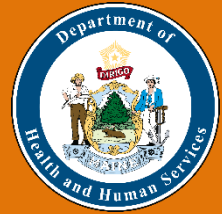




# Neonatal Abstinence Syndrome and Prenatal Opioid Use Diagnoses in Maine, 2016-2020



## Data Brief

March 2022

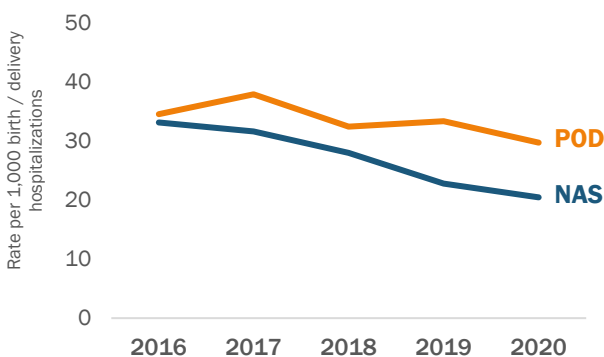
Throughout the past decade, Maine’s rates of **neonatal absence syndrome (NAS)** and **prenatal opioid-related diagnoses (POD)** have consistently been among the highest in the United States. In 2017 the rate of NAS in Maine was 2<sup>nd</sup> highest in the nation and the POD was 3<sup>rd</sup> highest.<sup>1</sup>

### OVERALL INCIDENCE

In 2020 in Maine there were:

- **20.5 NAS diagnoses per 1,000** birth hospitalizations (n= 220)
- **29.7 POD diagnoses per 1,000** delivery hospitalizations (n=318).

The incidence of **NAS** decreased significantly between 2016 and 2020. The **NAS rate dropped 12%** over this five-year period. The rate of **POD** also dropped during this time, but the change was not statistically significant.

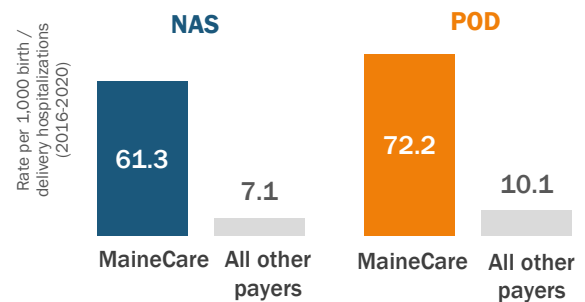


### DEMOGRAPHICS AND GEOGRAPHY

Maine’s rates of **NAS** and **POD** vary by, **insurance status, race, ethnicity, maternal age, rurality, and county**. The following sections describe these differences using data from **2016-2020**. Data shown are from the combined five-year period, unless otherwise noted.

### Insurance status

- The **NAS** rate was almost **nine times higher** among births hospitalizations for which **MaineCare** was the primary payer compared to **all other payers** (61.3 per 1,000 vs. 7.1 per 1,000).
- The **POD** rate was **seven times higher** among deliveries covered by **MaineCare**.



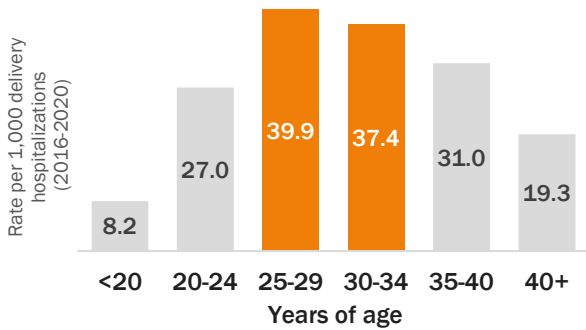
Between 2016 and 2020, the **NAS rate decreased significantly** among both **MaineCare** covered births, and births covered by **all other payers**. There was not a significant change in the rate of **POD** among delivery hospitalizations in either payer group.

### Race and ethnicity

- **NAS** rates were **highest** among **White infants** (29.0 cases per 1,000 hospitalizations), and **American Indian or Alaska Native (AIAN) infants** (53.0 per 1,000). Due to the small total number of AIAN infants diagnosed with NAS (n=15), these findings should be interpreted with caution.
- **POD** rates were **highest** among **White** and **AIAN birthing people** (36.3 and 95.2 cases per 1,000 hospitalizations, respectively).
- Both **NAS** and **POD** were **higher** among **non-Latinx** than **Latinx** infants and birthing people, though these findings were not statistically significant.

