

Neonatal Abstinence Syndrome (NAS)

DATA BRIEF: STATEWIDE AND COUNTY TRENDS, 2016-2022

Background

Neonatal abstinence syndrome (NAS) is a withdrawal syndrome that can occur in newborns who were exposed to substances or prescribed medications during pregnancy (Council of State and Territorial Epidemiologists, 2023; Jilani, Frey, Pepin, & et al, 2019). It is more commonly associated with in utero exposure to opioids, but other categories of substances have also been associated with withdrawal (Council of State and Territorial Epidemiologists, 2023). The incidence of NAS in the United States increased from 2.9 per 1,000 hospital births in 2009 to 7.3 per 1,000 hospital births in 2017 (Healthcare Cost and Utilization Project, 2021). It is estimated that between 55% and 94% of newborns whose parent was either addicted to or treated with opioids while pregnant will develop NAS (McQueen & Murphy-Oikonen, 2016).

NAS cases range from mild to severe with some more severe cases requiring intensive care and pharmacological interventions (Anbalagan & Mendez, 2023). Signs and symptoms of NAS generally include tremors, irritability, excessive crying, sneezing, and diarrhea (Anbalagan & Mendez, 2023). As cases can be mild, not all infants exposed to opioids or other substances in utero are diagnosed with NAS (McQueen & Murphy-Oikonen, 2016). The identification of infants at risk for NAS includes assessing the pregnant person's history of substance use, the pregnant person and infant toxicological results, and monitoring for symptom manifestation after birth (Jilani, Frey, Pepin, & et al, 2019). Nationally, in 2019, about 7% of women reported using prescription opioids during pregnancy (Centers for Disease Control and Prevention, 2020). Related estimates find one in five women report opioid misuse, defined as obtaining and using opioids from a source outside of the healthcare system that were not prescribed to them, including the use of illicit opioids (i.e., heroin and fentanyl) (Centers for Disease Control and Prevention, 2020). Estimating infants exposed to opioid use during pregnancy is challenging. Taken together, though, estimates indicate a significant population of infants are at risk for NAS.

NAS-related Hospital Visits in Minnesota

From 2016 to 2022, there were 2,794 NAS-related hospital visits in Minnesota (Table 1). This corresponds to a statewide rate of 6.2 per 1,000 live births. The median rate (i.e., the rate in the middle of the overall range of rates) among counties in Minnesota was 3.8 per 1,000 live births.

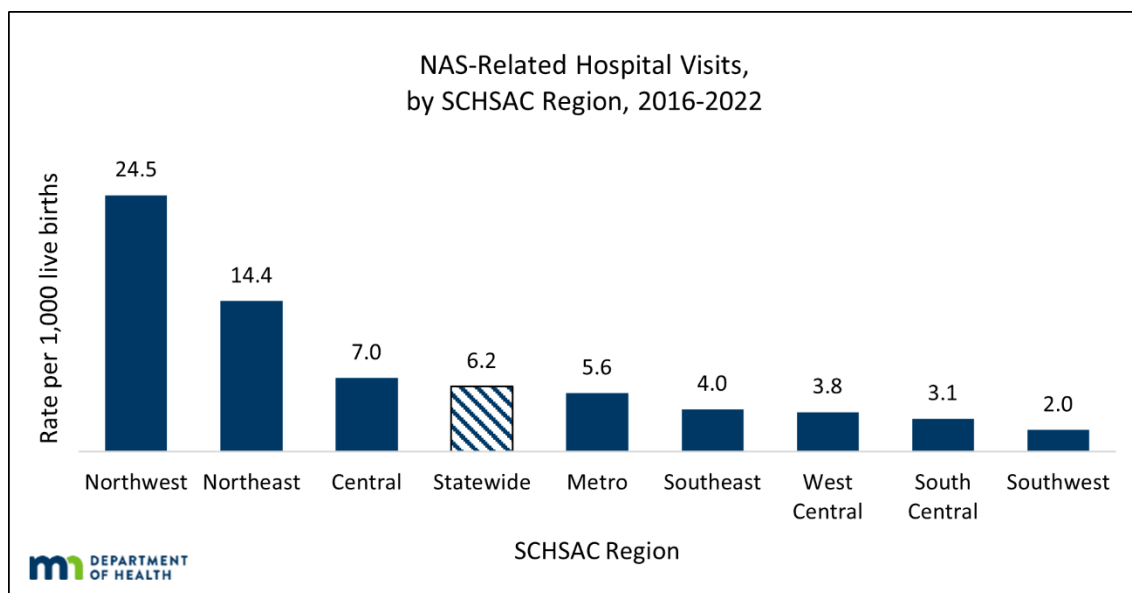
Table 1: The annual rate of NAS-related hospital visits (per 1,000 live births) has varied since 2016, ranging from 5.3 in 2018 to 7.3 in 2022

