

Neonatal Abstinence Syndrome (NAS)

DATA BRIEF: STATEWIDE AND COUNTY TRENDS, 2012-2016

Neonatal abstinence syndrome (NAS) is the fetal and neonatal addiction and withdrawal caused by a sudden discontinuation of fetal exposure to substances used or abused by the mother during pregnancy [1, 2]. Withdrawal symptoms usually begin shortly after birth, as the infant is no longer exposed to the drugs [1]. It is most commonly caused by opioid exposure. Signs and symptoms of NAS generally include tremors, irritability, excessive crying and diarrhea [1]. The incidence of NAS in the United States increased by 383% from 2000 to 2012 [2].

From 2012 to 2016, there were 1,839 cases of NAS in Minnesota (Figure 1). This corresponds to a rate of 55.2 per 10,000 live births; the median rate among counties in Minnesota was 32.9 per 10,000 live births. Of the total number of cases from 2012 to 2016, 56% were male.

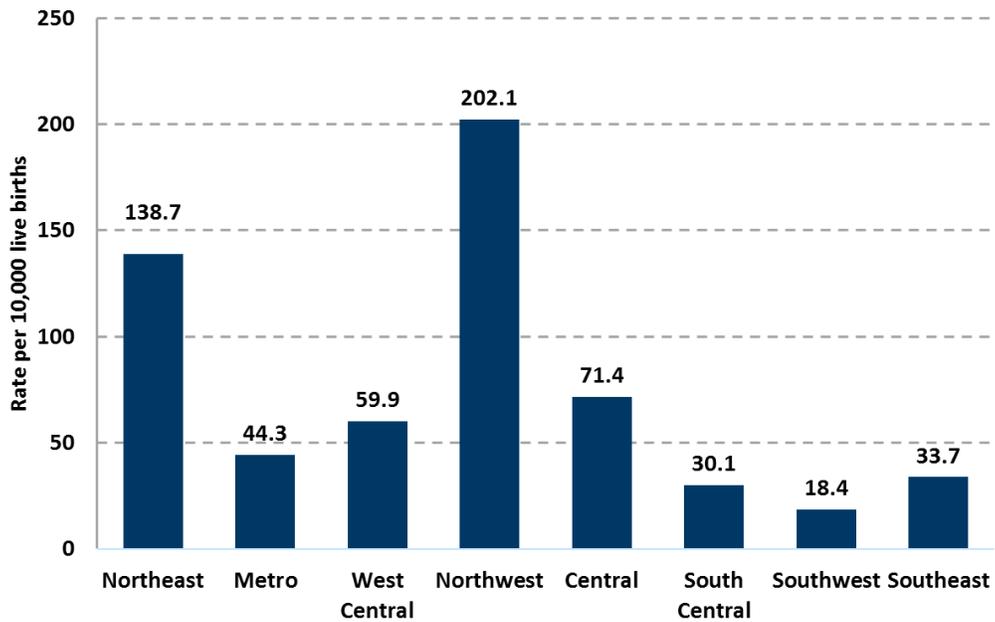
Figure 1: The number and rate of NAS cases increased from 2012 to 2015, then decreased in 2016

Year	Number of Cases	Rate per 10,000 live births
2012	236	35.9
2013	326	49.2
2014	396	59.1
2015	479	71.4
2016	402	60.0
Total	1,839	55.2

In Minnesota, there are eight Emergency Medical Services (EMS) regions (Appendix III). The highest rate was found in the Northwest EMS region of the state (202 per 10,000 live births) with a total of 173 cases between 2012 and 2016 (Figure 2). The lowest rate was found in the Southwest region of the state (18 per 10,000 live births) with a total of 23 cases between 2012 and 2016. However, a large portion (47%) of the total number of NAS cases occurred in the Metro region (873 of the total 1,839 cases), while the rate for the Metro region was the fifth highest among the EMS regions (Figure 2). Rates also varied among counties within regions (Appendix II).

