Neonatal Abstinence Syndrome Michigan, 2010 – 2020

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Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data,
Division for Vital Records and Health Statistics, MDHHS
May 2022

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This presentation provides information about neonatal abstinence syndrome in the state of Michigan, 2010-2020

Data source: Michigan resident live birth files linked with Michigan hospital discharge data created by the Division for Vital Records and Health Statistics (04/26/22), Bureau of Epidemiology and Population Health, Michigan Department of Health and Human Services, using data from the Michigan Inpatient Database obtained with permission from the Michigan Health and Hospital Association Service Corporation (MHASC). All data analyses were conducted by the Michigan Department of Health and Human Services, Maternal and Child Health Epidemiology Section.

Revised: May 2022

About the Data

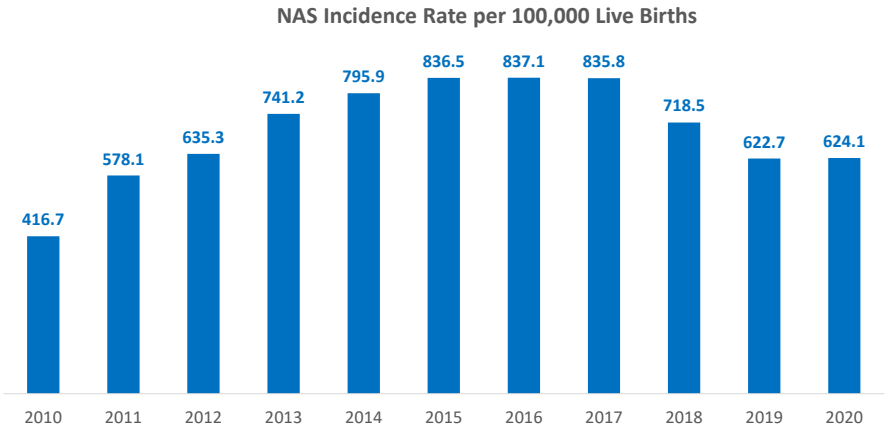
1. Cases of neonatal abstinence syndrome (NAS) in this presentation are identified by diagnosis code (ICD-9 779.5 or ICD-10 P96.1) from the Michigan Inpatient Database. If treatment for NAS is not, or can not, be billed, the diagnosis code may not be documented in the medical record. In these instances, cases of NAS will not be captured in the data. This is more likely to happen when infants receive non-pharmacological treatments.

2. Non-pharmacological interventions (i.e., decreased stimulation and increased calming techniques/Eat Sleep Console) of infants exhibiting NAS symptoms is growing. Given the variability in coding and/or billing, these cases of NAS may not be captured in the data. This shift may account for the recent decrease in NAS rates.

3. NAS symptoms may not occur until 5-7 days after birth. Unless re-admitted, infants discharged prior to the presentation of symptoms would not be captured in the data.

4. Nicotine, anti-anxiety and some depression medications can cause NAS-like symptoms.

Neonatal Abstinence Syndrome Michigan, 2010-2020



Year	# Cases	# Births	Rate
2010	478	114,717	416.7
2011	660	114,159	578.1
2012	716	112,708	635.3
2013	843	113,732	741.2
2014	911	114,460	795.9
2015	947	113,211	836.5
2016	949	113,374	837.1
2017	932	111,507	835.8
2018	791	110,093	718.5
2019	672	107,917	622.7
2020	650	104,149	624.1

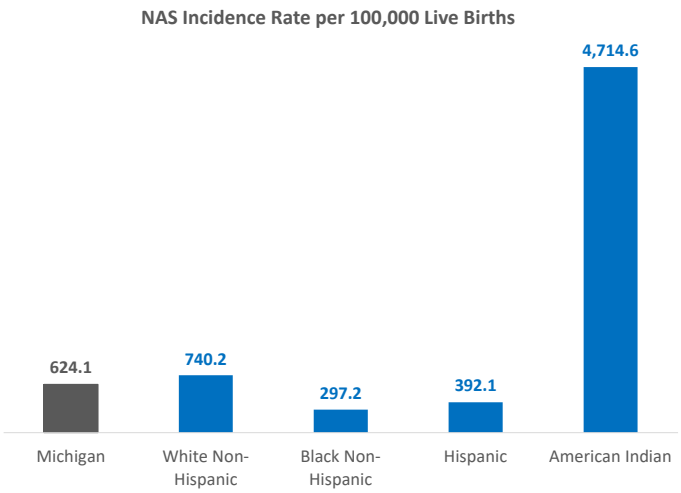
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) within the state of Michigan from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The number and rate of diagnosed NAS cases in Michigan increased from 2010 to 2016, peaking at 949 cases. Since 2016, the number and rate of diagnosed NAS cases has declined. In 2020, 650 infants were diagnosed with NAS.

