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Patterns of Medication for Opioid Use Disorder During Pregnancy, 7 Clinical Sites, MATernaL and Infant clinical NetworK (MAT-LINK), 2014–2021

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Abstract

Objectives: To describe patterns of medication for opioid use disorder (MOUD) during pregnancies in the opioid use disorder (OUD) cohort of MAT-LINK, a sentinel surveillance network of pregnancies at US clinical sites.

Methods: Seven clinical sites providing care for pregnant people with OUD collected electronic health record data. Pregnancies were included in this analysis if (1) the pregnancy outcome occurred between January 2014 and August 2021, (2) the person had OUD, and (3) there was any electronic health record–documented MOUD during pregnancy. Analyses describing MOUD type, demographic characteristics, and timing during pregnancy were performed.

Results: Among 3911 pregnancies with any documented MOUD, more than 90% of pregnancies with methadone were to publicly insured people, which was greater than percentages for pregnancies with other MOUD. Buprenorphine with naloxone and naltrexone were two MOUD types that were increasingly common among pregnant people in recent years. In most pregnancies, prenatal care and MOUD were first documented in the same trimester. During the first, second, and third trimesters, there were 37%, 61%, and 91% of pregnancies with MOUD, respectively. Approximately 87% (n = 3412) had only 1 documented MOUD type, versus 2 or 3 types. However, discontinuity in MOUD across trimesters was still observed.

Conclusions: In MAT-LINK's OUD cohort, the overall frequency of MOUD improved over the course of pregnancy. Contextual factors, such as insurance status and year of pregnancy outcome, might influence MOUD type. Prenatal care and MOUD might be facilitators for one another; however, there are still opportunities to improve early linkage and continuous access to both prenatal care and MOUD during pregnancy.

Keywords

opioid-related disorders; pregnancy; prenatal care; electronic health records; sentinel surveillance

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Opioid-related diagnoses increased from 3.5 to 8.2 per 1000 delivery hospitalizations from 2010 to 2017.[1] Untreated opioid use disorder (OUD) during pregnancy is associated with adverse health outcomes, including increased risk of overdose, delayed prenatal care, and untreated co-occurring mental health–related disorders.[2] In 2015, the American Society of Addiction Medicine (ASAM) recommended methadone or sublingual buprenorphine without naloxone (BUP) as standard-of-care medications for opioid use disorder (MOUD) during pregnancy and highlighted the need for patient-centered counseling.[3] Other organizations subsequently endorsed these or created similar recommendations, including the American College of Obstetricians and Gynecologists[2] and the American Academy of Pediatrics.[4] People prescribed methadone for OUD either must attend a federally certified opioid treatment program (OTP) daily to receive treatment or could receive take-home doses at the program's discretion.[5] BUP can be prescribed in office-based settings and dispensed by outpatient pharmacies in addition to being accessible at some OTPs.[5] The combination

product of buprenorphine with naloxone (BUP-NAL) might also be used in clinical practice for pregnant people with OUD and was endorsed as a safe and effective MOUD option for pregnant people in the 2020 ASAM national practice guidelines.[5] Naltrexone and long-acting BUP products are other MOUD options that are less commonly used among pregnant people, but ongoing studies are assessing their safety and/or efficacy of initiation or continuation during pregnancy.[6,7]

Although some studies are emerging to describe the prevalence and duration of MOUD use during pregnancy[8,9] and compare the safety and effectiveness of different MOUD types,[10–12] there is limited evidence incorporating longitudinal patterns of MOUD over the course of pregnancy, including transitioning between MOUD types. Additionally, recent data have called attention to racial and ethnic disparities in MOUD receipt and duration among Medicaid populations of reproductive age,[13] pregnant Medicaid populations,[14] and residents from a single state.[15] These patterns can be further explored by assessing a geographically diverse population with various insurance types, distinguishing between BUP and BUP-NAL, and considering longitudinal exposure to MOUD and changes in MOUD type during pregnancy.

Leveraging data from the MATernaL and Infant clinical NetworK (MAT-LINK) surveillance system, this report describes MOUD patterns among pregnant people with OUD at 7 clinical sites.[16,17] Among pregnancies with any MOUD documented in the electronic health record (EHR), the purpose of the report was to describe (1) the demographic characteristics of the pregnant person by MOUD type; (2) the timing of prenatal care initiation and the first MOUD documented during pregnancy; (3) pregnancy time frames during which the MOUD was documented; (4) the number of MOUD types reported during each pregnancy; and (5) patterns of transitioning between MOUD types.