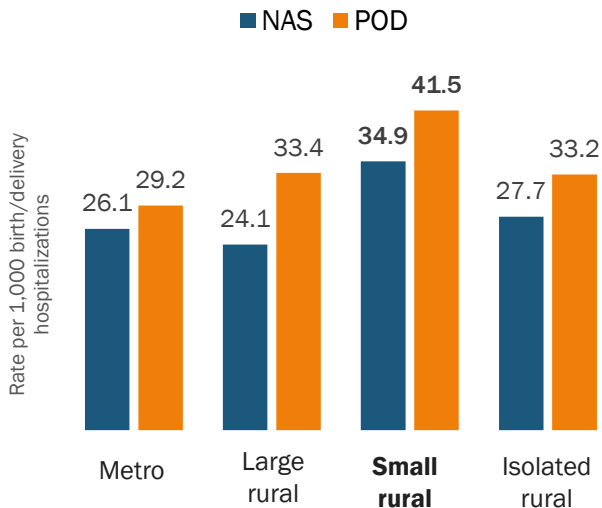
### Age at delivery

- Birthing people aged **25 – 34 years** had the **highest** rates of **POD** relative to other age groups.
- Rates were significantly **lower** among birthing people **24 years and younger**, and **35 years old and older**.



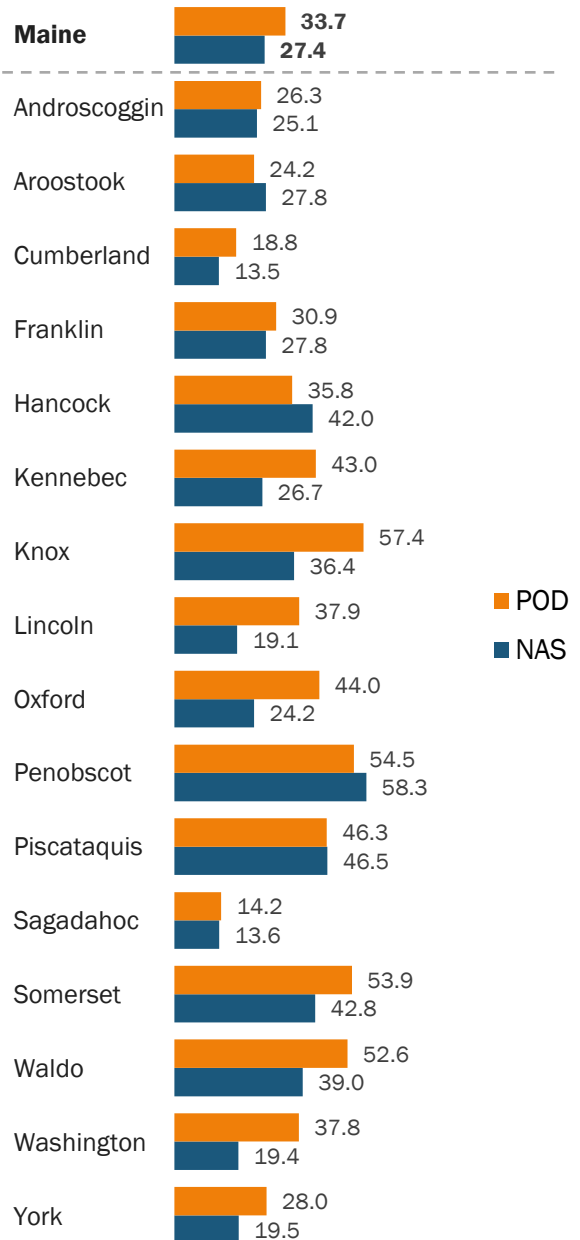
### Rurality

- **NAS** and **POD** rates were significantly **higher** among residents of **small rural areas** compared to the state as a whole.
- The rate of **NAS** among **small rural area** residents was **34.9 per 1,000** birth hospitalizations compared to 27.4 per 1,000 statewide.
- The rate of **POD** among **small rural area** residents was **41.5 per 1,000** delivery hospitalizations vs. 33.7 per 1,000 statewide.



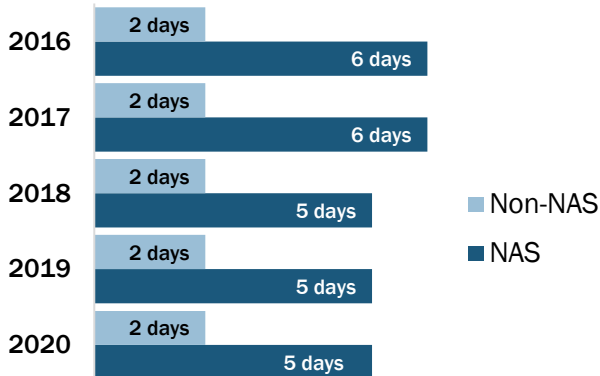
### County

- The rate of **NAS** was **highest** among **Penobscot County** resident infants (**58.3 per 1,000** birth hospitalizations). Penobscot's **NAS** rate was **twice as high** as the statewide rate of 27.4.
- **Knox County** residents had the **highest** rate of **POD** (**57.4 per 1,000** delivery hospitalizations). Knox County's rate of **POD** among delivery hospitalizations was **1.7 times higher** than the statewide rate of 33.7.