Neonatal Abstinence Syndrome by Maternal Race/Ethnicity, Michigan, 2020

Race/Ethnicity	# Cases	# Births	Rate
Michigan	650	104,149	624.1
White Non-Hispanic	519	70,113	740.2
Black Non-Hispanic	57	19,180	297.2
Hispanic	28	7,141	392.1
American Indian	19	403	4,714.6



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Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

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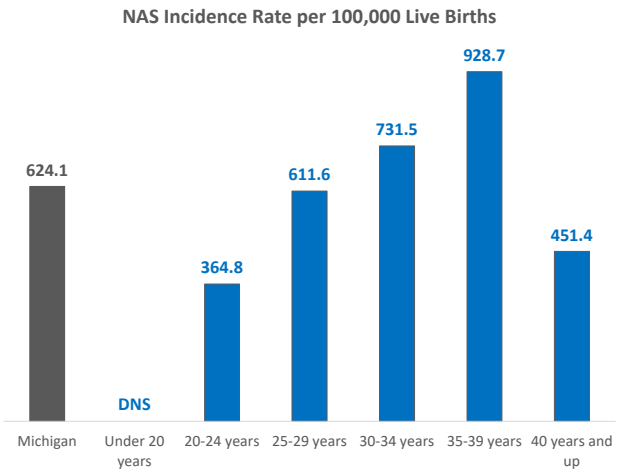
This slide shows the incidence of neonatal abstinence syndrome (NAS) by maternal race/ethnicity in 2020. The incidence of NAS differs by maternal race/ethnicity. The absolute number of NAS cases is highest among White Non-Hispanic mothers. The rate of NAS is significantly higher among American Indian mothers.

Neonatal Abstinence Syndrome by Maternal Age, Michigan, 2020

Age Group	# Cases	# Births	Rate
Michigan	650	104,149	624.1
Under 20 years	DNS	4,233	DNS
20-24 years	70	19,190	364.8
25-29 years	197	32,211	611.6
30-34 years	232	31,716	731.5
35-39	129	13,891	928.7
40 and up	13	2,879	451.5

DNS: Data Not Sufficient (0<N<6)



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Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

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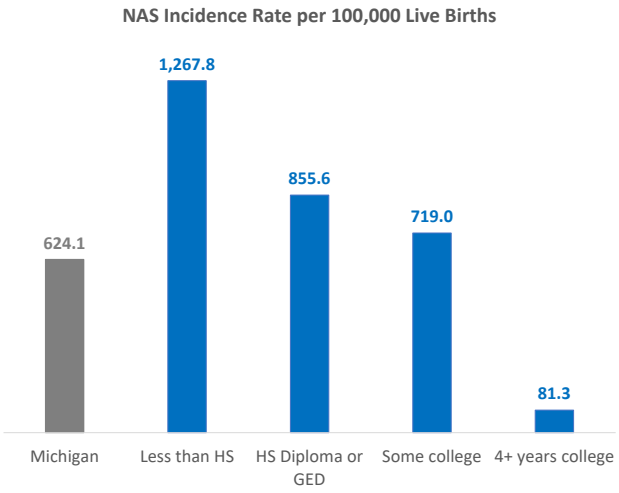
This slide shows the incidence of neonatal abstinence syndrome (NAS) by maternal age group in 2020. Generally, the rate of NAS cases increases as maternal age increases. The absolute number of NAS cases is highest within the 30-34 age group, at 232 cases in 2020. On the other hand, the rate is highest among the 35-39 age group, at 928.7 cases per 100,000 live births.