| Year | Number of NAS-related hospital visits | Rate per 1,000 live births |
|--------------|---------------------------------------|----------------------------|
| 2016 | 410 | 6.1 |
| 2017 | 444 | 6.7 |
| 2018 | 344 | 5.3 |
| 2019 | 364 | 5.7 |
| 2020 | 395 | 6.5 |
| 2021 | 380 | 6.0 |
| 2022 | 457 | 7.3 |
| Total | 2,794 | 6.2 |

SOURCE: Hospital Discharge Data, Injury and Violence Prevention Section, Minnesota Department of Health, 2016-2022

Examining the NAS data by State Community Health Services Advisory Committee (SCHSAC) regions, the highest rate of NAS-related hospital visits was found in the Northwest region, with a rate of 24.5 per 1,000 live births (284 visits between 2016 and 2022) (data by region are available in Appendix I). The lowest rate was found in the Southwest region of the state with a rate of 2.0 per 1,000 live births (34 visits between 2016 and 2022). The largest number and greatest proportion of NAS-related hospital visits occurred in the Metro region (1,455 visits; 52% of the total 2,794 visits from 2016 to 2022). The rate for the Metro region, however, was the fourth highest among all regions and had a lower rate than the statewide rate of 6.2 per 1,000 live births (Figure 1). Rates also varied among counties within regions and further data are available by county in Appendix II.

Figure 1: The rate of NAS-related hospital visits (per 1,000 live births) varied by Minnesota SCHSAC region from 2016-2022, ranging from 2.0 in the Southwest region to 24.5 in the Northwest region.

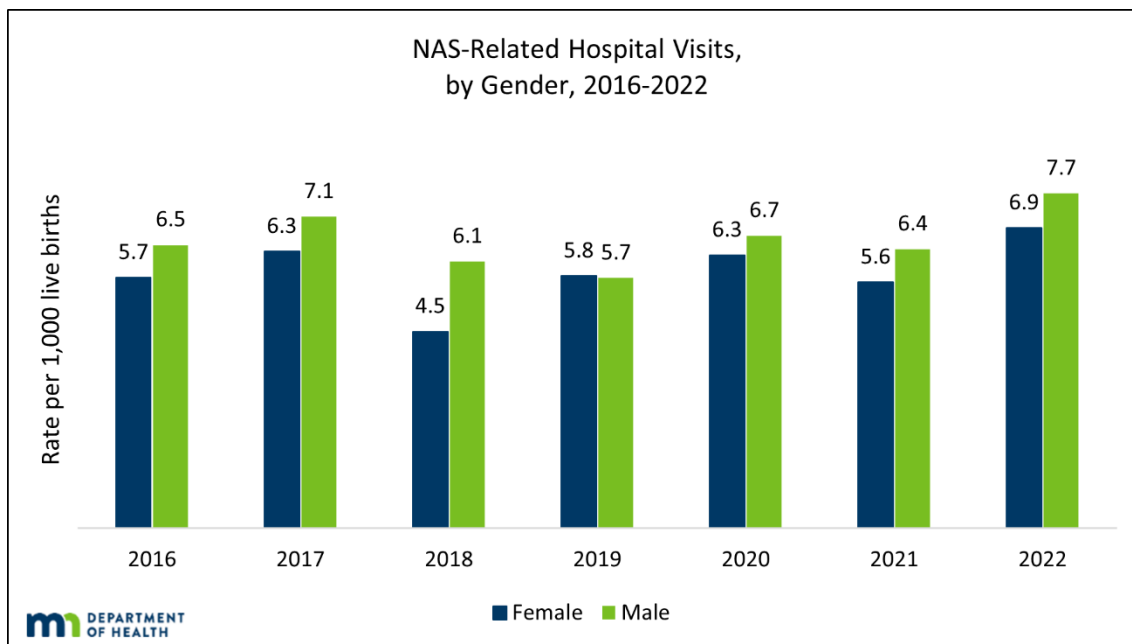


SOURCE: Hospital Discharge Data, Injury and Violence Prevention Section, Minnesota Department of Health, 2016-2022