METHODS

MAT-LINK

This descriptive analysis included data from 7 clinical sites participating in the OUD cohort of the MAT-LINK surveillance system.[17] MAT-LINK is a clinical network of sites that provide information about multiple cohorts of pregnant person–infant linked dyads based on exposures of interest. Clinical sites, selected based on their advanced data infrastructure and clinical care protocols, collected information from EHRs on pregnant person health history and pregnancy, infant, and child outcomes.[17] Individuals were included in the MAT-LINK OUD cohort if they had a known pregnancy outcome (including live and nonlive births) occurring between January 1, 2014, and August 31, 2021, and had an OUD diagnosis during that pregnancy. This analysis was restricted to those who had any MOUD documented in the EHR during that pregnancy.

Medications for Opioid Use Disorder

MOUD type was categorized as methadone, BUP, BUP-NAL, or naltrexone. To identify these pregnancies, clinical sites extracted and abstracted all available records of MOUD during each pregnancy. Clinical sites submitted key dates, including the date of pregnancy

outcome, estimated delivery date, and date of documented MOUD. This information was triangulated to verify which reports of MOUD occurred during pregnancy, defined as the day of the estimated last menstrual period to the pregnancy outcome. If relevant dates were missing or estimated delivery date was believed to be incorrect, defined as a calculated gestational age less than 0 or greater than 46 weeks, a categorical pregnancy time frame variable calculated by clinical sites was used to determine if the MOUD was documented during pregnancy.

After identifying which reports of MOUD occurred during pregnancy, key dates were utilized to define the trimester timing of MOUD. If trimester timing was not documented, the clinical sites indicated that the MOUD was documented during pregnancy, but the specific timing was unknown. To capture MOUD continued up to or initiated at the time of the pregnancy outcome, which could have occurred during any trimester, the timing of the last MOUD documented before the pregnancy outcome was dichotomized as within or not within 14 days prior to the pregnancy outcome.

Demographic and Prenatal Care Characteristics

Clinical sites extracted and abstracted information from health records about the pregnant person's age, race, ethnicity, health insurance status, urbanicity, parity, and year of pregnancy outcome.[17] Race and ethnicity were collected from medical records as proxies for systemic racism and implicit bias rather than indicators of physiologic differences.[18] Race and ethnicity categories were presented separately and followed the Office of Management and Budget Standards for the Classification of Federal Data on Race and Ethnicity.[19] Urbanicity was determined based on the pregnant person's residential zip code at the time of delivery using rural-urban commuting area categorizations: urban core, other urban, or rural.[17,20] The date of the first prenatal care visit for each pregnancy was provided from the EHR. The trimester during which prenatal care was initiated was calculated, along with the difference in days between prenatal care initiation and first MOUD documented during pregnancy when both dates were available.

Statistical Analysis

Descriptive analyses were performed at the pregnancy level, including pregnancies where any MOUD was documented. There were 362 pregnant people who had 2 to 5 pregnancies with MOUD during the cohort time frame, and each pregnancy was represented separately in the analysis. Pregnant person demographic characteristics were described for each pregnancy with any documented MOUD, both overall and by MOUD type in nonmutually exclusive categories, as more than 1 MOUD type could have been documented during each pregnancy. A Cochran-Armitage trend test was performed to determine if the proportion of this pregnancy cohort receiving each specific MOUD type significantly changed over years of pregnancy outcomes from 2014 to 2021. MOUD timing patterns were described across all pregnancies, including a comparison of the trimester and date of prenatal care initiation with the trimester and date of the first MOUD documented during each pregnancy. The numbers of pregnancies with each MOUD type documented during each trimester and within 14 days prior to the pregnancy outcome were also reported. The sequence of MOUD types documented (ie, first, second, third) during each pregnancy was calculated and presented in

a heat map. A Sankey diagram was used to visualize the first MOUD type in each trimester of each pregnancy, illustrating individual MOUD type trajectories. Results with counts smaller than or equal to 5 were suppressed. Categorical data are presented as frequencies and percentages. Analyses were conducted in April 2024 in SAS 9.4 (SAS Institute, Cary, NC) and R version 4.2.1.

