

Prescription Drug Exposure Among Pregnant Individuals in Rhode Island, 2019–2022

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INTRODUCTION

Since the 1990s, the United States has faced a rise in opioid overdose deaths, which began as an increase in deaths involving prescription opioids. In Rhode Island (RI), accidental drug overdose deaths have risen nearly 42% from 2019 to 2022.¹ As of 2021, RI ranks 15th for the highest drug overdose death rate in the nation, with 41.7 deaths per 100,000 people.² In response to the opioid overdose epidemic, in 2012, RI implemented the Prescription Drug Monitoring Program (PDMP). The PDMP collects data on all controlled substances dispensed by retail pharmacies in RI or to RI residents and receives prescription information from 34 other states (including all neighboring New England states). This helps to identify high-risk prescribing activity and diversion, as well as prescribing risks associated with individual patients, and promotes patient education.

Studies suggest that prenatal use of opioids and benzodiazepines are linked to possible adverse outcomes and birth defects.³ Healthcare professionals can monitor pregnant individuals taking these prescriptions for maternal and infant health outcomes. Additionally, the Centers for Disease Control and Prevention (CDC) suggest buprenorphine as a safe, first-line therapy option for pregnant individuals with opioid use disorder (OUD).⁴

In pregnancy, the use of prescriptions opioids to manage pain, benzodiazepines to manage mental health conditions, and buprenorphine or methadone to manage OUD may be warranted as part of a comprehensive approach to managing the biopsychosocial health and well-being of the pregnant individual. Although adverse outcomes of prenatal exposure may include but are not limited to neonatal abstinence syndrome (NAS), neonatal opioid withdrawal syndrome (NOWS), low-birth weight, and preterm birth, the risk involved with their use versus potential benefits to the pregnant individual should be discussed by the patient and their healthcare professional. Specifically, treating with buprenorphine or methadone is the standard of care for OUD in pregnancy and has been associated with improved maternal, infant, and birth outcomes.

To better understand the magnitude of prenatal prescription medication dispensations in RI, we aim to analyze the prevalence of in-utero exposure to prescription opioid analgesics, benzodiazepine, and buprenorphine medication for opioid use disorder (MOUD).

METHODS

We utilized birth certificate data from the Rhode Island Department of Health's (RIDOH) Center for Vital Records to identify live births occurring between 2019 and 2022 to RI residents with births occurring in RI and out-of-state. The conception date was calculated by subtracting the number of weeks of gestational age by obstetrical estimate from the infant's birth date.

PDMP data and birth certificate data were linked using both deterministic and probabilistic techniques via SAS Version 9.4 (SAS Institute, Cary, NC). The birthing parent's birth date, along with first, last, and maiden names (if applicable) were used to capture any opioid analgesics, benzodiazepine, or buprenorphine MOUD prescriptions (excludes Butrans™, Belbuca™, and Buprenex™ formulations, and generic equivalents) during each pregnancy, which was defined as a dispensed prescription on or after the conception date and before the infant's birth date.

For all descriptive analyses, 'no prescription involvement' was defined as the absence of any opioid analgesic, benzodiazepine, or buprenorphine MOUD prescription dispensed during pregnancy. For pregnancies with any involvement with these substances of interest, involvement was further examined by trimester, which was defined as follows: 1st trimester (conception date through 13 weeks); 2nd trimester (13 weeks to 26 weeks); and 3rd trimester (26 weeks through end of pregnancy).

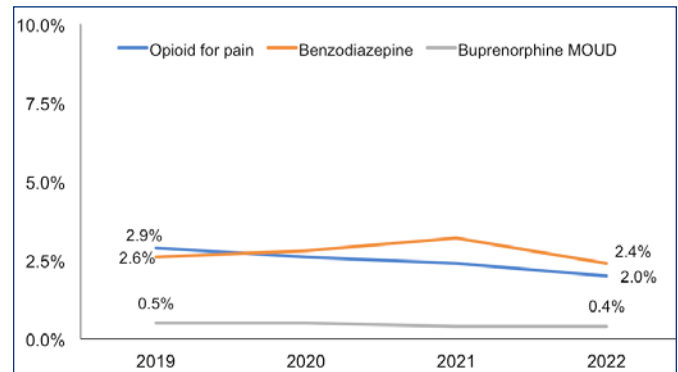
Birthing parent demographic information was obtained from self-reported birth certificate data, and included maternal age, highest education level, maternal race and ethnicity, insurance type at delivery, marital status, and city/town of residence, which was further defined as 'Core City' or 'Rest of State' ('None-Core'). A core city was defined as a RI municipality with 25% or more children living below the poverty threshold and includes Central Falls, Pawtucket, Providence, and Woonsocket. Combined maternal race and ethnicity categories were defined as: Hispanic (all races), non-Hispanic White, non-Hispanic Black or African American, Other/Unknown (included non-Hispanic Multiple Race). Insurance categories were defined as: Private, Public and Other/Unknown (included "Self-Pay" and "No Insurance").