Of the total number of NAS-related hospital visits from 2016 to 2022, 54% were male newborns and the annual rates tended to be higher among male newborns compared to female newborns (Figure 2). The higher rate of NAS among male newborns is reflected in previous studies that found an increased risk of NAS diagnosis among male infants, although there was not an increased severity of NAS symptoms (Charles, et al., 2017). Further investigation is required as it pertains to understanding this increased risk and translation to prevention and treatment of NAS.

An increase in the rates of NAS-related hospital visits was observed from 2021 to 2022 for both male newborns and female newborns. From 2021 to 2022, the rate of hospital visits of male newborns with NAS increased 19% (6.4 to 7.7 per 1,000 live births), while the rate for female newborns increased 21% (5.6 to 6.9 per 1,000 live births).

Figure 2: The rate of NAS-related hospital visits is slightly higher for male newborns than female newborns.



SOURCE: Hospital Discharge Data, Injury and Violence Prevention Section, Minnesota Department of Health, 2016-2022
Populations for rates are gender specific.

Prevention

Preventing NAS is best accomplished by intervening with a pregnant person's potential use during pregnancy. Preventing NAS requires an understanding that substance use is not simply an individual problem but is also shaped by factors such as community and family support, access to healthcare, and healthy relationships. The best method of prevention and treatment of opioid use during pregnancy and NAS is a whole-patient approach that includes a combination of medical, behavioral health, and community supports. Prevention strategies include preventing opioid misuse during pregnancy through changes in prescribing practices, identifying misuse during pregnancy, and connecting to treatment and recovery supports.

Screening, Brief Intervention, and Referral to Treatment (SBIRT) is an evidence-based approach for identifying women with substance use and connecting to treatment if needed. Women using opioids during pregnancy benefit from accessing comprehensive obstetric care that provides medication-assisted treatment (MAT) in addition to health monitoring and referral to recovery services. MAT has been shown to improve a patient's adherence to treatment, reduce illicit opioid use, and support long-term recovery (Pew Charitable Trusts, 2016).

Treatment

Women receiving treatment for opioid use disorder benefit when there is adequate access to a wide array of recovery supports and resources in the community. Recovery supports are varied and include, but are not limited to, MAT, behavioral health services, adequate and stable housing, family home visiting, and peer support groups (Substance Abuse and Mental Health Services Administration, 2018).

One of the most promising approaches for treatment of NAS is the evidence-based Eat, Sleep, Console (ESC) model of family-centered care (Grossman, Lipshaw, Osborn, & Berkwitt, 2018). The ESC model emphasizes the parent's ability to provide care for their infant to reduce NAS symptoms through breastfeeding, swaddling, and skin-to-skin contact. Initial evaluations of the ESC model have shown a reduction in the length of hospital stays, pharmacological interventions needed for symptom management, and cost associated with infant care (Grossman, Lipshaw, Osborn, & Berkwitt, 2018). Hospitals can adapt policies and protocols to support the ESC model by promoting rooming in, allowing parents to provide the majority of infant care, and encouraging parents to spend as much time with their infant as possible.

Comprehensive obstetric care that includes MAT can help to reduce the incidence of NAS through management of the amount and type of opioids that a fetus receives in utero. Certain medications used in MAT have been shown to be more effective in reducing the symptoms of NAS, but more research is needed (Grossman, Lipshaw, Osborn, & Berkwitt, 2018). Physicians can receive waivers that allow for the prescription of MAT by completing a brief training. Increasing the number of physicians that are waived to provide MAT will reduce the treatment gap for women who have access to MAT. Nationwide, access to MAT is dependent on several factors, such as where women live and their health insurance coverage. Coverage of services is often more difficult for women living in rural areas and women insured through Medicaid (Pew Charitable Trusts, 2016). These barriers must be addressed to allow women to access the services for their needs and circumstances.