RESULTS

Among 5540 total pregnancies in the MAT-LINK OUD cohort, there were 3911 pregnancies (70.6%) with any documented MOUD. Among pregnancies with any MOUD, the majority of people were White (n = 3351, 85.7%), not Hispanic or Latino (n = 2722, 69.6%), receiving public health insurance (ie, Medicaid) (n = 3285, 84.0%), or living in urban core zip codes (n = 3206, 82.0%) (Table 1). Almost half (n = 1780, 45.5%) of pregnancies were among people who had 1 to 2 prior pregnancies. Considering that multiple types of MOUD could have been documented during each pregnancy, among the 3911 pregnancies included in this analysis, there were 1642 (42.0%) with methadone, 1662 (42.5%) with BUP, 1101 (28.2%) with BUP-NAL, and 22 (0.6%) with naltrexone documented at least once in the EHR. When pregnancies were assessed by MOUD type in nonmutually exclusive categories, patterns in age at pregnancy outcome and race were similar across each MOUD type; however, patterns in ethnicity differed by MOUD type. Among pregnancies with methadone and BUP, 34.6% (n = 568) and 35.6% (n = 592), respectively, were among Hispanic or Latino people, whereas among pregnancies with BUP-NAL, only 6.6% (n = 73) were among Hispanic or Latino people. Among pregnancies with methadone, 90.5% (n = 1486) were among people covered by public insurance, which was greater than the corresponding percentages among pregnancies with BUP (n = 1290, 77.6%), BUP-NAL (n = 899, 81.7%), or naltrexone (n = 15, 68.2%). Compared with other MOUD types, pregnancies with BUP-NAL had the highest percentage of rural zip code residence (n = 128, 11.6%), followed by BUP (n = 149, 9.0%) and methadone (n = 83, 5.1%). Pregnancies with naltrexone had the highest percentage of nulliparous pregnancies (n = 8, 36.4%), whereas BUP-NAL had the lowest percentage of nulliparous pregnancies (n = 204, 18.5%). From January 2014 to August 2021, the proportion of pregnancies with documented BUP-NAL and naltrexone significantly increased over time, whereas the proportion with methadone significantly decreased over time (Figure, Supplemental Digital Content 1, http://links.lww.com/JAM/A580). Long-acting BUP and naltrexone products were exclusively seen in pregnancies with an outcome occurring during 2017 and beyond.

Table 2 shows that among most pregnancies where trimester information was available for both first MOUD and prenatal care initiation, prenatal care was initiated during the same trimester as the first documented MOUD during pregnancy. However, more than 30% (n = 450/1454) of pregnancies with prenatal care information documented in the first trimester did not have MOUD documented until the second or third trimester. Additionally, among the pregnancies with MOUD in the first trimester, 12.3% (n = 141/1145) had no prenatal care until the second or third trimester. The median gestational age at first MOUD during pregnancy was 20 weeks, whereas the median gestational age at prenatal care initiation was 15 weeks.

In later trimesters, the percentage of pregnancies with documented MOUD notably increased, as shown in Table 3; 37.0% (n = 1447/3911) of pregnancies had MOUD documented in the EHR during the first trimester, 61.3% (n = 2324/3791 continuing pregnancies) during the second trimester, and 90.8% (n = 3347/3688 continuing pregnancies) during the third trimester. Within 2 weeks prior to the pregnancy outcome, which could have occurred during any trimester, 80.1% (n = 3134/3911) of pregnancies had any MOUD. Across all time frames of pregnancy, BUP was the most commonly documented MOUD type. Overall, BUP-NAL was also commonly documented in more than a quarter of pregnancies.

Among pregnancies with any MOUD, most had a single MOUD type documented (n = 3412, 87.2%), whereas 12.3% (n = 482) pregnancies had 2 and 0.4% (n = 17) pregnancies had 3 MOUD types documented, respectively (Fig. 1). Among the pregnancies with 2 or 3 MOUD types, the most common transitions were from BUP-NAL to BUP and from BUP to methadone. As further shown in Figure 2, whereas the first documented MOUD type per trimester stayed consistent for most pregnancies, there were also pregnancies either with multiple types of MOUD or with discontinuity in MOUD across trimesters (represented as a transition from any MOUD type to the “No MOUD” category).

DISCUSSION

Among 5540 pregnancies with an OUD diagnosis and a pregnancy outcome between January 1, 2014, and August 31, 2021, 7 in 10 had any MOUD in the EHR, and the majority had only one single MOUD type documented during pregnancy. However, this report highlights opportunities to enhance timely access to MOUD during pregnancy. Approximately 30% of pregnancies impacted by OUD did not have any documented MOUD. Among those with any MOUD documented during pregnancy, demographic differences were observed by MOUD type, such as health insurance status. Notably, 12.3% (n = 141/1145) of pregnancies with MOUD documented in the first trimester did not have prenatal care until the second or third trimester, and 30.9% (n = 450/1454) of pregnancies with prenatal care in the first trimester did not have MOUD documented until the second or third trimester. Furthermore, less MOUD was documented during the first trimester compared with the second and third trimesters, and discontinuity in reported MOUD across trimesters was observed.