## LENGTH OF HOSPITAL STAY

In 2016-2020, the median length of inpatient hospital stay (LOS) differed among births with a diagnosis of **NAS** versus **those without**.



The median LOS for NAS birth hospitalizations decreased by one day between 2017 and 2018. This may reflect the introduction of the Eat-Sleep-Console (ESC) approach to care for NAS which is designed to improve infant and family outcomes, including reducing hospital LOS.<sup>2</sup>

The median LOS for delivery hospitalizations with **POD** in 2016-2020 was 3 days, versus 2 days for all other deliveries.

## CONCLUSION

While the rates of NAS and POD in Maine remain elevated relative to most US states, Maine's NAS rate has recently declined, and the POD rate has stabilized. Disproportionately high rates of both diagnoses continue to be experienced by White and AIAN birthing people and infants, residents of small rural areas, and birthing people and infants covered by MaineCare.

Findings suggest the need for continued and intensive prevention and intervention work to further reduce the incidence of NAS and POS in Maine. Several new and innovative initiatives to address the state's opioid crisis and its affects on children and families, such as the MaineMOM program and Eat-Sleep-Console (see inset box), promise to further reduce NAS and POD in Maine. Future analyses of hospitalization and other public health data may help illuminate the impacts of these and other prevention and intervention efforts.

## Efforts to address POD and NAS in Maine

**MaineMOM: Support for birthing people experiencing opioid use disorder:** MaineMOM is a MaineCare initiative designed to enhance the care-delivery system for pregnant and postpartum patients with Opioid Use Disorder (OUD), and their infants, through comprehensive case management integrated with maternity and OUD treatment services. MaineMOM services launched at 17 sites across Maine in July 2021 (see [MaineMOM.org](https://MaineMOM.org) for service and location information). In 2022 it will expand to more sites statewide after integration into the Medicaid State Plan. MaineMOM is funded by the Centers for Medicare and Medicaid Services.

**Eat-Sleep-Console (ESC):** ESC is a holistic, non-stigmatizing, non-pharmacological approach to caring for opioid-exposed infants.<sup>2</sup> The ESC model focuses on empowering birthing people as their infant's caregiver, using strategies such as rooming in, skin-to-skin contact, and breastfeeding. The ESC approach is in use at most of Maine's 25 birthing facilities.

## ACKNOWLEDGEMENTS

This report was prepared by the University of Southern Maine, Cutler Institute on behalf of the Maine Center for Disease Control (ME CDC) Title V Maternal and Child Health Program. The authors thank the following for their assistance and contributions:

Amy Belisle, *Child Health Officer, ME DHHS*

Kelley Bowden, *Perinatal Outreach Education Coordinator, Maine Medical Center*

Ashly Hirai, *Health Scientist, Maternal and Child Health Bureau, HRSA*

Maryann Harakall, *Director, Title V Program, ME CDC*

Maine Health Data Organization (MHDO)

Ashley Olen, *Clinical Nurse Consultant, Office of Child and Family Services, ME DHHS*