Neonatal Abstinence Syndrome by Maternal Education, Michigan, 2020

Maternal Education	# Cases	# Births	Rate
Michigan	650	104,149	624.1
< High School Diploma/GED	136	10,727	1,267.8
High School Diploma/GED	237	27,700	855.6
Some College	228	31,712	719.0
4 or More Years College	27	33,217	81.3



Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

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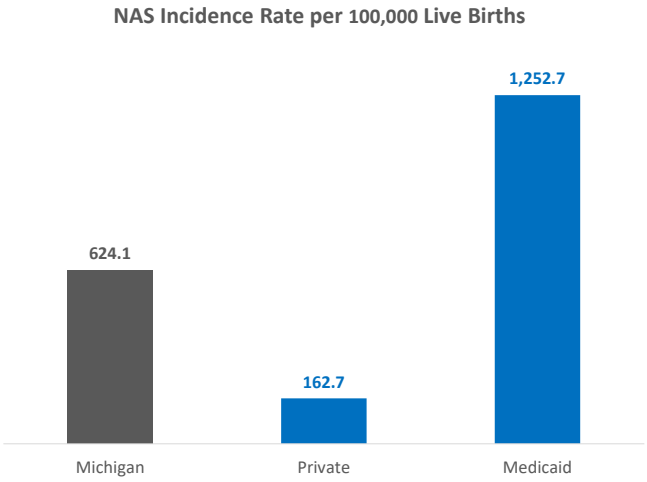
This slide shows the incidence of neonatal abstinence syndrome (NAS) by maternal education in 2020. Overall, the rate of NAS decreases as education, represented here as a categorical variable, increases. The incidence rate is highest among women without a high school diploma or GED, at 1,267.8 cases per 100,000 live births. The rate of NAS is lowest among women who had four or more years of college, at 81.3 cases per 100,000 live births. The absolute number of cases is highest among women who had obtained a high school diploma or GED, and those who completed some college, at 237 and 228 cases, respectively.

Neonatal Abstinence Syndrome by Payment Source, Michigan, 2020

Payment Source	# Cases	# Births	Rate per 100,000
Michigan	650	104,149	624.1
Private	96	59,015	162.7
Medicaid	517	41,271	1,252.7



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Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the incidence of neonatal abstinence syndrome (NAS) by intended payment source in 2020. The number and rate of NAS cases is highest among women who intended to use Medicaid as a payment source at delivery, at 1,252.7 cases per 100,000 live births. This is twice the statewide rate, and more than seven times the rate among women intending to use private insurance as a payment source.

Neonatal Abstinence Syndrome by Prosperity Region, 2019

Region	# Cases	# Births	Rate per 100,000 Live Births
Michigan	672	107,917	622.7
1	68	2,499	2,721.1
2	22	2,700	814.8
3	27	1,691	1,596.7
4	62	18,404	336.9
5	56	5,653	990.6
6	101	8,810	1,146.4
7	26	4,928	527.6
8	35	8,711	401.8
9	51	9,947	512.7
10	224	44,570	502.6

Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) by prosperity region in 2019. The burden of NAS differs by region, with Region 10 accounting for more than 1/3 of the cases statewide (N=224 cases). 15% of statewide cases are in Region 6 (N=101). Regions 2 and 3 account for the fewest number of absolute cases, at 22 and 27 cases, respectively.

The incidence rate is highest in Region 1, at 2,721.1 cases per 100,000 live births. The rate of cases is lowest in region 4, at 336.9 cases per 100,000 live births.

