

**NEONATAL ABTINENCE SYNDROME (NAS) IN OHIO**  
**2006- 2015 REPORT**

**Ohio Department of Health**

**Office of Health Improvement and Wellness**

**Bureau of Health Services**

**Violence and Injury Prevention Program**

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## Introduction

This report has been prepared by the Ohio Department of Health pursuant to Ohio Revised Code 3711.30.

## What is Neonatal Abstinence Syndrome (NAS)?

Neonatal abstinence syndrome (NAS), also known as neonatal withdrawal syndrome, is a set of symptoms associated with the abrupt withdrawal of opioids and other drugs when infants are born to mothers who were taking these substances. The symptoms can range from mild to severe and include:

- Low birth weight
- Breathing problems
- Seizures
- Feeding difficulties
- Tremors (trembling)
- Irritability (excessive crying)
- Sleep problems
- High-pitched crying
- Yawning, stuffy nose, and sneezing
- Vomiting
- Diarrhea
- Dehydration
- Sweating
- Fever or unstable temperature

## How is NAS diagnosed?

NAS scoring tools that assess the infant's symptoms may be used to help diagnose and determine the severity of the withdrawal. This scoring may also help in planning treatment for the infant's unique symptoms. An accurate report of the mother's drug usage is also important, including the time of the last drug taken.

## Data Summary

Between 2006 and 2015 in Ohio, 11,283 hospitalizations resulted from Neonatal Abstinence Syndrome (NAS) in inpatient settings. In 2015 alone, there were 2,174 admissions, which equates to nearly six admissions per day. The rate of NAS grew nearly 8 times from 20 per 10,000 live births in 2006 to 155 per 10,000 live births in 2015. The most common conditions associated with NAS were respiratory complications, low birth weight, feeding difficulties and seizures.

NAS has taken a heavy toll on Ohio's healthcare system. Treating newborns with NAS was associated with over \$133 million in charges and nearly 14 days in Ohio's hospitals in 2015. Between 2006 and 2015, the average charge associated with NAS hospitalizations increased from \$39,561 to \$61,371 while the average stay (LOS) fluctuated between 14 and 20 days. The average service charges and average LOS for NAS infants are much greater than for all Ohio infants. In 2015, the average inpatient charge was four times higher for NAS infants, and the average LOS was almost four times greater than for all Ohio infants.

Data on exposure to noxious substances through the placenta or breast milk suggests an increasing number of infants are exposed to opioids (i.e., heroin and prescription pain medication) and hallucinogens. About 6,406 infants were exposed to opioid and hallucinogens between 2006 and 2015. The annual number of inpatient hospitalizations related to opioids and hallucinogens increased 816 percent during this period; and opioid and hallucinogens combined have surpassed cocaine as the common drugs of exposure in 2009 and remained the leading drugs of exposure in 2015.

In addition to the rise in NAS, approximately 29,425 hospitalizations resulted from drug abuse or dependence among mothers at time of delivery between 2006 and 2015. Hospitalization rates doubled from 135 per 10,000 in 2006 to 285 per 10,000 discharges in 2015. Opioid continue to be the second most common drug abused among mothers at time of delivery after Marijuana.

**Table 1: Ohio Neonatal Abstinence Syndrome Report**

<b>Table 1A: Hospitalizations* for Neonatal Abstinence Syndrome</b>										
Setting:	Inpatient (all)									
Location:	Ohio Hospitals									
People:	Ohio Residents									
Age:	<1									
Query Codes:	ICD-9: 779.5; ICD10: P96.1 (NAS-Could be in primary or 18 secondary dx fields.)									
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Inpatient discharge*	305	369	477	715	953	1,172	1,482	1,717	1,919	2,174
Medicaid Discharge	222	288	369	583	811	998	1,322	1,502	1,741	1,950
Non-Medicaid Discharge	83	81	108	132	142	174	160	215	178	224
Average LOS (days)	16	19.5	20.1	19.6	18.9	16.37	17.73	15.19	14.9	13.9
Total LOS (days)	4,892	7,200	9,580	14,006	17,965	19,181	21,834	26,085	28,580	30,153
Average charge	\$39,561	\$59,033	\$59,580	\$72,158	\$64,911	\$59,847	\$57,813	\$61,469	\$68,666	\$61,371
Total charge	\$12,066,087	\$20,982,542	\$28,419,546	\$51,592,956	\$61,860,258	\$70,140,821	\$85,678,946	\$105,542,816	\$131,770,486	\$133,138,341