NAS Prevention Resources

[Fast Tracker \(https://sud.fasttrackermn.org/\)](https://sud.fasttrackermn.org/) is a resource developed by the Minnesota Department of Human Services that allows people to search for substance use treatment options.

The [Minnesota Hospital Association \(https://www.mnhospitals.org/\)](https://www.mnhospitals.org/) has developed a [Neonatal Abstinence Syndrome \(NAS\) toolkit \(https://www.mnhospitals.org/Portals/0/Documents/patientsafety/Perinatal/Neonatal%20Abstinence%20Syndrome%20Toolkit.pdf\)](https://www.mnhospitals.org/Portals/0/Documents/patientsafety/Perinatal/Neonatal%20Abstinence%20Syndrome%20Toolkit.pdf). The toolkit provides information on risk assessment, screening, and treatment of NAS.

The [Substance Abuse and Mental Health Services Administration \(https://www.samhsa.gov/\)](https://www.samhsa.gov/) has developed [Clinical Guidance for Treating Pregnant and Parenting Women with Opioid Use Disorder and Their Infants \(https://store.samhsa.gov/product/Clinical-Guidance-for-Treating-Pregnant-and-Parenting-Women-With-Opioid-Use-Disorder-and-Their-Infants/SMA18-5054\)](https://store.samhsa.gov/product/Clinical-Guidance-for-Treating-Pregnant-and-Parenting-Women-With-Opioid-Use-Disorder-and-Their-Infants/SMA18-5054). This clinical guidance provides information on promising best practices for the prevention and treatment of maternal opioid use disorder and NAS.

Methods

All hospitalizations of acute care, non-federal in-state hospital settings were included in these analyses. Excluded are those with unknown age, out-of-jurisdiction residence, unknown state of residence, non-acute care or federal hospital admission, and admission only for short stays or observation visits. The NAS case definition used aligns with the CSTE position statement for working with hospital discharge data (Council of State and Territorial Epidemiologists, 2023). The International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) code of P96.1 was used to identify NAS-related hospital visits. Rates were calculated per 1,000 live births among Minnesota residents.

References

- Anbalagan, S., & Mendez, M. D. (2023). *Neonatal Abstinence Syndrome*. Treasure Island (FL): StatPearls Publishing.
- Centers for Disease Control and Prevention. (2020). *Data and statistics about opioid use during pregnancy*. Retrieved from Centers for Disease Control and Prevention: <https://www.cdc.gov/pregnancy/opioids/data.html>
- Charles, M. K., Cooper, W. O., Jansson, L. M., Dudley, J., Slaughter, J. C., & Patrick, S. W. (2017). Male Sex Associated With Increased Risk of Neonatal Abstinence Syndrome. *Hospital Pediatrics*, 7(6), 328-334. doi:10.1542/hpeds.2016-0218
- Council of State and Territorial Epidemiologists. (2019). *Neonatal Abstinence Syndrome Standardized Case Definition*. CSTE. Retrieved from https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-MCH-01_final_7.31.19.pdf
- Council of State and Territorial Epidemiologists. (2023). *Update to the Neonatal Abstinence Syndrome Standardized Case Definition*.
- Grossman, M., Lipshaw, M., Osborn, R., & Berkwitt, A. (2018). A novel approach to assessing infants with neonatal abstinence syndrome. *Hospital Pediatrics*, 8(1), 1-6. doi:10.1542/hpeds.2017-0128
- Healthcare Cost and Utilization Project. (2021). *Neonatal Abstinence Syndrome (NAS) Among Newborn Hospitalizations*. Retrieved from <https://www.hcup-us.ahrq.gov/faststats/NASServlet?setting1=IP>
- Jilani, S., Frey, M., Pepin, D., & et al. (2019). Evaluation of state-mandated reporting of neonatal abstinence syndrome - six states, 2013-2017. *Morbidity and Mortality Weekly Report*, 68(1), 6-10. doi:10.15585/mmwr.mm6801a2
- Kocherlakota, P. (2014). Neonatal abstinence syndrome. *Pediatrics*, 134(2), e547-e561.
- McQueen, K., & Murphy-Oikonen, J. (2016). Neonatal abstinence syndrome. *New England Journal of Medicine*, 2468-2479.
- Pew Charitable Trusts. (2016). *Medication-assisted treatment improves outcomes for patients with opioid use disorder*. Retrieved from https://www.pewtrusts.org/-/media/assets/2016/11/medicationassistedtreatment_v3.pdf
- Steinbeck, J. (1937). *Of Mice and Men*.
- Substance Abuse and Mental Health Services Administration. (2018). *Clinical guidance for treating pregnant and parenting women with opioid use disorder and their infants*. SAMHSA. Retrieved from <https://store.samhsa.gov/product/Clinical-Guidance-for-Treating-Pregnant-and-Parenting-Women-With-Opioid-Use-Disorder-and-Their-Infants/SMA18-5054>