Neonatal Abstinence Syndrome by Prosperity Region, 2020

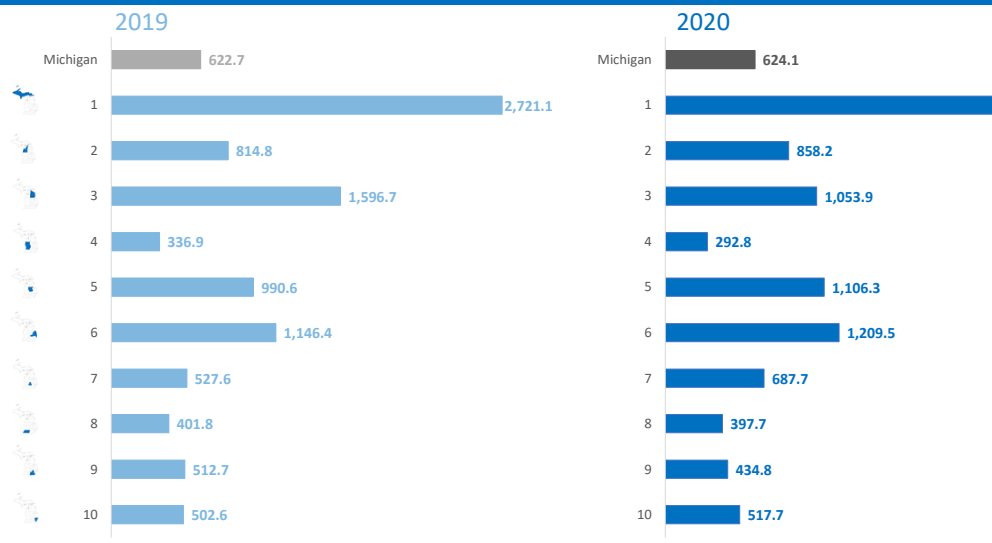
Region	# Cases	# Births	Rate per 100,000 Live Births
Michigan	650	104,149	624.1
1	67	2,489	2,691.8
2	23	2,680	858.2
3	17	1,613	1,053.9
4	53	18,104	292.8
5	59	5,333	1,106.3
6	102	8,433	1,209.5
7	32	4,653	687.7
8	33	8,298	397.7
9	42	9,660	434.8
10	222	42,878	517.7

Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) by prosperity region in 2020. The burden of NAS differs by region, with Region 10 accounting for more than 1/3 of the cases statewide (N=222 cases). More than15% of statewide cases are in Region 6 (N=102). Region 3 had the fewest absolute number of cases (N=17).

The incidence rate is highest in Region 1, at 2,691.8 cases per 100,000 live births. The rate of cases is lowest in region 4, at 292.8 cases per 100,000 live births.

NAS Rate per 100,000 Live Births by Prosperity Region, 2019 + 2020



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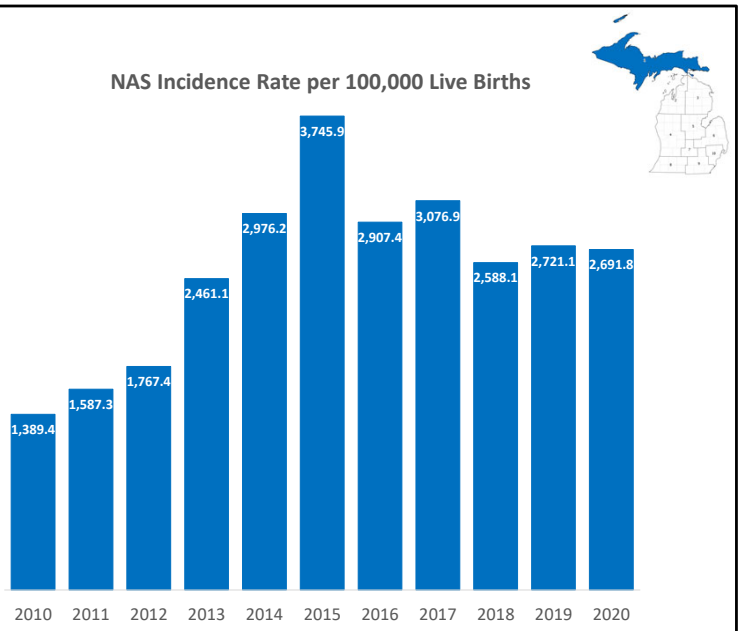
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows compares the 2019 incidence of neonatal abstinence syndrome (NAS) by prosperity region with that in 2020.

Neonatal Abstinence Syndrome, Prosperity Region 1, 2010-2020

Year	# Cases	# Births	Rate
2010	39	2,807	1,389.4
2011	45	2,835	1,587.3
2012	50	2,829	1,767.4
2013	68	2,763	2,461.1
2014	85	2,856	2,976.2
2015	102	2,723	3,745.9
2016	81	2,786	2,907.4
2017	82	2,665	3,076.9
2018	69	2,666	2,588.1
2019	68	2,499	2,721.1
2020	67	2,489	2,691.8