Liz Remillard, *MaineMOM Program Manager, Office of MaineCare Services*

Table 1. Neonatal Abstinence Syndrome, Maine, 2016-2020

<b>Year</b>	<b>Birth Hospitalizations with NAS</b>	<b>All Birth Hospitalizations</b>	<b>Rate per 1,000</b>	<b>95% Confidence Interval</b>
2016	395	11,901	33.19	30.00 - 36.63
2017	366	11,563	31.65	28.49 - 35.07
2018	322	11,501	28.00	25.02 - 31.23
2019	251	10,999	22.82	20.08 - 25.83
2020	220	10,740	20.48	17.87 - 23.38
2016 - 2020	1,554	56,704	27.41	26.07 - 28.79
<b>Geography, 2016-2020</b>				
<b>County</b>				
Androscoggin	146	5,827	25.06	21.16 - 29.47
Aroostook	80	2,880	27.78	22.03 - 34.57
Cumberland	181	13,405	13.50	11.61 - 15.62
Franklin	31	1,115	27.80	18.89 - 39.46
Hancock	82	1,951	42.03	33.43 - 52.17
Kennebec	147	5,499	26.73	22.59 - 31.42
Knox	53	1,457	36.38	27.25 - 47.58
Lincoln	25	1,307	19.13	12.38 - 28.24
Oxford	53	2,186	24.25	18.16 - 31.71
Penobscot	382	6,548	58.34	52.63 - 64.49
Piscataquis	29	624	46.47	31.12 - 66.74
Sagadahoc	20	1,474	13.57	8.29 - 20.96
Somerset	95	2,219	42.81	34.64 - 52.34
Waldo	62	1,590	38.99	29.90 - 49.99
Washington	26	1,341	19.39	12.67 - 28.41
York	142	7,281	19.50	16.43 - 22.99
<b>Rurality</b>				
Metro	533	20,396	26.13	23.96 - 28.45
Large rural	502	20,860	24.07	22.01 - 26.27
Small rural	442	12,669	34.89	31.71 - 38.30
Isolated rural	77	2,779	27.71	21.87 - 34.63
<b>Demographics, 2016-2020</b>				
<b>Payer</b>				
All other payers	251	35,226	7.1	6.27 - 8.06
MaineCare	1,292	21,069	61.3	58.02 - 64.76
<b>Race†</b>				
American Indian or Alaska Native	15	283	53.0*	29.67 - 87.42*
Asian	0	711	0	NA
Black or African-American	11	2,430	4.5*	2.26 - 8.10*
Native Hawaiian or Other Pacific Islander	1	52	19.2*	0.49 - 107.15*
White	1,442	49,674	29.0	27.55 - 30.57
Other Race	14	1,103	12.7*	6.94 - 21.30*
Patient elected not to answer	37	1,182	31.3	22.04 - 43.15
<b>Ethnicity ††</b>				
Hispanic/Latinx	14	938	14.9*	8.16 - 25.04*
Non-Hispanic/Latinx	1,059	44,941	23.6	22.17 - 25.03

\* Interpret with caution: rates are calculated with less than 20 in the numerator.

† Race data were missing from the inpatient hospitalization records of one Maine hospital in 2016.

†† Ethnicity was unknown for 23% of birth hospitalization records in 2016-2020 (n=472).

Table 2. Prenatal Opioid Use Related Diagnoses, Maine, 2016-2020

Year	Delivery Hospitalizations with POD	All Delivery Hospitalizations	Rate per 1,000	95% Confidence Interval
2016	410	11,856	34.58	31.31 - 38.10
2017	438	11,547	37.93	34.46 - 41.66
2018	371	11,432	32.45	29.23 - 35.93
2019	365	10,928	33.40	30.06 - 37.01
2020	318	10,692	29.74	26.56 - 33.20
2016 - 2020	1,902	56,450	33.69	32.20 - 35.23
<b>Geography, 2016-2020</b>				
<b>County</b>				
Androscoggin	152	5,780	26.30	22.28 - 30.83
Aroostook	70	2,890	24.22	18.88 - 30.60
Cumberland	249	13,253	18.79	16.53 - 21.27
Franklin	34	1,101	30.88	21.39 - 43.15
Hancock	72	2,013	35.77	27.99 - 45.04
Kennebec	234	5,443	42.99	37.66 - 48.87
Knox	84	1,463	57.42	45.80 - 71.09
Lincoln	49	1,294	37.87	28.01 - 50.06
Oxford	97	2,207	43.95	35.64 - 53.62
Penobscot	354	6,497	54.49	48.96 - 60.47
Piscataquis	29	626	46.33	31.03 - 66.53
Sagadahoc	21	1,481	14.18	8.78 - 21.68
Somerset	119	2,208	53.89	44.65 - 64.49
Waldo	84	1,597	52.60	41.95 - 65.12
Washington	51	1,349	37.81	28.15 - 49.71
York	203	7,253	27.99	24.27 - 32.11
<b>Rurality</b>				
Metro	589	20,193	29.17	26.86 - 31.62
Large rural	693	20,753	33.39	30.95 - 35.97
Small rural	527	12,706	41.48	38.01 - 45.17
Isolated rural	93	2,803	33.18	26.78 - 40.65
<b>Demographics, 2016-2020</b>				
<b>Payer</b>				
All other payers	350	34,753	10.07	9.04 - 11.18
MaineCare	1,536	21,262	72.24	68.67 - 75.95
<b>Race†</b>				
American Indian or Alaska Native	28	333	84.08	55.87 - 121.52
Asian	2	803	2.49*	0.30 - 9.00*
Black or African-American	10	2,477	4.04*	1.94 - 7.42*
Native Hawaiian or Other Pacific Islander	2	65	30.77*	3.73 - 111.15*
White	1,809	50,923	35.52	33.91 - 37.20
Other Race	18	962	18.71*	11.09 - 29.57*
Patient elected not to answer	2	327	6.12*	0.74 - 22.09*
<b>Ethnicity</b>				
Hispanic/Latinx	24	964	24.90	15.95 - 37.04
Non-Hispanic/Latinx	1,830	53,847	33.99	32.45 - 35.58
<b>Age at delivery</b>				
<20 years	18	2,190	8.22*	4.87 - 12.99*
20-24 years	286	10,597	26.99	23.95 - 30.30
25-29 years	687	17,216	39.90	36.98 - 43.00
30-34 years	636	16,987	37.44	34.59 - 40.47
35-40 years	245	7,908	30.98	27.22 - 35.11
40+ years	30	1,557	19.27	13.00 - 27.51