Winkelman, T., Villapiano, N., Kozhimannil, K., Davis, M., & Patrick, S. (2020). Incidence and costs of neonatal abstinence syndrome among infants with medicaid: 2004-2014. *Pediatrics*, 141(4). doi:10.1542/peds.2017-3520

Suggested Citation

Giesel, S., Corey, L., & Wright, N. (2023) Neonatal Abstinence Syndrome: Statewide and County Trends, Data Brief. Minnesota Department of Health. Retrieved from <https://www.health.state.mn.us/communities/opioids/opioid-dashboard/resources.html#data>

Minnesota Department of Health

([health.state.mn.us](https://www.health.state.mn.us))

Injury and Violence Prevention Section

PO Box 64822

Saint Paul, MN, 55164-0882

651-201-5400

health.drugODepi@state.mn.us

To obtain this information in a different format, call: 651-201-5484.

Appendix I: NAS-related hospital visits by SCHSAC region, Number and Rates (per 1,000 live births), 2016-2022

| SCHSAC Region | 2016 N (rate) | 2017 N (rate) | 2018 N (rate) | 2019 N (rate) | 2020 N (rate) | 2021 N (rate) | 2022 N (rate) | Total N (rate) |
|---------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|
| Metro | 177 (4.5) | 236 (6.1) | 180 (4.7) | 190 (5.1) | 220 (6.1) | 214 (5.9) | 238 (6.7) | 1,455 (5.6) |
| Northwest | 56 (34) | 38 (22.9) | 32 (20.8) | 26 (16.6) | 39 (27.5) | 44 (23) | 49 (26.3) | 284 (24.5) |
| Northeast | 53 (16.6) | 43 (13.4) | 47 (15.7) | 45 (14.7) | 47 (16.7) | 37 (12.6) | 31 (10.7) | 303 (14.4) |
| West Central | 4 (2.2*) | 9 (5.1*) | 7 (4.1*) | 7 (4.1*) | 5 (3.1*) | 11 (4.3*) | 9 (3.4*) | 52 (3.8) |
| Central | 93 (10) | 73 (8.1) | 51 (5.6) | 60 (6.9) | 57 (6.5) | 45 (5) | 62 (6.8) | 441 (7) |
| Southwest | 6 (2.4*) | 4 (1.6*) | 4 (1.6*) | 4 (1.7*) | 6 (2.6*) | 5 (2.2*) | 5 (2.2*) | 34 (2) |
| South Central | 6 (1.8*) | 17 (5.4*) | 9 (2.7*) | 17 (5.4*) | 6 (2*) | 8 (2.6*) | 6 (2*) | 69 (3.1) |
| Southeast | 15 (2.6*) | 24 (4.3) | 14 (2.6*) | 15 (2.7*) | 15 (2.9*) | 16 (3*) | 54 (10.3) | 153 (4) |

**Rates are considered unreliable when the rate is calculated with a numerator of 20 or less.*

Map of SCHSAC regions available: <https://www.health.state.mn.us/communities/practice/connect/docs/schsac.pdf>