RESULTS

There were 40,955 RI resident births from 2019–2022, and 2,189 (5%) matched to PDMP opioid analgesic, benzodiazepine, and/or buprenorphine MOUD records (Table 1a). The proportions of birthing individuals dispensed an opioid analgesic, benzodiazepine, and buprenorphine MOUD have decreased from 2019 to 2022. The proportion of pregnant individuals dispensed opioid analgesics decreased 31% from 2.9% in 2019 to 2.0% in 2022 and benzodiazepines decreased 7.7% from 2.6% in 2019 to 2.4% in 2022 (Figure 1).

Overall, 5.3% of pregnancies involved an opioid analgesic, benzodiazepine, or buprenorphine MOUD prescription (Table 1a). Of these, 46.2% involved an opioid analgesic prescription, 51.7% involved a benzodiazepine prescription, and 8.5% involved a buprenorphine MOUD prescription. About 44% of births with no prescription involvement and 46% of births that involved opioid analgesics had a birthing parent younger than 30 years old. Contrastingly, 28% of births involving benzodiazepine prescriptions, and 33% of births involving buprenorphine MOUD had a birthing parent younger than 30 years old. Greater than 70% of births involving buprenorphine MOUD and/or benzodiazepine prescriptions were to White, non-Hispanic birthing parents, whereas greater than 65% of births involving opioid analgesics, or having no prescription involvement had White, non-Hispanic birthing parents (Table 1a). Greater than 70% buprenorphine MOUD and/or benzodiazepine-involved births were to birthing parents residing in a non-core

Figure 1. Percent of birthing individuals dispensed controlled substances during pregnancy in Rhode Island, 2019–2022.



city (Table 1b). Of births involving an opioid analgesic, benzodiazepine, and/or buprenorphine MOUD, 52% had public insurance compared to 45% of births with no prescription involvement. Of benzodiazepine-involved births, nearly 71% had a birthing parent with greater than a 12th grade education. Contrastingly, 43% of births involving buprenorphine MOUD had a birthing parent with an education greater than high school. Of births involving these substances, 54% of birthing parents were single compared to 43% birthing parents with no prescription involvement (Table 1b). For benzodiazepine-involved births, 71% filled their prescriptions during the first trimester, and 19% filled prescriptions during all three trimesters (Table 2).

Table 1a. Maternal demographics by prescription involvement in Rhode Island, 2019–2022

| | No Prescription Involvement N (%) | Any Opioid, Benzodiazepine, and/or Buprenorphine MOUD involvement during pregnancy N (%) | Opioid Involvement N (%) | Benzodiazepine Involvement N (%) | Buprenorphine MOUD Involvement N (%) |
|--------------------------------|--------------------------------------|---|--------------------------------|--|--|
| Total | 38,766 (94.7%) | 2,189 (5.3%) | 1,012 (46.2%) | 1,132 (51.7%) | 183 (8.4%) |
| Maternal Age | | | | | |
| <25 | 6,778 (17.5%) | 246 (11.2%) | 166 (16.4%) | 80 (7.1%) | 14 (7.7%) ^c |
| 25–29 | 10,252 (26.5%) | 543 (24.8%) | 300 (29.6%) | 236 (20.9%) | 46 (25.1%) |
| 30–34 | 13,119 (33.4%) | 767 (35.0%) | 292 (28.9%) | 452 (39.9%) | 62 (33.9%) |
| 35–39 | 6,926 (17.9%) | 492 (22.5%) | 198 (19.6%) | 283 (25.0%) | 45 (24.6%) |
| 40+ | 1666 (4.3%) | 140 (6.4%) | 55 (5.4%) | 81 (7.2%) | 16 (8.7%) ^b |
| Maternal Race/Ethnicity | | | | | |
| Hispanic | 11,307(29.2%) | 367 (16.8%) | 244 (24.1%) | 123 (10.9%) | 17 (9.3%) ^b |
| Non-Hispanic White | 19,368 (50.0%) | 1,412 (64.5%) | 526 (52.0%) | 839 (74.1%) | 141 (77.1%) |
| Non-Hispanic Black | 2,771 (7.2%) | 126 (5.8%) | 90 (8.9%) | 41 (3.6%) | <5 ^a |
| Non-Hispanic | 2,318 (6.0%) | 159 (7.3%) | 79 (7.8%) | 78 (6.9%) | 14 (7.7%) ^b |
| Other/Unknown | 2,875 (7.4%) | 113 (5.16%) | 67 (6.6%) | 41 (3.6%) | 10 (5.5%) ^c |