In this analysis of MAT-LINK’s OUD cohort, a higher proportion of pregnancies with any MOUD was observed compared with existing estimates from 1996 to 2017 (50%–60%) based on the Medicaid administrative data or the Treatment Episode Data Set.[9,21–23] This difference might be attributed to the origin of the MAT-LINK data, which are collected from 7 clinical sites renowned for their expertise in managing OUD during pregnancy.[17] These clinics provide care using a multidisciplinary, comprehensive, and nonstigmatizing approach, likely leading to higher linkage to and continuation of MOUD during pregnancy. In this report, methadone and BUP were documented most frequently overall, and transitioning between MOUD types most often involved shifts from BUP-NAL to BUP. However, BUP-NAL was still commonly observed in more than a quarter of pregnancies and showed an increasing trend in recent years. These patterns were expected

because methadone and BUP are the MOUD types currently recommended in clinical guidelines for OUD during pregnancy.[2] However, following emerging evidence supporting BUP-NAL for OUD during pregnancy,[5,24] BUP-NAL was also included in the updated 2020 ASAM national practice guideline as a safe and effective MOUD option during pregnancy. Results from this report demonstrate an increase in use of BUP-NAL over time, correlating with the release of clinical guidance.

Naltrexone was uncommon but increasingly documented in more recent years. In addition to not being endorsed in clinical guidance for MOUD during pregnancy, its limited use in this cohort might also be explained by scarcity of sites nationwide that routinely provide naltrexone as a treatment option for pregnant people.[25] Emerging evidence on the use of naltrexone for OUD during pregnancy has shown comparable outcomes to buprenorphine and methadone for gestational age at delivery, mode of delivery, and preterm birth.[26] Barriers to offering naltrexone during pregnancy might include concerns around requiring a 7-to-10-day opioid-free period before naltrexone initiation, which might present as a period of vulnerability for people to return to nonprescribed substance use.[27] Due to this required period of opioid withdrawal, naltrexone has been proposed as a potential option for some pregnant populations, such as those who were already receiving and successfully maintaining treatment before pregnancy.[6,26]

Certain demographic characteristics appeared to differ by MOUD type documented during pregnancy, including pregnant person ethnicity, health insurance coverage, urbanicity, parity, and year of pregnancy outcome. A previous report of MAT-LINK data comparing any MOUD versus no MOUD during pregnancy observed a significant difference according to pregnant person race.[17] However, in the current report, no differences in the distribution of race were observed by MOUD type. These findings contradict previously published literature using other data sources, which have shown racial disparities affecting MOUD access during pregnancy, specifically timely receipt of MOUD,[14,23] receipt of BUP/BUP-NAL versus methadone,[14,15] and consistent use of MOUD during pregnancy and postpartum periods.[14,15] These examples demonstrate the persistence of systemic racism and implicit bias toward pregnant populations from racial minority groups,[14,15] and further analyses are needed to understand disparities affecting the MAT-LINK OUD cohort. There is an opportunity and need at the federal, state, and local levels to address racial and other disparities in treatment by identifying treatment gaps by patient characteristics, such as race and residence, and implementing targeted interventions where services are most needed.[28] This report did, however, find different patterns in ethnicity by MOUD type: 7% of pregnancies with BUP-NAL were among Hispanic or Latino people, whereas more than 30% of pregnancies with BUP or methadone were among Hispanic or Latino people. This is one of the few analyses to observe differences in buprenorphine by ethnicity across multiple clinical sites.[14,15] Prior reports, such as that by Xu et al, have suggested that analyses on MOUD in Hispanic or Latino pregnant people have lacked sufficient statistical power.[13] Further exploration is needed to understand the differences in ethnicity by MOUD type, especially because these differences may reflect variations in MOUD practices due to implicit biases or structural barriers to treatment, such as the accessibility of clinical services by Hispanic or Latino pregnant people.

Different patterns in health insurance were also observed by MOUD type. More than 90% of pregnancies with methadone were to publicly insured pregnant people, surpassing the percentage for any other MOUD type examined. Health insurance status in this report might correlate with an individual's financial resources or ability to afford out-of-pocket costs for MOUD, particularly considering that buprenorphine typically may cost more than methadone.[29,30] "Secret shopper" studies, where trained callers pose as people with assigned demographic profiles needing services, and surveys of MOUD prescribers revealed that many clinicians did not accept private or public insurance and instead only accepted cash payments from both pregnant and nonpregnant women seeking treatment.[29–32] Researchers posing over phone calls as a pregnant person with Medicaid insurance were less likely to be offered an appointment with a buprenorphine prescriber than at an OTP and encountered more barriers compared with nonpregnant or privately insured women.[32] Prioritizing the needs of pregnant people without socioeconomic biases when making decisions about MOUD use might improve affordability and accessibility of MOUD prior to and during pregnancy.[2]