NEONATAL ABSTINENCE SYNDROME (NAS) DATA BRIEF

Appendix II: Number of NAS-related hospital visits by County of Residence, 2016-2022

| County of Residence | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Total | Rate per 1,000 |
|---------------------|------|------|------|------|------|------|------|-------|----------------|
| Aitkin | 1 | 2 | 1 | 2 | 1 | 3 | 0 | 10 | 12.5* |
| Anoka | 19 | 26 | 25 | 31 | 25 | 20 | 18 | 164 | 5.7 |
| Becker | 3 | 5 | 5 | 3 | 1 | 6 | 1 | 24 | 9.9 |
| Beltrami | 41 | 26 | 27 | 18 | 32 | 39 | 42 | 225 | 52.9 |
| Benton | 4 | 3 | 3 | 3 | 1 | 1 | 0 | 15 | 4.1* |
| Big Stone | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2.9* |
| Blue Earth | 2 | 4 | 3 | 6 | 2 | 2 | 2 | 21 | 4.2 |
| Brown | 0 | 6 | 0 | 0 | 0 | 1 | 1 | 8 | 4.3* |
| Carlton | 6 | 10 | 9 | 10 | 6 | 8 | 3 | 52 | 20.7 |
| Carver | 3 | 3 | 2 | 1 | 5 | 10 | 1 | 25 | 3.1 |
| Cass | 36 | 23 | 13 | 11 | 14 | 14 | 15 | 126 | 64.9 |
| Chippewa | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 4 | 3.8* |
| Chisago | 0 | 5 | 1 | 3 | 1 | 1 | 4 | 15 | 4.0* |
| Clay | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 3 | 1.7* |
| Clearwater | 1 | 2 | 1 | 1 | 1 | 0 | 1 | 7 | 9.6* |
| Cook | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 4 | 15.0* |
| Cottonwood | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 4 | 4.7* |
| Crow Wing | 4 | 5 | 6 | 4 | 5 | 3 | 11 | 38 | 8.3 |
| Dakota | 17 | 28 | 22 | 23 | 24 | 14 | 18 | 146 | 4.1 |
| Dodge | 0 | 2 | 0 | 0 | 2 | 1 | 5 | 10 | 5.8* |
| Douglas | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 12 | 4.2* |
| Faribault | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | 3.1* |

NEONATAL ABSTINENCE SYNDROME (NAS) DATA BRIEF

| County of Residence | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Total | Rate per 1,000 |
|---------------------|------|------|------|------|------|------|------|-------|----------------|
| Fillmore | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 3 | 2.1* |
| Freeborn | 2 | 0 | 2 | 0 | 2 | 1 | 1 | 8 | 3.8* |
| Goodhue | 0 | 4 | 2 | 5 | 2 | 3 | 2 | 18 | 5.2* |
| Grant | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2.2* |
| Hennepin | 77 | 105 | 81 | 85 | 96 | 105 | 119 | 668 | 6.2 |
| Houston | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Hubbard | 4 | 1 | 0 | 0 | 0 | 1 | 0 | 6 | 4.3* |
| Isanti | 3 | 2 | 2 | 3 | 0 | 1 | 0 | 11 | 3.5* |
| Itasca | 7 | 6 | 6 | 4 | 2 | 4 | 6 | 35 | 12.0 |
| Jackson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Kanabec | 1 | 1 | 2 | 0 | 1 | 0 | 3 | 8 | 7.1* |
| Kandiyohi | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | 1.0* |
| Kittson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Koochiching | 3 | 3 | 2 | 0 | 2 | 2 | 1 | 13 | 19.3* |
| Lac Qui Parle | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2.7* |
| Lake | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 3 | 4.5* |
| Lake of the Woods | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Le Sueur | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 6 | 2.8* |
| Lincoln | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Lyon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Mahnomen | 6 | 6 | 1 | 5 | 5 | 3 | 4 | 30 | 52.3 |
| Marshall | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 6.7* |
| Martin | 0 | 1 | 0 | 3 | 0 | 0 | 1 | 5 | 3.2* |