\* Interpret with caution: rates are calculated with less than 20 in the numerator.

† Race data were missing from the inpatient hospitalization records of one Maine hospital in 2016.

## TECHNICAL NOTES

Data presented throughout this report were obtained from the Maine Health Data Organization (MHDO) Inpatient (IP) Dataset. Hospitalizations discharged in 2016 – 2020 were included in the analysis. Newborn (birth) records and birthing parent (delivery) records were analyzed separately. Analyses were limited to Maine resident discharges.

**Neonatal abstinence syndrome** Identification of NAS cases was limited to birth hospitalizations, excluding records indicative of a transfer from another facility to avoid potential duplication.<sup>1</sup> NAS cases were identified from among birth hospitalizations using the *ICD-10-CM* code P96.1, *neonatal withdrawal symptoms from prenatal use of drugs of addiction*.

**Prenatal opioid-related diagnoses** Identification of POD cases was limited to delivery hospitalizations. POD diagnoses were identified from within delivery hospitalization records using *ICD-10-CM* codes for opioid dependence (F11.20-F11.29), non-dependent opioid use (F11.10-F11.19), unspecified opioid use (F11.90-F11.99), and long-term use of opioid analgesics (Z79.891). Records indicating opioid use in remission (F11.11) or opioid dependence in remission (F11.21) were excluded.<sup>1</sup>

NAS and POD cases were analyzed by discharge year, demographics (primary payer for hospitalization, patient race, patient ethnicity, and patient age), and geography (county of residence and rurality of residence). Rurality of residence was assessed using the USDA's RUCA coding scheme (zip code version; four-level).<sup>3</sup> Median length of stay for NAS and non-NAS birth hospitalizations was calculated using MHDO's length of stay calculated variable; *Wilcoxon–Mann–Whitney* tests were performed to test for statistical significance between groups. Tests for trend over the five-year period 2016-2020 were performed using Joinpoint statistical software<sup>4</sup>. All other analyses were performed using SAS 9.4.

## REFERENCES

1. Hirai AH, Ko JY, Owens PL, Stocks C, Patrick SW. Neonatal Abstinence Syndrome and prenatal opioid-related diagnoses in the US, 2010-2017. *JAMA*. 2021;325(2):146–155.
2. Grossman MR, Lipshaw MJ, Osborn RR, Berkwitz AK. *Hospital Pediatrics* January 2018, 8 (1) 1-6.
3. USDA Economic Research Service. (2021). Rural-Urban Commuting Area Codes. Economic Research Service, Department of Agriculture. <https://data.nal.usda.gov/dataset/rural-urban-commuting-area-codes>. Accessed 2021-09-15.
4. Joinpoint Regression Program, Version 4.8.0.1 - April 2020; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute.

### About the Data

The MHDO IP dataset is comprised of encounter-level inpatient records from all hospitals in Maine. Hospitals are required to submit common elements and use common definitions for these elements. Definitions for required data elements are primarily drawn from the National Uniform Billing Committee's Data Element Specifications.

The IP encounters datasets available from the MHDO are the most comprehensive, standardized source of Maine hospitalization data available for public health surveillance and research. The data elements submitted to MHDO by hospitals are primarily collected by those hospitals for billing and other administrative purposes. Differences in hospital operations, such as medical coding and insurance billing practices, across hospitals can result in inconsistencies in submitted data. These inconsistencies can present challenges when aggregating data across facilities, and may impact the reliability of calculated estimates, particularly for uncommon conditions.