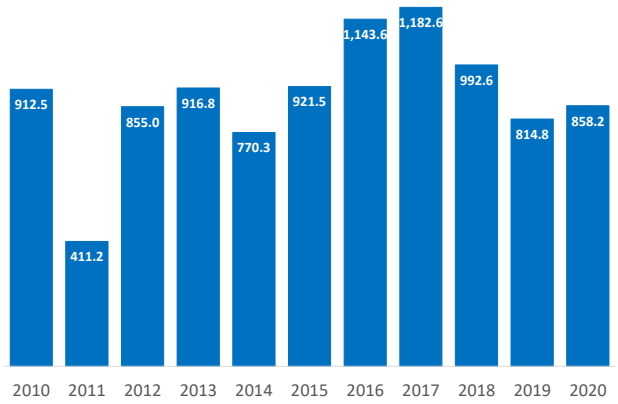
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 1 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The number and rate of NAS cases increased from 2010 to 2015, peaking at 102 cases in 2015. The number and rate of diagnosed NAS cases in Region 1 has since declined. In 2020, 67 infants in Region 1 were diagnosed with NAS. The incidence rate was 2,691.8 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 2, 2010-2020

Year	# Cases	# Births	Rate
2010	27	2,959	912.5
2011	12	2,918	411.2
2012	25	2,924	855.0
2013	27	2,945	916.8
2014	23	2,986	770.3
2015	27	2,930	921.5
2016	34	2,973	1,143.6
2017	34	2,875	1,182.6
2018	28	2,821	992.6
2019	22	2,700	814.8
2020	23	2,680	858.2



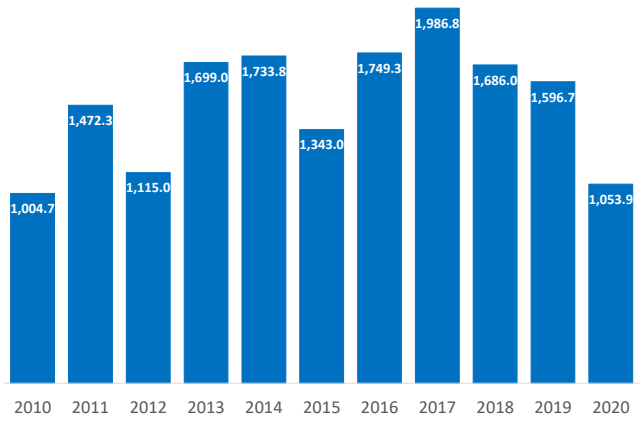
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 2 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The number and rate of NAS cases in Region 2 has fluctuated from 2010 through 2015. Since 2016, the number and rate of diagnosed NAS cases has declined. In 2020, 23 infants were diagnosed with NAS. The incidence rate was 858.2 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 3, 2010-2020

Year	# Cases	# Births	Rate
2010	17	1,692	1,004.7
2011	26	1,766	1,472.3
2012	19	1,704	1,115.0
2013	28	1,648	1,699.0
2014	31	1,788	1,733.8
2015	24	1,787	1,343.0
2016	30	1,715	1,749.3
2017	36	1,812	1,986.8
2018	29	1,720	1,686.0
2019	27	1,691	1,596.7
2020	17	1,613	1,053.9



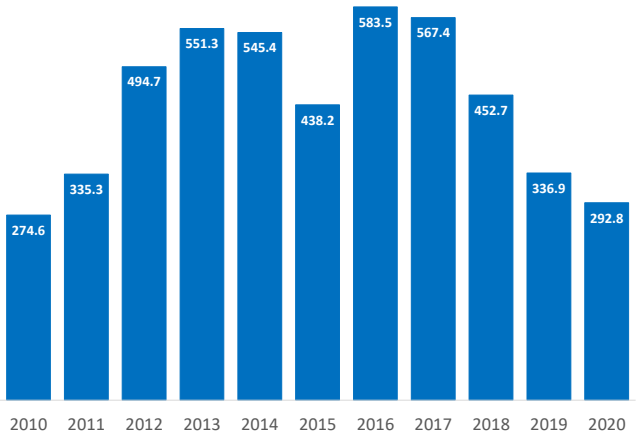
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 3 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The number and rate of NAS cases in Region 3 has fluctuated during 2010-2016. The number of cases peaked in 2017, at 36 cases. Since 2017, the number and rate of diagnosed NAS cases in Region 3 has declined, most notably in 2020. In 2020, 17 infants were diagnosed with NAS. The incidence rate was 1,053.9 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 4, 2010-2020

Year	# Cases	# Births	Rate
2010	54	19,665	274.6
2011	66	19,681	335.3
2012	98	19,811	494.7
2013	108	19,591	551.3
2014	108	19,802	545.4
2015	86	19,625	438.2
2016	115	19,709	583.5
2017	110	19,387	567.4
2018	87	19,218	452.7
2019	62	18,404	336.9
2020	53	18,104	292.8