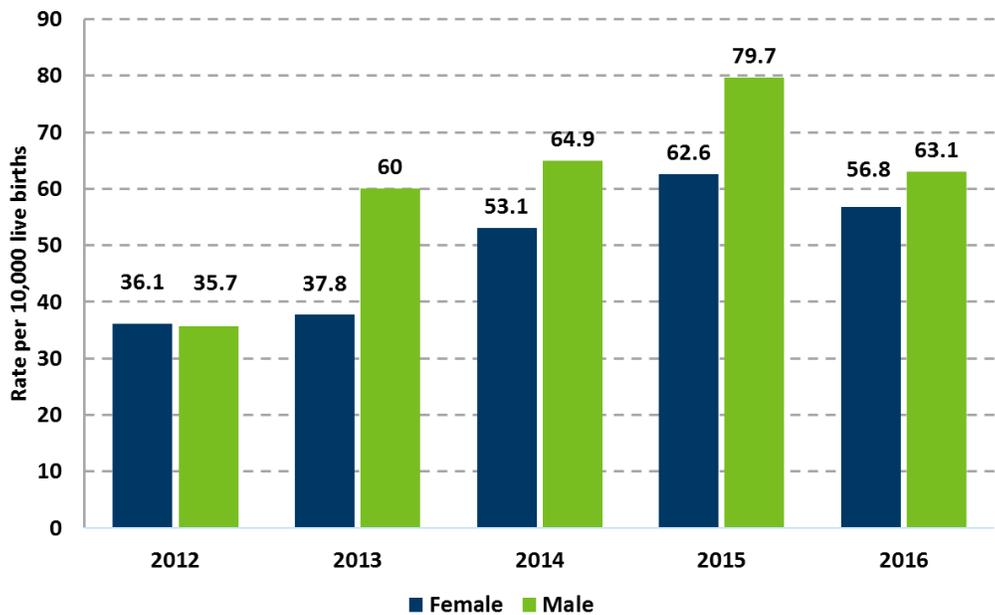
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Figure 2: The NAS newborn rate varied by Minnesota EMS region



From 2012 to 2016, the rates of NAS tend to be higher among newborn males than among females (Figure 3).

Figure 3: The rates of NAS are higher for males than females



*Populations for rates are gender-specific

Prevention

Minnesota’s prevention strategies incorporate an understanding that substance abuse is not simply an individual problem, but is also shaped by factors such as community and family support, access to health care, and healthy relationships. Pregnant women with an opioid use disorder require comprehensive obstetric (OB) care that includes medication-assisted therapy. An example of an OB clinic serving pregnant women with an opioid use disorder is the PATHways Clinic in Kentucky [3]. They found that suboxone was more effective than methadone in terms of shorter hospital stays and less medication for babies born with NAS. They also found that group prenatal care supported recovery, and that having the mother in charge of newborn care reduced the hospital stay after birth, resulted in less medication for the baby, and increased the likelihood of babies going home with the mother.

Improved outcomes can be expected as we integrate medical, mental, dental, sexual, and chemical health care through increased communication and greater access and referral to services. Increased collaboration and coordination between Minnesota’s Health Care Homes (HCH) program and Behavioral Health Home services (BHH) is expected to improve quality and value of care.

In regards to the increased rate of NAS among males, one study has found an increased risk among males, but not severity [4]. However, further investigation is required as it pertains to prevention efforts and treatment of NAS.

Neonatal Abstinence Syndrome (NAS) Toolkit

(Toolkit for identification, screening, and treatment of NAS, developed by the MN Hospital Association)

Methods

All hospitalizations of acute care, non-federal in-state hospital settings were included. 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. ICD-9-CM code of 779.5 and ICD-10-CM code of P96.1 were used. Rates were calculated per 10,000 live births in Minnesota among Minnesota residents.

References

1. Kocherlakota, P. (2014). Neonatal abstinence syndrome. *Pediatrics*, 134(2), e547-e561.
2. Ko JY, Patrick SW, Tong VT, Patel R, Lind JN, Barfield WD. *Incidence of Neonatal Abstinence Syndrome — 28 States, 1999–2013*. MMWR Morb Mortal Wkly Rep 2016; 65:799–802. DOI: <http://dx.doi.org/10.15585/mmwr.mm6531a2>
3. Kristin Ashford, Agatha Critchfield, Michelle Lofwall, Lori Shook, and Sharon Walsh, staff from PATHways Clinic, presented at the 2017 Rx Drug Abuse & Heroin Summit in Atlanta.
4. 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*, hpeds-2016.

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Appendix I: NAS cases by EMS region, Number and Rates, 2012-2016

EMS Region	2012 N(rate)	2013 N(rate)	2014 N(rate)	2015 N(rate)	2016 N(rate)	Total N(rate)
Metro	118 (30.4)	177 (45.2)	180 (45.3)	230 (57.8)	168 (42.6)	873 (44.3)
Northwest	12 (69.5)	23 (130.6)	30 (175.0)	55 (328.8)	53 (314.4)	173 (202.1)
Northeast	40 (124.0)	38 (120.2)	45 (139.3)	48 (151.6)	50 (158.8)	221 (138.7)
West Central	9 (52.4)	18 (104.0)	16 (88.3)	6 (34.0)	4 (21.9)	53 (59.9)
Central	35 (38.9)	44 (48.6)	72 (79.8)	85 (93.0)	89 (95.9)	325 (71.4)
Southwest	3 (12.2)	3 (12.0)	6 (24.6)	5 (19.3)	6 (23.9)	23 (18.4)
South Central	5 (15.6)	9 (28.2)	14 (42.5)	16 (48.8)	5 (15.1)	49 (30.1)
Southeast	14 (25.0)	14 (24.5)	32 (55.5)	21 (36.7)	15 (26.2)	96 (33.7)

