ± 134	0.499
Mean adherence rate (%)	58.9 ± 35.1	61.0 ± 33.2	57.7 ± 35.5	0.348
Adherence below 80%	416 (59.9%)	74 (59.2%)	311 (61.0%)	0.725
Adherence greater than/equal to 80%	278 (40.1%)	51 (40.8%)	199 (39.0%)	

*Sig. at 95%. Calculated using chi-square or Fisher's exact test for categorical variables and independent samples t-test for continuous variables.

Discussion

The existing body of literature on pregnant people with OUD and their use of buprenorphine during pregnancy provides a diverse range of estimates, reflecting variations in treatment approaches, populations, and settings. Estimates for the prevalence of OUD during pregnancy range from 0.3%[20] among commercially insured populations to 5.5% among individuals insured with Medicaid.[16] A notable trend in the literature is the predominant focus on Medicaid populations,[16–19,22] with a fewer number of studies examining commercially insured pregnant people[20,21] and only one study with an inpatient setting.[2] However, a significant gap exists in the literature concerning commercially insured individuals, an aspect that our study seeks to address. Additionally, no studies examine this topic during the peri-pregnancy period and by rurality.

The current study contributes to the existing knowledge by examining the prevalence of commercially insured pregnant people who received buprenorphine treatment during the peri-pregnancy period. We find approximately 700 instances of buprenorphine treatment during

peri-pregnancy in a continuously enrolled, commercially insured population from 2015 through 2019. This likely represents a small portion of the total number of individuals with OUD during pregnancy, and those treated with buprenorphine. Combined with evidence of individuals with Medicaid coverage during pregnancy, this suggests commercially insured individuals represent a small but important share of this population, and with considerably different coverage and context. Policies relevant to this population differ from those for individuals with Medicaid coverage. While the rates observed in our study fall within the range reported by other studies, we anticipate that they may be comparatively lower. This expectation is grounded in the understanding that Medicaid covers a substantial proportion of births and pregnancies,[26] and OUD is likely more prevalent within this specific population.[27–29] Additionally, this dataset did not include instances of inpatient or residential treatment for pregnant individuals. This could also potentially lead to a lower rate of the prevalence of OUD in pregnant people receiving buprenorphine compared to other studies.

The average age at first buprenorphine claim during peri-pregnancy in our study is 26; this age corresponds to the point when individuals are no longer allowed to remain on their parents' insurance coverage. Sudden loss of coverage at 26 may potentially impact access to healthcare services, their likelihood of being commercially insured, and, consequently, the utilization of buprenorphine during pregnancy overall and within this particular dataset. Data were not analyzed by those under and over age 26. Of note, it is likely that a greater portion of individuals in this population receive insurance coverage through Medicaid after age 26 when parental coverage is lost. Existing evidence suggests that there are high rates of insurance churn around pregnancy, which limits the ability to continuously follow individuals in the period before, during, and after pregnancy and often means individuals who churn insurance types during this period are omitted from studies that include only continuously enrolled individuals in either Medicaid or commercial plans, including ours.[30] Future research more closely examining loss of coverage and access to OUD-related services during pregnancy may be used to inform policy and practice in the future.

Our analysis did not reveal a rural-urban difference in the utilization of buprenorphine among pregnant people with OUD. This may be counterintuitive as rural communities have substantially higher rates of OUD and may have lower access to treatment, and as such, we hypothesized lower adherence and persistence.[31–34] This absence of disparity may be related to the different timing and experiences of the opioid epidemic in rural and urban areas. More specifically, OUD and opioid related deaths peaked in rural areas before urban. It is possible that in response to this, rural communities may have stronger and more established recovery ecosystems in place. This observation adds a nuanced perspective to the rural-urban dynamics associated with OUD during pregnancy and warrants further investigation.

Each individual study in this area makes a unique contribution but is insufficient on its own, including the current study. Collectively, these studies offer insights into different variables such as insurance coverage type, inpatient vs outpatient care, and geographic context. However, none of the existing studies comprehensively capture the diversity of scenarios, including both inpatient and outpatient settings, Medicaid and commercially insured populations, individuals churning through insurance, and the full spectrum of available

treatment options. Our manuscript extends the current literature by focusing on commercially insured pregnant people with OUD on buprenorphine by rurality, addressing a gap in the existing literature.