<b>Table 1B: In-state Births to Ohio Residents</b>										
Setting:	Inpatient (all)									
Location:	Ohio Hospitals									
People:	Ohio Residents									
Age:	<1									
Query Codes:	MSDRG 789-795 (Neonates and Newborns)									
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Inpatient discharges	152,740	151,454	148,800	146,226	139,987	137,168	139,517	140,034	140,656	140,658
Medicaid Discharge	60,976	59,830	61,461	65,062	63,710	62,429	67,364	65,415	67,308	67,009
Non-Medicaid Discharge	91,764	91,624	87,339	81,164	76,277	74,739	72,153	74,619	73,348	73,649
Average LOS (days)	3.4	3.5	3.5	3.6	3.6	3.6	3.8	3.7	3.7	3.7
Average charge	\$6,838	\$7,870	\$8,660	\$9,680	\$10,336	\$11,452	\$12,977	\$13,604	\$14,570	\$15,494

**Table 1C: Hospitalizations\* Associated with Exposure to Noxious Substances through the Placenta or Breast Milk**

Setting: Inpatient (all)  
 Location: Ohio Hospitals  
 People: Ohio Residents  
 Age: <1  
 Query Codes: MSDRG 789-795 (Neonates and Newborns)

**For the following groups:**

Cocaine ICD9: 760.75; ICD10: P04.41 (Could be in primary or 18 secondary dx fields.)  
 Opioid & Hallucinogen ICD9: 760.72, 760.73; ICD10: P04.49 (Could be in primary or 18 secondary dx fields.)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cocaine	459	407	332	234	152	201	163	240	196	237
Opioid & Hallucinogen	187	232	274	255	354	444	683	1011	1253	1713

**Table 1D: Drug Abuse and Dependence Diagnoses at Time of Delivery**

Setting: Inpatient (all)  
 Location: Ohio Hospitals  
 People: Ohio Residents  
 Age: All  
 Query Codes: MSDRGs 765-768 and 774,775 (Vaginal Deliveries and C-Sections)  
 \*See Codes Tab for ICD-9 and ICD-10 Codes (Could be in primary or 18 secondary dx fields.)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Marijuana	1,295	1,434	1,422	1,514	1,557	1,556	1,941	2,150	2,447	2,061
Opioid	302	382	455	600	778	1,010	1,303	1,609	1,910	1,949
Cocaine	718	690	544	404	337	359	356	323	343	332
Other (Amphetamine Psychostimulant, Hallucinogens and Sedatives)	81	94	99	93	89	100	109	140	131	137
Total Number Delivering Mothers Diagnosed with Dependence**	2,068	2,250	2,194	2,301	2,467	2,704	3,298	3,777	4,353	4,013

\*May not reflect unique individuals.

\*\*Mother may be diagnosed with more than one abuse/dependence condition.