The percentage of pregnancies with any MOUD at these clinical sites more than doubled over the course of pregnancy, from the first to the third trimester. During most pregnancies, prenatal care was initiated during the same trimester as their first documented MOUD during pregnancy, suggesting that prenatal care and initiation of MOUD may be facilitators for one another. However, 3 of 10 pregnancies with first-trimester prenatal care information had no MOUD documented until the second or third trimester, and 12% of pregnancies with MOUD in the first trimester had no prenatal care documented until the second or third trimester. This potentially indicates missed opportunities for early linkage to prenatal care and MOUD treatment[33] and prompts the need to support and address barriers to linking people with OUD to prenatal care and MOUD during early pregnancy. Stigma against substance use and MOUD during pregnancy, along with punitive laws and policies, persist as barriers to care in the United States.[34–36] Prior researchers have shown that punitive state-wide prenatal substance use policies were associated with reduced admission of women of reproductive age to substance use disorder (SUD) pharmacological and psychosocial treatment, whereas policies funding SUD treatment programs for pregnant people were associated with reduced opioid overdoses and increased access to MOUD.[34,35] As of 2023, almost all MAT-LINK clinical sites were located in states with supportive policies funding programs for pregnant people with SUD, but approximately half of these states simultaneously had punitive or mandatory reporting policies.[37,38] A nonstigmatizing approach to the management of pregnant people with OUD might facilitate MOUD access during pregnancy and potentially have downstream benefits such as reducing the rate of entry into foster care.[39]

This analysis is subject to some limitations. First, these results are not generalizable to all US individuals who access OUD treatment during pregnancy. Second, because multiple MOUD types were documented during some pregnancies, MOUD type categories were nonmutually exclusive, and χ^2 tests could not be performed to determine statistically significant differences in demographic characteristics or MOUD timing by MOUD type. However, because MAT-LINK captured data on a census of pregnancies with OUD in these 7 clinical sites, sampling error is not expected among this analytic sample, so statistical

testing is not required to interpret descriptive comparisons. Third, observed differences in ethnicity could have been influenced by clustering of people documented as Hispanic or Latino at certain clinical sites with specific MOUD treatment patterns. Fourth, EHR-documented MOUD includes inpatient and outpatient prescriptions but may not always reflect dispensation or consumption. Fifth, certain variables are prone to misclassification in the EHR or were not included in the analysis because they are not collected systematically within or across EHR systems at clinical sites. Information on MOUD timing was subject to some missingness and misclassification because some clinical sites reported difficulties obtaining MOUD data from external sources, especially OTPs. Consequently, methadone data might be less accurate than other data. Lastly, data were not available to differentiate whether the MOUD documented in the first trimester was initiated prior to versus after conception.

The MAT-LINK surveillance system offers ample opportunity for further analyses on MOUD during pregnancy as a unique collection of extracted and abstracted EHR data spanning nearly 8 years of pregnancy outcomes and involving 7 US clinical sites.[16,17] Future analyses on MOUD during pregnancy might consider dosing and frequency, continuity during the postpartum period, and predictors and effects of transitioning between MOUD types. MAT-LINK will continue collecting MOUD data through December 31, 2024, with 3 additional clinical sites to monitor evolving clinical guidance and legislative environments related to the opioid crisis.

CONCLUSION

In the MAT-LINK OUD cohort, the overall frequency of MOUD appeared to improve over the course of pregnancy, with rates increasing from the first to the second and third trimester. From 2014 to 2021, BUP-NAL and naltrexone were increasingly documented MOUD types during pregnancy, indicating that clinical practice appears to be evolving over time in response to growing evidence and updated clinical guidance. Contextual factors, such as insurance status and year of pregnancy outcome, might influence MOUD types documented during pregnancy. Although the findings of this report suggest that prenatal care and MOUD might be facilitators for one another, there are still opportunities to improve early linkage and continuous access to both prenatal care and MOUD during pregnancy. Continuity of care for pregnant people with OUD might improve when decisions on OUD and prenatal care are prioritized based on each person’s unique needs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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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.

In this report, the term “maternal” is used to identify the person who is pregnant. Pregnancy is not equated with the decision to parent, nor do all parents who give birth identify as mothers.