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Appendix II: Number of NAS cases by County of Residence, 2012-2016

County of Residence	2012	2013	2014	2015	2016	Total	Rate
Aitkin	0	2	1	0	1	4	71.0
Anoka	8	30	20	34	17	109	52.6
Becker	5	10	7	3	3	28	157.7
Beltrami	8	7	19	46	40	120	361.2
Benton	0	5	7	4	4	20	71.4
Big Stone	0	0	0	0	0	0	0.0
Blue Earth	1	4	4	7	2	18	49.8
Brown	0	2	0	1	0	3	21.9
Carlton	7	12	12	11	6	48	262.4
Carver	2	1	2	1	3	9	15.5
Cass	12	5	18	23	33	91	557.6
Chippewa	0	0	0	1	1	2	24.5
Chisago	4	1	0	4	0	9	35.1
Clay	1	1	4	1	0	7	479.5
Clearwater	1	0	1	0	1	3	56.6
Cook	0	1	0	0	0	1	43.3
Cottonwood	0	0	0	0	1	1	14.9
Crow Wing	2	0	5	8	4	19	53.3
Dakota	15	23	16	30	16	100	38.4
Dodge	0	1	2	1	0	4	32.9
Douglas	1	3	3	0	1	8	38.9
Faribault	1	0	0	1	0	2	26.8
Fillmore	2	0	1	1	0	4	38.1

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County of Residence	2012	2013	2014	2015	2016	Total	Rate
Freeborn	0	0	2	0	2	4	24.4
Goodhue	4	4	1	6	0	15	60.6
Grant	0	0	0	0	0	0	0.0
Hennepin	59	76	92	96	74	397	48.2
Houston	0	0	0	0	0	0	0.0
Hubbard	0	3	1	1	3	8	79.6
Isanti	0	2	3	3	3	11	51.6
Itasca	4	3	4	5	7	23	99.7
Jackson	0	0	2	0	0	2	42.6
Kanabec	1	0	2	4	1	8	106.4
Kandiyohi	0	2	2	1	2	7	24.1
Kittson	0	0	0	0	0	0	0.0
Koochiching	0	0	2	1	3	6	117.4
Lac Qui Parle	0	0	0	0	0	0	0.0
Lake	0	0	0	0	0	0	0.0
Lake of the Woods	0	0	0	0	0	0	0.0
Le Sueur	0	0	0	2	0	2	13.2
Lincoln	0	0	0	0	0	0	0.0
Lyon	1	0	0	0	0	1	6.1
McLeod	0	0	0	2	0	2	9.5
Mahnomen	1	9	6	6	5	27	615.0
Marshall	1	0	0	0	2	3	117.6
Martin	0	0	1	1	0	2	18.4
Meeker	1	0	2	1	1	5	37.1