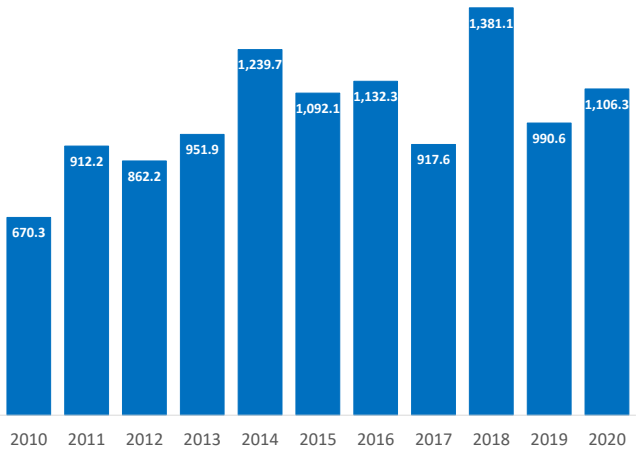
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 4 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The burden of NAS increased in Region 4 from 2010 through 2014. Since 2016, the number and rate of diagnosed NAS cases in Region 4 has declined, with the number of cases halved from 115 to 53. In 2020, The incidence rate was 292.8 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 5, 2010-2020

Year	# Cases	# Births	Rate
2010	41	6,117	670.3
2011	56	6,139	912.2
2012	51	5,915	862.2
2013	56	5,883	951.9
2014	75	6,050	1,239.7
2015	65	5,952	1,092.1
2016	66	5,829	1,132.3
2017	54	5,885	917.6
2018	79	5,720	1,381.1
2019	56	5,653	990.6
2020	59	5,333	1,106.3



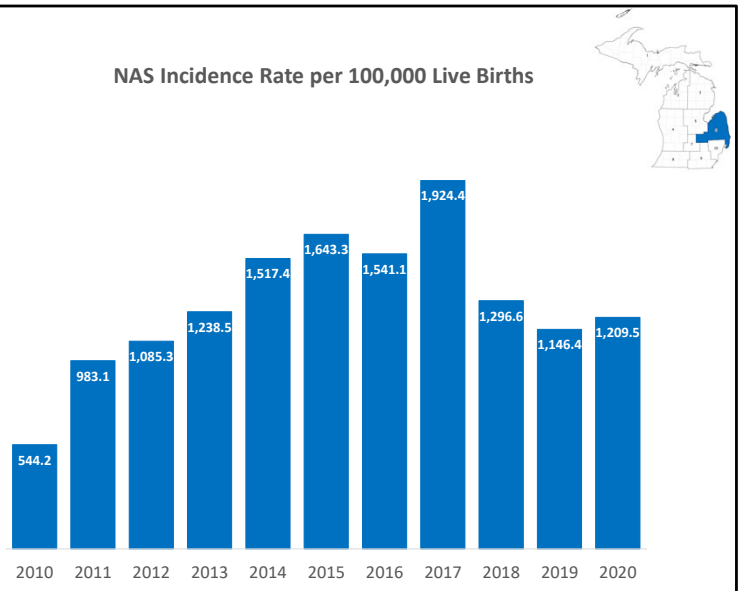
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 5 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The number and rate of NAS cases in Region 5 increased from 2010 through 2014. Since 2015, the number and rate of diagnosed NAS cases in Region 5 has fluctuated. In 2020, 59 infants were diagnosed with NAS. The incidence rate was 1,106.3 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 6, 2010-2020

Year	# Cases	# Births	Rate
2010	53	9,739	544.2
2011	93	9,460	983.1
2012	101	9,306	1,085.3
2013	116	9,366	1,238.5
2014	143	9,424	1,517.4
2015	149	9,067	1,643.3
2016	142	9,214	1,541.1
2017	172	8,938	1,924.4
2018	114	8,792	1,296.6
2019	101	8,810	1,146.4
2020	102	8,433	1,209.5