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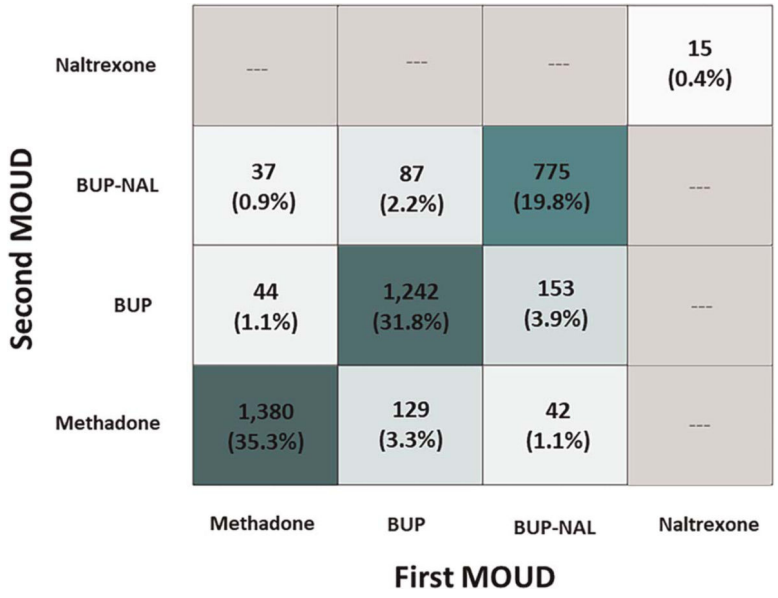

FIGURE 1.

Number of different medication for opioid use disorder (MOUD) types documented for each pregnancy (N = 3911)—7 clinical sites, MATernaL and Infant clinical NetworK (MAT-LINK). BUP indicates buprenorphine without naloxone; BUP-NAL, buprenorphine with naloxone. Darker colors reflect larger counts of pregnancies; values ≤5 were suppressed and are shown in gray. Figure does not reflect transitioning back to a prior documented MOUD type. First, second, and third MOUD were determined using both treatment dates and the pregnancy time frame information submitted by clinical sites. If treatment date information was not available, pregnancy time frame information was used to identify the first, second, and/or third MOUD. Therefore, this order might be prone to misclassification since pregnancy time frame information was not as precise as dates. Methadone was a third MOUD type in 9 pregnancies. BUP or BUP-NAL was a third MOUD type in 8 pregnancies.

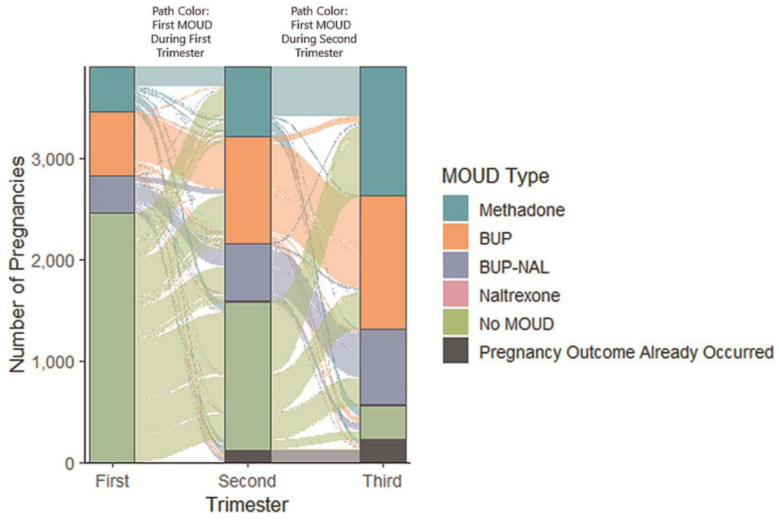

FIGURE 2.

First type of medication for opioid use disorder (MOUD) documented during each trimester (N = 3903)—7 clinical sites, MATernaL and Infant clinical NetworK (MAT-LINK). BUP indicates buprenorphine without naloxone; BUP-NAL, buprenorphine with naloxone. Among 3911 total pregnancies where any MOUD was documented, 3903 pregnancies are represented in this figure where trimester timing was available for at least 1 documented MOUD. Among the included 3903 pregnancies, 3896 pregnancies had trimester timing available for all documented instances of MOUD during that pregnancy. The remaining 7 of 3903 pregnancies had trimester timing information documented for at least 1 MOUD, but trimester timing information was also missing for at least 1 other documented MOUD. The first path (from the first to second trimester) is color coded according to the first type of MOUD in the first trimester. The second path (from the second to third trimester) is color coded according to the first type of MOUD in the second trimester. Thicker paths indicate a higher density of pregnancies within that path. Pregnancies with a loss or termination in a previous trimester are indicated in gray. Twenty-one pregnancies had naltrexone as their first MOUD in at least 1 trimester: 9 pregnancies during the first trimester, 10 during the second trimester, and 10 during the third trimester.