#ICD-10-CM (International Classification of Diseases, Tenth Revision, Clinical Modification) codes were used to generate result for Q4 of 2015

Data source: Ohio Hospital Association

**Table 2: Health outcomes in inpatient settings, NAS infants\* vs. all infants, Ohio, 2015**

<b>Table 2: Health outcomes in inpatient settings, NAS infants* vs. all infants, Ohio</b>		
Setting:	Inpatient (all)	
Location:	Ohio hospitals	
People:	Ohio Residents	
Age:	<1	
Query Codes:	MSDRG 789-795 (Neonates and Newborns)	
	ICD-9 779.5 (NAS) *Could be in primary or 18 secondary dx fields	
	*See Codes Tab for ICD-9 and ICD-10 Codes (Could be in primary or 18 secondary dx fields.)	
	*Divide each group by the total number of NAS infants to get %	
<b>2015</b>		
<b>Health Outcomes</b>	<b>NAS infants (%)</b>	<b>All Infants (%)</b>
Feeding Difficulties	16.45	5.36
Low Birth Weight	19.63	9.99
Respiratory Symptoms	21.03	9.46
Seizures and Convulsion	0.79	0.19

\*Children may be diagnosed with more than one condition, so percentages do not add to 100.

#ICD-10-CM (International Classification of Diseases, Tenth Revision, Clinical Modification) codes were used to generate result for Q4 of 2015

Data source: Ohio Hospital Association

## Key Findings and Comparisons

### Key Data Findings:

- The hospitalization rate of NAS has increased rapidly in Ohio between 2006 and 2015. In 2015 alone, there were 2,174 admissions to inpatient settings, which equates to nearly six admissions per day.
- Women diagnosed with drug abuse and dependence at time of delivery has increased rapidly.
- Health outcomes for NAS infants (feeding difficulties, low birth weight, respiratory distress, and seizures/convulsions) are all significantly worse than for all Ohio infants.
- Treating NAS has placed a significant burden on Ohio's healthcare system with more than \$133 million in hospital charges and nearly 14 days of hospital stay in 2015 alone.
- The number of pregnant women in treatment has risen. Women are disclosing that their primary drug of choice is changing from cocaine and marijuana to opioids.

## Recommendations to Prevent NAS

- All newborns and at-risk breastfeeding children should be screened for NAS symptoms. Standardized instruments like the Neonatal Abstinence Scoring System<sup>2</sup> should be used to evaluate these groups for NAS. Researchers should develop new instruments for other drug classes if none exist.
- All physicians and nurses who treat women should be educated about the signs of addiction and utilize brief screening tools for at-risk women. Women seeking prenatal care should be screened for substance use and counseled on the impact of such use on their babies. According to the Pregnancy Risk Assessment Monitoring System, 55 percent of mothers reported discussing alcohol, prescription medication, over-the-counter medication, and illegal drug use with the healthcare provider during a prenatal visit.
- Women of childbearing age being treated for substance abuse or dependence should be counseled on the impact of substance use on pregnancy. Women who screen positive for drug abuse and dependence should also be screened for Hepatitis C and HIV because of the high comorbidity.
- Prescribers should carefully consider whether opioid analgesics should be used on a long-term basis during pregnancy.
- Women who deliver drug-addicted babies should be provided with aftercare services, so that mothers can cope with their addiction and learn about the special needs of their infants.
- Alcohol and drug abuse prevention activities should be targeted to women of prime child-bearing age.
- Promising practices in the diagnosis and treatment of NAS should be identified and promoted throughout the state.

## **Methods**

### **Neonatal Abstinence Syndrome**

Hospitalizations for infants with NAS were identified using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and ICD-10-CM (for the last quarter of 2015). Records for infants (age < 1) with a diagnosis code of ICD-9: 779.5 or ICD-10: P96.1 (drug withdrawal syndrome in a newborn) were pulled if they had applicable codes anywhere in discharge fields related to the primary diagnosis or any of the 18 secondary diagnosis fields. The diagnosis of NAS may reflect one or more drugs in the infant's system, but this code does not include a diagnosis of Fetal Alcohol Spectrum Disorder - ICD-9-CM 760.71 (ICD-10-CM P04.3). Unlike NAS codes in the ICD-10, the ICD-9-CM code does not distinguish between NAS caused by drugs ingested by the mother versus NAS caused by drugs legitimately given by delivering physicians.