Given the implications for maternal and fetal health, the importance of policy in addressing OUD and prescribing buprenorphine among pregnant people is paramount. Opioid misuse during pregnancy poses substantial risks, including preterm birth, neonatal abstinence syndrome (NAS), and long-term developmental challenges for the child.[35] Buprenorphine has demonstrated effectiveness in mitigating these risks by stabilizing maternal opioid dependence.[36] Comprehensive policies that encourage appropriate use of buprenorphine in pregnant people can significantly improve maternal and neonatal outcomes. As opioid agonist pharmacotherapy such as buprenorphine is the recommended therapy for pregnant individuals with OUD by the American College of Obstetricians and Gynecologists,[37] it is imperative, in the context of loss of age groups and insurance churn, that comprehensive coverage by all insurance providers is ensured. Moreover, adherence to guidelines is crucial among healthcare providers to guarantee the uninterrupted continuity of treatment, even in the face of potential changes in insurance coverage and/or healthcare providers during this period. Policy initiatives could prioritize expanding access to evidence-based treatments, removing barriers to buprenorphine prescribing, and ensuring adequate education and support for healthcare providers. Additionally, policies could address the societal stigma surrounding OUD in pregnancy, promote early intervention, and foster a continuum of care that extends beyond the prenatal period.

Limitations

The findings are subject to limitations. Several data and measurement limitations were identified. Identification of pregnancy cases for inclusion was dependent on the accuracy and completeness of the medical coding in the claims submitted to the database. Care outside of an insurance plan is not captured; for example, some patients may decide to pay for prescriptions without insurance or they may experience inpatient hospital administration of treatment medications which are not filed as prescription claims. Next, the rural/non-rural comparison was based on the MSA associated with claims, which is indicative of the patient's area of residence, not the location of medical care. Further, in order to capture all buprenorphine prescription claims filed during pregnancy, gestational age at delivery was imputed based on diagnosis and procedure codes billed on the date of delivery. This method is consistent with published literature,[23] but is less precise than a medical record of gestational age at birth, particularly for preterm deliveries.[38] Finally, estimates of buprenorphine treatment, persistence, and adherence were based on prescription claim records, which reflect medications dispensed to a patient but do not indicate whether the medication was actually used as directed. Likewise, cessation of buprenorphine claims indicates the medication was no longer dispensed to the patient but does not indicate whether the decision was that of the prescriber, patient, or both. This analysis did not include the strength of the medication dispensed, which would provide additional information on dose adjustments during treatment and tapering or abrupt discontinuation upon treatment cessation.

There are additional limitations surrounding the generalizability of the results. The data reflect pregnancies occurring between 2015 and 2019. The landscape of OUD and buprenorphine prescribing may have changed during this time. Further, changes in the rural/non-rural comparison of treatment characteristics may have occurred during pandemic-era challenges with access to care.[24] Next, the results of this study are not generalizable to individuals who are covered under public insurance programs or are uninsured. The population in this study who is continuously enrolled in commercial insurance is likely to have higher incomes and contain children that are enrolled on their parents' insurance up until age 26. This is unlikely to represent the full population of individuals who are pregnant with OUD. Further, these analyses are bivariate and associative in nature. Data used for this study did not account for other potentially important characteristics that are often associated with treatment., such as measures of demographic characteristics, recovery ecosystems, stigma, income, presence of a partner, and availability of treatment providers. There are likely differences by these characteristics which have considerable implications for health equity, particularly as it relates to minoritized populations and Medicaid eligibility. Finally, this analysis did not consider age which relates to eligibility for commercial insurance coverage particularly around the young adult provision of the ACA. Individuals who are not the primary plan holder (employee) or the spouse are likely child dependents. This may also limit the generalizability of these findings.

Finally, there are several potential limitations due to the timing of claims in the data. This analysis required that the individual received an OUD diagnosis at some point during the 5 years. This could have occurred before, during, or after the peri-pregnancy period. There is some evidence that OUD is often underdiagnosed or miscoded,[39,40] and buprenorphine prescribing can occur without a documented OUD diagnosis. Relatedly, individuals in the sample were only required to be in the sample continuously enrolled for the peri-pregnancy period. Evidence suggests that insurance churn surrounding pregnancy is high,[30] particularly before many states expanded their postpartum Medicaid coverage.[41] Individuals who are able to be continuously enrolled in commercial insurance during this time period are likely different from those who churn between insurance providers or plans during this time period. The inclusion criteria for this analysis also did not allow for ability to consider buprenorphine treatment before and after the peri-pregnancy period, but this may be an area for future study.

Summary

The prescribing of buprenorphine for the treatment of OUD during and around pregnancy is a pressing healthcare concern. Existing literature primarily focuses on Medicaid populations, leaving a significant gap in understanding the dynamics within the commercially insured population. This study, using commercial insurance data, addresses this gap by examining the evidence-based prescribing practices, adherence, and treatment outcomes in the context of pregnancy and OUD. The results of this study provide nuanced insights into the unique challenges and patterns of care delivery, including the absence of a rural-urban difference in the utilization of buprenorphine among pregnant people with OUD. Policy may inform evidence-based guidelines and tailored interventions specifically for pregnant individuals with OUD, and may especially consider diverse insurance landscapes.

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