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TABLE 1.

Sociodemographic Characteristics of People for Each Pregnancy With Any Medication for Opioid Use Disorder (MOUD)—7 Clinical Sites, MATernaL and Infant clinical NetworK (MAT-LINK)

		Type of MOUD Documented During Pregnancy*			
	Overall N (%)	**Methadone n (%)**	**BUP† n (%)**	**BUP-NAL n (%)**	**Naltrexone† n (%)**
Total no. of pregnancies	3911 (100.0)	1642 (100.0)	1662 (100.0)	1101 (100.0)	22 (100.0)
Age at time of pregnancy outcome					
≤24 y	684 (17.5)	271 (16.5)	309 (18.6)	176 (16.0)	—
25–29 y	1393 (35.6)	582 (35.4)	600 (36.1)	404 (36.7)	—
30–34 y	1208 (30.9)	524 (31.9)	490 (29.5)	345 (31.3)	9 (40.9)
≥35 y	626 (16.0)	265 (16.1)	263 (15.8)	176 (16.0)	—
Race					
American Indian or Alaska Native	110 (2.8)	45 (2.7)	72 (4.3)	9 (0.8)	—
Black or African American	177 (4.5)	77 (4.7)	43 (2.6)	68 (6.2)	—
White	3351 (85.7)	1398 (85.1)	1426 (85.8)	958 (87.0)	17 (77.3)
Other race‡	187 (4.8)	96 (5.8)	79 (4.8)	39 (3.5)	—
Not reported	86 (2.2)	26 (1.6)	42 (2.5)	27 (2.5)	—
Ethnicity					
Hispanic or Latino§	1103 (28.2)	568 (34.6)	592 (35.6)	73 (6.6)	—
Not Hispanic or Latino	2722 (69.6)	1040 (63.3)	1023 (61.6)	1015 (92.2)	19 (86.4)
Not reported	86 (2.2)	34 (2.1)	47 (2.8)	13 (1.2)	—
Health insurance					
Public	3285 (84.0)	1486 (90.5)	1290 (77.6)	899 (81.7)	15 (68.2)
Private	517 (13.2)	107 (6.5)	321 (19.3)	182 (16.5)	—
No insurance	70 (1.8)	39 (2.4)	25 (1.5)	14 (1.3)	—
Other‖/not reported	39 (1.0)	10 (0.6)	26 (1.6)	6 (0.5)	—
Urbanicity¶					
Urban core	3206 (82.0)	1433 (87.3)	1315 (79.1)	863 (78.4)	18 (81.8)
Urban other	349 (8.9)	117 (7.1)	177 (10.6)	97 (8.8)	—
Rural	316 (8.1)	83 (5.1)	149 (9.0)	128 (11.6)	—
Not reported	40 (1.0)	9 (0.5)	21 (1.3)	13 (1.2)	—

	Overall N (%)	Type of MOUD Documented During Pregnancy*			
		Methadone n (%)	BUP† n (%)	BUP-NAL n (%)	Naltrexone† n (%)
No. of prior pregnancies					
Nulliparous: 0	890 (22.8)	367 (22.4)	435 (26.2)	204 (18.5)	8 (36.4)
Multiparous: 1–2	1780 (45.5)	707 (43.1)	733 (44.1)	599 (54.4)	8 (36.4)
Multiparous: ≥3	820 (21.0)	347 (21.1)	292 (17.6)	270 (24.5)	—
Not reported	421 (10.8)	221 (13.5)	202 (12.2)	28 (2.5)	—

Cell sizes ≤5 were suppressed.

*MOUD type categories are not mutually exclusive because each pregnancy may have had multiple MOUD types documented during pregnancy. Additionally, 1 person may be represented more than once if they had more than 1 pregnancy between January 1, 2014, and August 31, 2021.

†The BUP category includes long-acting products (Sublocade injection and Butrans transdermal patch) documented during 5 pregnancies; the naltrexone category includes long-acting products documented during 10 pregnancies.

‡Other race includes Asian, Native Hawaiian or other Pacific Islander, multiracial persons, and unspecified other race.

§All persons with a reported ethnicity as Hispanic are grouped as Hispanic, regardless of race, and persons with a reported race are also grouped separately by race category.

‖Other insurance includes unspecified health insurance types.

¶Urbanicity status was determined based on rural-urban commuting area designation. Subgroup descriptions are detailed in the supplementary table of prior study.[17] BUP indicates buprenorphine without naloxone; BUP-NAL, buprenorphine with naloxone.