NEONATAL ABSTINENCE SYNDROME (NAS) DATA BRIEF

| County of Residence | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Total | Rate per 1,000 |
|---------------------|------|------|------|------|------|------|------|-------|----------------|
| McLeod | 0 | 1 | 1 | 2 | 1 | 0 | 1 | 6 | 2.2* |
| Meeker | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 4 | 2.2* |
| Mille Lacs | 15 | 10 | 3 | 12 | 7 | 6 | 12 | 65 | 31.2 |
| Morrison | 5 | 2 | 1 | 3 | 2 | 3 | 1 | 17 | 6.7* |
| Mower | 0 | 3 | 1 | 1 | 1 | 1 | 5 | 12 | 3.4* |
| Murray | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Nicollet | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 4 | 1.7* |
| Nobles | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 1.0* |
| Norman | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Olmsted | 5 | 2 | 3 | 5 | 5 | 2 | 32 | 54 | 3.8 |
| Otter Tail | 0 | 1 | 0 | 0 | 2 | 0 | 1 | 4 | 1.0* |
| Pennington | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 4 | 4.1* |
| Pine | 3 | 6 | 4 | 7 | 7 | 3 | 5 | 35 | 19.8 |
| Pipestone | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1.7* |
| Polk | 1 | 1 | 3 | 0 | 0 | 0 | 1 | 6 | 4.1* |
| Pope | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 3.4* |
| Ramsey | 43 | 50 | 34 | 34 | 43 | 42 | 57 | 303 | 6.1 |
| Red Lake | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 7.7* |
| Redwood | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 4 | 3.1* |
| Renville | 1 | 3 | 1 | 1 | 1 | 1 | 2 | 10 | 8.3* |
| Rice | 1 | 3 | 0 | 2 | 1 | 5 | 2 | 14 | 2.8* |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Roseau | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0.9* |

NEONATAL ABSTINENCE SYNDROME (NAS) DATA BRIEF

| County of Residence | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Total | Rate per 1,000 |
|---------------------|------------|------------|------------|------------|------------|------------|------------|-------------|----------------|
| St. Louis | 36 | 21 | 29 | 28 | 34 | 19 | 19 | 186 | 14.3 |
| Scott | 7 | 7 | 4 | 10 | 12 | 13 | 12 | 65 | 5.3 |
| Sherburne | 9 | 6 | 1 | 0 | 4 | 4 | 3 | 27 | 3.3 |
| Sibley | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 4 | 3.4* |
| Stearns | 6 | 5 | 6 | 10 | 7 | 7 | 5 | 46 | 3.3 |
| Steele | 2 | 5 | 2 | 1 | 0 | 2 | 1 | 13 | 4.6* |
| Stevens | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1.2* |
| Swift | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1.3* |
| Todd | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 4 | 1.8* |
| Traverse | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 6.3* |
| Wabasha | 1 | 0 | 1 | 0 | 0 | 0 | 5 | 7 | 4.4* |
| Wadena | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 3 | 2.2* |
| Waseca | 2 | 2 | 1 | 1 | 0 | 1 | 0 | 7 | 5.1* |
| Washington | 11 | 17 | 12 | 6 | 15 | 10 | 13 | 84 | 4.4 |
| Watsonwan | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.9* |
| Wilkin | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 3 | 10.6* |
| Winona | 4 | 4 | 2 | 1 | 2 | 0 | 1 | 14 | 6.3* |
| Wright | 5 | 5 | 8 | 3 | 5 | 2 | 3 | 31 | 2.5 |
| Yellow Medicine | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 3.2* |
| 7-county Metro | 177 | 236 | 180 | 190 | 220 | 214 | 238 | 1455 | 5.6 |
| Greater MN | 233 | 208 | 164 | 174 | 175 | 166 | 216 | 1336 | 7.2 |
| Total | 410 | 444 | 344 | 364 | 395 | 380 | 454 | 2791 | 6.2 |

*Rates are considered unreliable when the rate is calculated with a numerator of 20 or less.

Appendix III: Five-year NAS-related hospital visits by County of Residence, 2018-2022

| County of Residence | Five-year Total, 2018-2022 | Five-year Rate/1,000 |
|---------------------|----------------------------|----------------------|
| Aitkin | 7 | 12.6* |
| Anoka | 119 | 5.8 |
| Becker | 16 | 9.3* |
| Beltrami | 158 | 53.6 |
| Benton | 8 | 3.2* |
| Big Stone | 1 | 3.9* |
| Blue Earth | 15 | 4.3* |
| Brown | 2 | 1.5* |
| Carlton | 36 | 20.1 |
| Carver | 19 | 3.3* |
| Cass | 67 | 49.7 |
| Chippewa | 3 | 4.0* |
| Chisago | 10 | 3.7* |
| Clay | 3 | 1.8* |
| Clearwater | 4 | 7.9* |
| Cook | 3 | 17.2* |
| Cottonwood | 3 | 5.0* |
| Crow Wing | 29 | 9.1 |
| Dakota | 101 | 4.0 |
| Dodge | 8 | 6.4* |
| Douglas | 10 | 4.9* |
| Faribault | 3 | 4.5* |