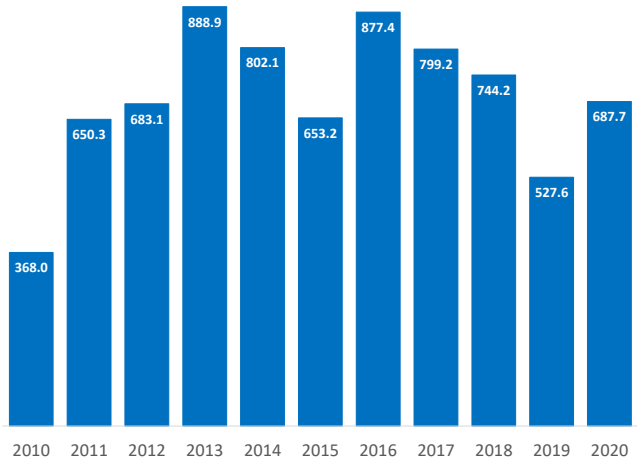
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 6 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The number and rate of cases in Region 6 increased from 2010 through 2017, peaking at 172 cases. Although the rate has declined since 2017, it has been steady during 2018-2020. In 2020, there were 1,209.5 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 7, 2010-2020

Year	# Cases	# Births	Rate
2010	19	5,163	368.0
2011	34	5,228	650.3
2012	36	5,270	683.1
2013	46	5,175	888.9
2014	43	5,361	802.1
2015	34	5,205	653.2
2016	47	5,357	877.4
2017	41	5,130	799.2
2018	37	4,972	744.2
2019	26	4,928	527.6
2020	32	4,653	687.7



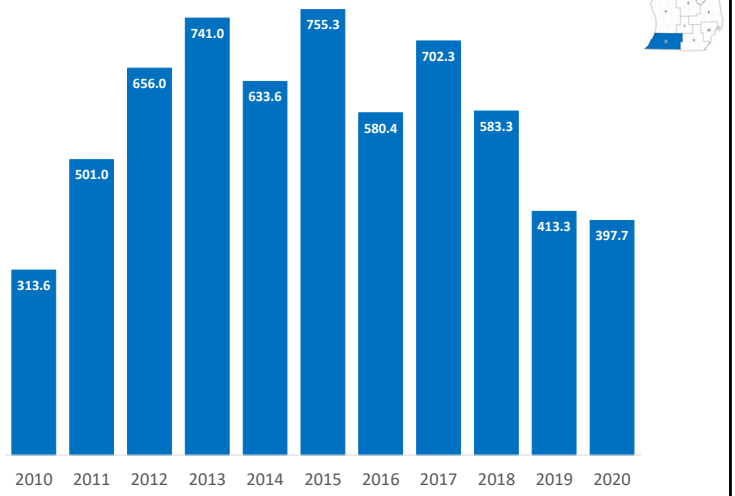
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 7 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The rate of NAS in Region 7 has fluctuated over the past decade. Since 2016, the number and rate of diagnosed NAS cases in Region 7 has decreased slightly. In 2020, 32 infants were diagnosed with NAS. The incidence rate was 687.7 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 8, 2010-2020

Year	# Cases	# Births	Rate
2010	30	9,565	313.6
2011	47	9,381	501.0
2012	60	9,147	656.0
2013	71	9,582	741.0
2014	60	9,470	633.6
2015	70	9,268	755.3
2016	53	9,131	580.4
2017	63	8,970	702.3
2018	52	8,915	583.3
2019	36	8,711	413.3
2020	33	8,298	397.7



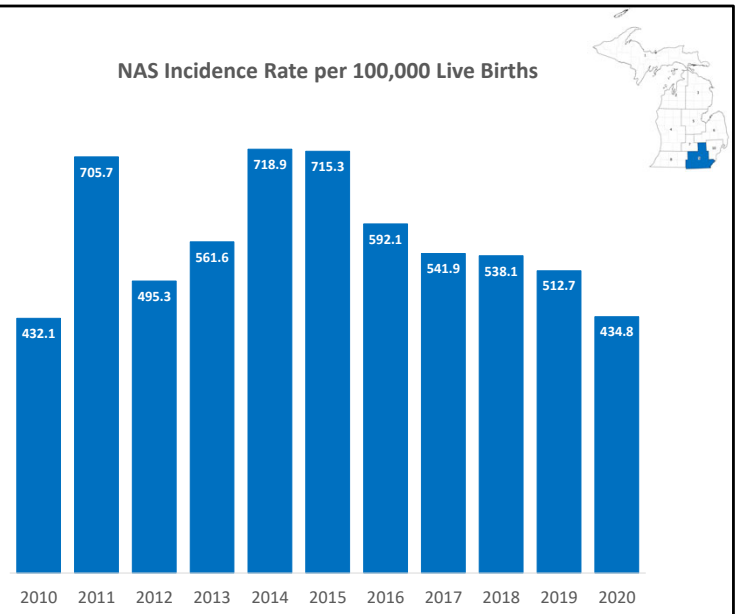
Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 8 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The number and rate of NAS in Region 8 increased from 2010 through 2015. Overall, the number and rate of diagnosed NAS cases in Region 8 has since decreased. In 2020, 33 infants were diagnosed with NAS. The incidence rate was 397.7 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 9, 2010-2020