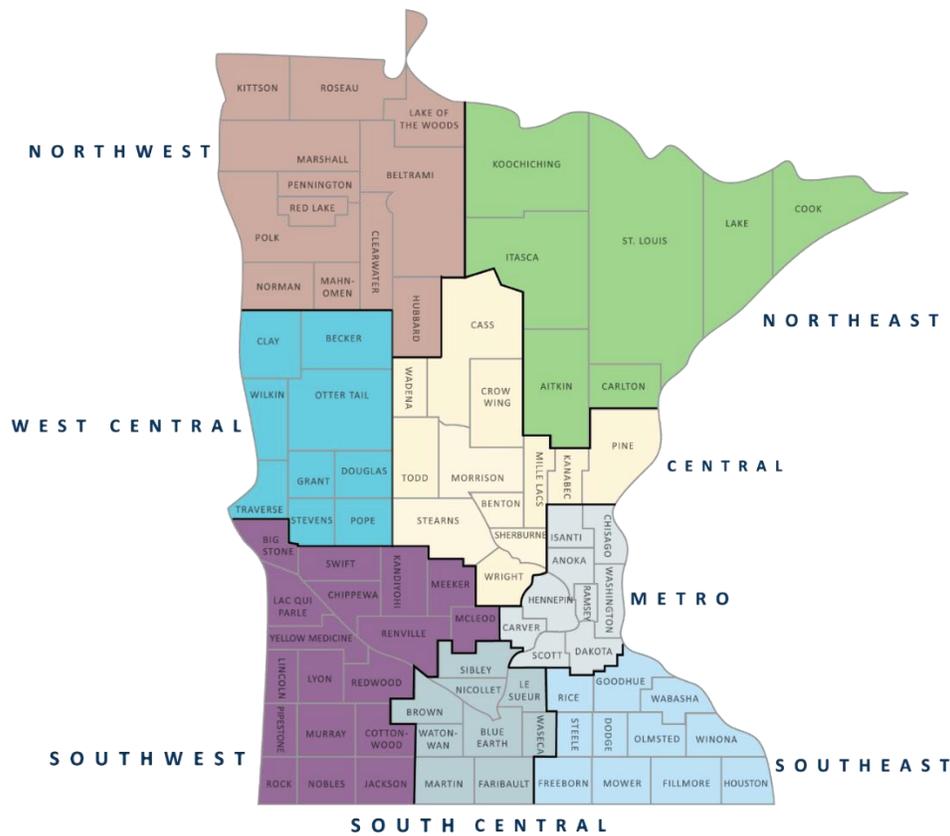
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County of Residence	2012	2013	2014	2015	2016	Total	Rate
Mille Lacs	4	12	18	13	15	62	375.1
Morrison	0	2	4	4	5	15	77.8
Mower	1	0	1	1	0	3	12.2
Murray	1	0	0	0	0	1	29.3
Nicollet	0	1	6	1	0	8	42.6
Nobles	0	0	0	0	0	0	0.0
Norman	0	0	0	0	0	0	0.0
Olmsted	4	3	9	3	5	24	22.5
Otter Tail	1	3	2	2	0	8	26.5
Pennington	0	1	0	1	1	3	38.0
Pine	1	2	1	0	2	6	43.8
Pipestone	0	0	0	0	0	0	0.0
Polk	1	3	3	1	1	9	117.6
Pope	1	0	0	0	0	1	15.9
Ramsey	24	29	30	47	41	171	44.2
Red Lake	0	0	0	0	0	0	0.0
Redwood	0	0	0	2	1	3	33.1
Renville	1	1	2	0	1	5	57.6
Rice	2	3	4	3	1	13	35.8
Rock	0	0	0	0	0	0	0.0
Roseau	0	0	0	0	0	0	0.0
St. Louis	29	20	26	31	33	139	139.5
Scott	3	5	7	8	6	29	30.8
Sherburne	7	4	3	8	9	31	52.7

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County of Residence	2012	2013	2014	2015	2016	Total	Rate
Sibley	0	0	0	0	0	0	0.0
Stearns	2	6	6	11	6	31	31.8
Steele	0	3	8	3	2	16	69.2
Stevens	0	1	0	0	0	1	18.0
Swift	0	0	0	1	0	1	18.9
Todd	0	1	0	0	1	2	12.6
Traverse	0	0	0	0	0	0	0.0
Wabasha	0	0	1	0	1	2	17.6
Wadena	0	0	0	0	1	1	10.6
Waseca	2	1	1	0	1	5	47.4
Washington	7	13	13	14	11	58	41.6
Watonwan	0	1	0	0	1	2	26.4
Wilkin	0	0	0	0	0	0	0.0
Winona	1	0	3	3	4	11	58.6
Wright	2	4	5	3	5	19	21.3
Yellow Medicine	0	0	0	0	0	0	0.0
7-county Metro	118	177	180	230	168	873	44.3
Greater MN	118	149	215	236	222	940	69.0
Unknown county	0	0	1	13	12	26	**
Total	236	326	396	479	402	1,839	55.2

Appendix III: Emergency Medical Services Regions



EMS regions

Northwest: Beltrami, Clearwater, Hubbard, Kittson, Lake of the Woods, Mahnomen, Marshall, Norman, Pennington, Polk, Red Lake, and Roseau Counties.

West Central: Becker, Clay, Douglas, Grant, Otter Trail, Pope, Stevens, Traverse, and Wilkin Counties

Southwest: Big Stone, Chippewa, Cottonwood, Jackson, Kandiyohi, Lac Qui Parle, Lincoln, Lyon, Nobles, McLeod, Meeker, Murray, Pipestone, Redwood, Renville, Rock, Swift, and Yellow Medicine Counties.

South Central: Blue Earth, Brown, Faribault, Le Sueur, Martin, Nicollet, Sibley, Waseca, and Watonwan Counties.

Southeast: Dodge, Fillmore, Freeborn, Goodhue, Houston, Mower, Olmstead, Rice, Steele, Wabasha, and Winona Counties.

Metro: Anoka, Carver, Chisago, Dakota, Hennepin, Isanti Washington, Ramsey, and Scott Counties.

Central: Benton, Cass, Crow Wing, Kanabec, Mille Lacs, Morrison, Pine, Sherburne, Stearns, Todd, Wadena, and Wright Counties.

Northeast: Aitkin, Carlton, Cook, Itasca Koochiching, Lake, and St. Louis Counties.