TABLE 2.

Trimester of Prenatal Care Initiation According to Timing of First Documented MOUD During Pregnancy (N = 3239)—7 Clinical Sites, MATernaL and Infant clinical NetworK (MAT-LINK)[*,†,‡,§]

		First Documented MOUD During Pregnancy[‖]		
	Overall (*N* = 3239)	**First Trimester (n = 1145)**	**Second Trimester (n = 1113)**	**Third Trimester (n = 981)**
First prenatal care visit				
First trimester	1454 (44.9%)	1004 (31.0%)	219 (6.8%)	231 (7.1%)
Second trimester	1200 (37.0%)	111 (3.4%)	843 (26.0%)	246 (7.6%)
Third trimester	585 (18.1%)	30 (0.9%)	51 (1.6%)	504 (15.6%)
Not reported	664	302	127	235

[*] This table contains table percentages with a denominator of 3239. This is the number of pregnancies with any MOUD in MAT-LINK where trimester timing data for both the first MOUD and first prenatal care visit were available.

[†] Fifty-eight of these 3239 pregnancies had a pregnancy loss or termination in the first trimester; 74 of these 3239 pregnancies had a pregnancy loss or termination in the second trimester.

[‡] One person may be represented more than once if they had more than one pregnancy between January 1, 2014, and August 31, 2021. Multiple-gestation pregnancies are counted as 1 pregnancy.

[§] First trimester: 0 to <14 weeks; second trimester: 14 to <28 weeks; third trimester: 28 weeks to pregnancy outcome.

[‖] Only the pregnancies with available MOUD trimester timing information were represented in the rows categorizing MOUD by trimester. Fifteen pregnancies had at least 1 instance of MOUD with missing trimester information; among these, 7 pregnancies had at least 1 other instance of MOUD with trimester timing information.

TABLE 3.

Number of Pregnancies with Any Medication for Opioid Use Disorder (MOUD) According to MOUD Type and Pregnancy Time Frame (N = 3911)—7 Clinical Sites, MATernaL and Infant clinical NetworK (MAT-LINK)

		Type of MOUD Documented During Pregnancy			
	Overall N (% of All Pregnancies)	**Methadone n (% of All Pregnancies)**	**BUP* n (% of All Pregnancies)**	**BUP-NAL n (% of All Pregnancies)**	**Naltrexone* n (% of All Pregnancies)**
Total no. of pregnancies†	3911 (100%)	1642 (42.0%)	1662 (42.5%)	1101 (28.2%)	22 (0.6%)
MOUD during each trimester‡§					
First trimester	1447 (37.0%)	466 (11.9%)	718 (18.4%)	392 (10.0%)	10 (0.3%)
Second trimester	2324 (61.3%)	736 (19.4%)	1116 (29.4%)	609 (16.1%)	11 (0.3%)
Third trimester	3347 (90.8%)	1314 (35.6%)	1362 (36.9%)	806 (21.9%)	10 (0.3%)
MOUD prior to pregnancy outcome‖,¶					
Within 14 days prior to pregnancy outcome	3134 (80.1%)	1193 (30.5%)	1270 (32.5%)	723 (18.5%)	—

Cell sizes ≤5 were suppressed.

*The BUP category includes long-acting products (Sublocade injection and Butrans transdermal patch) documented during 5 pregnancies; the naltrexone category includes long-acting products documented during 10 pregnancies.

†This table includes table percentages with a denominator of all pregnancies in MAT-LINK with any documented MOUD during the following time frames: 3911 during the first trimester and within 14 days prior to the pregnancy outcome, 3791 during the second trimester due to 120 pregnancies resulting in an outcome in the first trimester, and 3688 during the third trimester due to 120 pregnancies resulting in an outcome in the first trimester and 103 pregnancies resulting in an outcome in the second trimester.

‡First trimester: 0 to <14 weeks; second trimester: 14 to <28 weeks; third trimester: 28 weeks to pregnancy outcome.

§Only the pregnancies with available MOUD trimester timing information were represented in the rows categorizing MOUD by trimester. Fifteen pregnancies had at least 1 instance of MOUD with missing trimester information; among these, 7 pregnancies had at least 1 other instance of MOUD with trimester timing information.

‖MOUD ≤14 days before the pregnancy outcome could have occurred during any trimester.

¶There were 213 pregnancies with at least one instance of MOUD with missing treatment date information; among these, 160 pregnancies had another instance of MOUD during pregnancy with treatment date information available.

BUP indicates buprenorphine without naloxone; BUP-NAL, buprenorphine with naloxone.