NEONATAL ABSTINENCE SYNDROME (NAS) DATA BRIEF

| County of Residence | Five-year Total, 2018-2022 | Five-year Rate/1,000 |
|---------------------|----------------------------|----------------------|
| Fillmore | 2 | 2.1* |
| Freeborn | 6 | 4.1* |
| Goodhue | 14 | 5.7* |
| Grant | 1 | 3.0* |
| Hennepin | 486 | 6.5 |
| Houston | 0 | 0.0 |
| Hubbard | 1 | 1.0* |
| Isanti | 6 | 2.6* |
| Itasca | 22 | 10.9 |
| Jackson | 0 | 0.0 |
| Kanabec | 6 | 7.5* |
| Kandiyohi | 2 | 0.7* |
| Kittson | 0 | 0.0 |
| Koochiching | 7 | 14.8* |
| Lac Qui Parle | 1 | 3.7* |
| Lake | 3 | 6.6* |
| Lake of the Woods | 0 | 0.0 |
| Le Sueur | 6 | 4.0* |
| Lincoln | 0 | 0.0 |
| Lyon | 0 | 0.0 |
| Mahnomen | 18 | 45.9* |
| Marshall | 1 | 2.9* |
| Martin | 4 | 3.6* |

NEONATAL ABSTINENCE SYNDROME (NAS) DATA BRIEF

| County of Residence | Five-year Total, 2018-2022 | Five-year Rate/1,000 |
|---------------------|----------------------------|----------------------|
| McLeod | 5 | 2.6* |
| Meeker | 3 | 2.3* |
| Mille Lacs | 40 | 28.3 |
| Morrison | 10 | 5.7* |
| Mower | 9 | 3.6* |
| Murray | 0 | 0.0 |
| Nicollet | 2 | 1.2* |
| Nobles | 2 | 1.4* |
| Norman | 0 | 0.0 |
| Olmsted | 47 | 4.7 |
| Otter Tail | 3 | 1.0* |
| Pennington | 2 | 2.9* |
| Pine | 26 | 21.1 |
| Pipestone | 1 | 2.3* |
| Polk | 4 | 3.6* |
| Pope | 3 | 4.8* |
| Ramsey | 210 | 6.1 |
| Red Lake | 1 | 5.2* |
| Redwood | 3 | 3.3* |
| Renville | 6 | 7.3* |
| Rice | 10 | 2.9* |
| Rock | 0 | 0.0 |
| Roseau | 1 | 1.2* |

NEONATAL ABSTINENCE SYNDROME (NAS) DATA BRIEF

| County of Residence | Five-year Total, 2018-2022 | Five-year Rate/1,000 |
|---------------------|----------------------------|----------------------|
| St. Louis | 129 | 14.2 |
| Scott | 51 | 6.0 |
| Sherburne | 12 | 2.0* |
| Sibley | 3 | 3.5* |
| Stearns | 35 | 3.5 |
| Steele | 6 | 3.0* |
| Stevens | 1 | 1.6* |
| Swift | 0 | 0.0 |
| Todd | 3 | 1.9* |
| Traverse | 0 | 0.0 |
| Wabasha | 6 | 5.4* |
| Wadena | 2 | 2.1* |
| Waseca | 3 | 3.1* |
| Washington | 56 | 4.1 |
| Watonwan | 0 | 0.0 |
| Wilkin | 2 | 9.8* |
| Winona | 6 | 3.9* |
| Wright | 21 | 2.4 |
| Yellow Medicine | 2 | 4.6* |
| 7-county Metro | 1042 | 5.7 |
| Greater MN | 895 | 6.8 |
| Total | 1937 | 6.2 |

**Rates are considered unreliable when the rate is calculated with a numerator of 20 or less.*