Year	# Cases	# Births	Rate
2010	46	10,646	432.1
2011	75	10,627	705.7
2012	51	10,297	495.3
2013	58	10,328	561.6
2014	76	10,571	718.9
2015	73	10,206	715.3
2016	62	10,471	592.1
2017	55	10,149	541.9
2018	54	10,035	538.1
2019	51	9,947	512.7
2020	42	9,660	434.8



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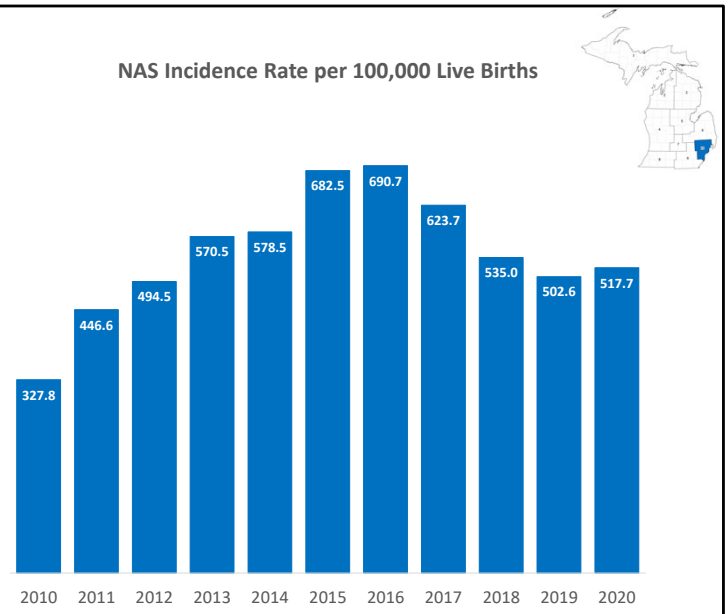
Overall, the burden of NAS in Region 9 increased from 2010 through 2015. The number and rate of diagnosed NAS cases in Region 9 has since steadily declined. In 2020, 42 infants were diagnosed with NAS. The incidence rate was 434.8 cases per 100,000 live births.

Neonatal Abstinence Syndrome, Prosperity Region 10, 2010-2020

Year	# Cases	# Births	Rate
2010	152	46,364	327.8
2011	206	46,124	446.6
2012	225	45,505	494.5
2013	265	46,451	570.5
2014	267	46,152	578.5
2015	317	46,444	682.5
2016	319	46,185	690.7
2017	285	45,693	623.7
2018	242	45,233	535.0
2019	224	44,570	502.6
2020	222	42,878	517.7



Note: 2010-2015: 779.5 (drug withdrawal syndrome in newborn) and 2016-current: P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction)
Data source: Michigan Resident Live Birth Files Linked with Michigan Hospital Discharge Data, Division for Vital Records and Health Statistics, MDHHS

This slide shows the incidence of neonatal abstinence syndrome (NAS) in Region 10 from 2010 through 2020. Infants with NAS were identified by any diagnosis of the International Classification of Diseases (ICD), Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 779.5 (drug withdrawal syndrome in newborn) through September 2015 and Tenth Revision (ICD-10-CM) diagnosis code of P96.1 (neonatal withdrawal symptoms from maternal use of drugs of addiction) starting in October 2015.

The burden of NAS in Region 10 increased from 2010 through 2016, peaking at over 300 cases in a single year. Since 2016, the number and rate of diagnosed NAS cases in Region 10 has declined. In 2020, 222 infants were diagnosed with NAS. The incidence rate was 517.7 cases per 100,000 live births.