a Counts for sensitive information less than 5 are suppressed according to the RIDOH's Small Numbers Policy

b Per RIDOH's Small Numbers Policy, estimates in this group are statistically unstable (Relative standard error between 20% and 30%) and need to be interpreted with caution.

c Per RIDOH's Small Numbers Policy, estimates in this group are not statistically unstable (Relative standard error greater than 30%) and percentages will not be reported.

Table 1b. Maternal demographics by prescription involvement in Rhode Island, 2019–2022

| | No Prescription Involvement N (%) | Any Opioid, Benzodiazepine, and/or Buprenorphine MOUD involvement during pregnancy N (%) | Opioid Involvement N (%) | Benzodiazepine Involvement N (%) | Buprenorphine MOUD Involvement N (%) |
|-----------------------------------|--------------------------------------|---|--------------------------------|--|--|
| City/Town | | | | | |
| Core City ^a | 15,333 (39.6%) | 671 (30.7%) | 399 (39.4%) | 263 (23.2%) | 54 (29.5%) |
| Rest of State (Non-Core) | 23,276 (60.1%) | 1,511 (69.0%) | 608 (60.1%) | 866 (76.5%) | 129 (70.5%) |
| Insurance Type at Delivery | | | | | |
| Private | 20,776 (53.6%) | 1,027 (46.9%) | 436 (43.1%) | 607 (53.6%) | 26 (14.2%) |
| Public | 17,489 (45.1%) | 1,138 (52.0%) | 569 (56.2%) | 506 (44.7%) | 157 (85.8%) |
| Unknown/Missing ^c | 502 (1.3%) | 24 (1.1%) | 7 ^b | 19 (1.7%) | 0 (0.0%) |
| Highest Education Level | | | | | |
| Less than 12th Grade | 4,402 (11.4%) | 228 (10.4%) | 119 (11.8%) | 91 (8.0%) | 41 (22.4%) |
| 12th Grade | 7,801 (20.1%) | 500 (22.8%) | 269 (26.6%) | 208 (18.4%) | 53 (29.0%) |
| Greater than 12th Grade | 25,724 (66.4%) | 1,394 (63.7%) | 595 (58.8%) | 800 (70.7%) | 78 (42.6%) |
| Marital Status | | | | | |
| Single | 16,577 (42.8%) | 1,182 (54.0%) | 556 (54.9%) | 562 (49.7%) | 147 (80.3%) |
| Married | 21,989 (56.8%) | 991 (45.3%) | 449 (44.3%) | 565 (49.9%) | 31 (16.9%) |

a Core cities include Central Falls, Pawtucket, Providence, and Woonsocket. These are municipalities in Rhode Island that had 25% or more children living below the poverty threshold.

b Per RIDOH's Small Numbers Policy, estimates in this group are not statistically unstable (Relative standard error greater than 30%) and percentages will not be reported.

c Includes "Self-Pay" and "No Insurance".