The study period for hospitalizations resulting from NAS was from 2006 to 2015 on inpatient settings. The number of member hospitals reporting inpatient data was consistent between 2006 and 2015.

The annual hospitalization rates of NAS were calculated by dividing the number of infants hospitalized for NAS in Ohio's hospitals by the number of live births in Ohio. Birth records were pulled for infants being born to women residing in Ohio. All data were obtained from the Ohio Hospital Association (OHA).

The burden of NAS on Ohio's healthcare system was estimated by quantifying charges and length of hospital stay (LOS) associated with NAS treatment. Average charges and LOS associated with NAS were compared to all Ohio infants born in Ohio's hospitals for diagnostic related groups 789-795.

### **Noxious Substances Affecting Infants and Breastfeeding Children**

Neonatal abstinence syndrome cannot be broken down by individual drug; however, other ICD-9-CM codes may prove useful when examining drug-specific trends. ICD-9-CM and ICD-10-CM diagnostic codes that indicate specific noxious influences affecting fetuses or infants via placenta or breast milk include: - ICD-9: 760.75 (ICD-10:P04.41) – cocaine; ICD-9:760.72 – opioids, including heroin and prescription opioids; and ICD-9:760.73 – hallucinogens (ICD-10:P04.49 - Opioid and Hallucinogens). The primary and all 18 secondary diagnostic codes for inpatients were queried independently of ICD-9: 779.5 (ICD-10:P96.1) for infants of any age. As with ICD-9:779.5 (ICD-10: P96.1), these diagnostic codes are thought to be underutilized by physicians and other medical professionals.

### **Drug Abuse and Dependence at Time of Delivery**

OHA data was used to examine drug-related diagnoses among mothers at time of delivery. Diagnostic related groups 765-768 and 774,775 370-375 were used to identify delivering mothers. ICD-9-CM and ICD-10-CM diagnostic codes indicated drug abuse (ICD-9:305.xx or ICD-10:F11-16) or drug dependence-related diagnoses (ICD-9:304.xx or ICD-10: F11-16;19) for the five most commonly abused drugs including amphetamines, marijuana, cocaine, hallucinogens, opioids (i.e., heroin and prescription opioids) and sedative-hypnotics (i.e., benzodiazepines, barbiturates and muscle relaxants).

## Glossary of Terms

**Average length of stay** – the average number of days in an inpatient setting.

**Drug abuse and dependence diagnosis rate** – the number of inpatient women diagnosed with drug abuse or dependence divided by the number of live births to Ohio residents, giving birth in Ohio. The rate is presented in units per 10,000 live births.

**Drug class** – a general category of drugs (e.g., crack cocaine, heroin) that can be used for licit or illicit purposes.

**Inpatient setting** – a person seen in the context of a hospital inpatient setting or skilled nursing facility.

**Medicaid discharge** – a person who terminates medical services and has Medicaid as a payer source.

**NAS hospitalization rate** – the number of inpatient NAS hospitalizations divided by the number of live births to Ohio residents, giving birth in Ohio. The rate is presented in units per 10,000 live births.

**Neonatal abstinence syndrome** – a medical condition brought on by the termination of licit or illicit drugs. The condition is also known as neonatal withdrawal syndrome, and it is coded as drug withdrawal syndrome in newborns (779.5) in the ICD-9-CM and (P96.1) in ICD-10-CM.

**Primary drug of choice** – the most preferred licit or illicit drug reported by the client.

**Service charge** – This definition differs by reporting entity. Service charges for OHA data reflect average or total charges billed on behalf of the hospital. Insurance-negotiated rates may or may not be included in these charges. These charges are an underestimate of total charges because they do not include physician bills that are separate from the hospital billing systems.

## References

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4. Massatti, R., Falb, M., Yors, A., Potts, L., Beeghly, C. & Starr, S. (2013, November). *Neonatal abstinence syndrome and drug use among pregnant women in Ohio, 2004-2011*. Columbus, OH: Ohio Department of Mental Health and Addiction Services.