Table 2. Maternal substance involvement by trimester in Rhode Island, 2019–2022

| Substance | Any Pregnancy Involvement | 1st Trimester N (%) | 2nd Trimester N (%) | 3rd Trimester N (%) | All 3 Trimesters N (%) |
|--------------------|---------------------------------|---------------------------|---------------------------|---------------------------|------------------------------|
| Opioid for pain | 1,012 | 383 (37.8%) | 380 (37.5%) | 383 (37.8%) | 32 (3.2%) |
| Benzodiazepine | 1,132 | 801 (70.8%) | 453 (40.0%) | 481 (42.5%) | 213 (18.8%) |
| Buprenorphine MOUD | 183 | 150 (82.0%) | 154 (84.2%) | 163 (89.1%) | 133 (72.7%) |

DISCUSSION

Overall, the proportion of births involving prenatal use of opioid analgesic, benzodiazepines, and buprenorphine MOUD have all decreased since 2019. Since 2020, prenatal use of benzodiazepine is higher than opioid analgesics and buprenorphine MOUD. While maternal substance use is prevalent in RI, it is decreasing and below overall self-reported national levels.⁵ Prenatal prescription opioid and benzodiazepine use mirrors trends in the overall population, with the number of pregnant individuals dispensed these prescriptions decreasing since 2017.⁶

Disparities exist within prenatal use of controlled substance prescriptions, as births involving benzodiazepine and buprenorphine MOUD tend to have birthing parents who are non-Hispanic White, non-core municipality residents, and older in age when compared to births with opioid analgesic involvement, and without controlled substance involvement. Benzodiazepine-involved births appeared to have

birthing parents with an overall higher education level than other groups. Births involving buprenorphine MOUD had birthing parents with the lowest education level and a higher proportion of single birthing parents over any other exposure group. These results compare to studies suggesting that among

the general population, non-White, lower-income patients are less likely to receive benzodiazepine and buprenorphine MOUD prescriptions when compared to their white counterparts.^{7,8,9}

Despite the increase in buprenorphine MOUD in the general population, dispensation to pregnant individuals has decreased,⁶ which may be due to several factors, including barriers to treatment including but not limited to access, stigma, or misinformation on the safety of buprenorphine use in pregnancy. As opposed to illicit opioid use or supervised/unsupervised withdrawal, buprenorphine during pregnancy is recommended to treat OUD by the Substance Abuse and Mental Health Services Administration (SAMHSA), American College of Obstetricians and Gynecologists (ACOG), and the CDC, as it engenders safe and monitored use of an opioid agonist for the pregnant individual and less severe NAS or NOWS symptoms in the neonate that can be monitored and appropriately treated.⁴

Prenatal benzodiazepine use is more common during the first trimester, when many expecting individuals may be unaware of their pregnancy. Benzodiazepine use decreases greatly in the second and third trimester, which is concerning given this may result in adverse mental health outcomes for the pregnant individual. The risks of discontinuing benzodiazepine use in pregnancy should be carefully weighed with the potential risks to the neonate, and decisions should be made in tandem between healthcare professionals and their patients. In contrast, prenatal increase in buprenorphine MOUD use each trimester may suggest similar conversations are occurring between prenatal and/or treatment providers and their pregnant patients.

Future analyses are planned to compare linkage findings with RIDOH's Substance Exposed Newborn (SEN) surveillance system to evaluate how well it captures prenatal prescription drug exposure. Additionally, MOUD maintenance among pregnant individuals and how it relates to neonatal and childhood health and developmental outcomes should be explored. Given RI's recent increase in stimulant use, studies should also examine the prevalence of prenatal stimulant involvement to determine if there are concerning trends. Future interventions should focus on underserved populations to increase MOUD access and provide education regarding appropriate maternal benzodiazepine use to decrease disparities in maternal mental health and substance use. Healthcare professionals should continue to discuss the risks and benefits of controlled substance medications with pregnant patients to choose an appropriate treatment plan that is in the best interest of both the patient and their baby.

LIMITATIONS

Although the PDMP is a vital resource for prescription data in RI, it does not contain data on 1) substances prescribed and not dispensed; 2) if prescriptions were taken as prescribed; 3) unprescribed use of these substances; 4) inpatient prescriptions; 5) prescriptions dispensed to incarcerated individuals; or 6) MOUD dispensations from opioid treatment programs (OTPs). The analysis did not look specifically at how many prescriptions were dispensed or the total days during the trimester with prescription coverage to ascertain more detailed exposure information. Birth certificate data used in this analysis were self-reported, which may under- or over-estimate some characteristics.

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