

# Hospitalizations for Neonatal Abstinence Syndrome in Mississippi, 2010-2011



Research Brief  
November, 2016

## KEY FINDINGS

**Serious comorbid conditions:** 36% of all NAS-related discharges had a coexisting respiratory condition and 23% had a concomitant low birth weight diagnosis.

**High in-hospital charges:** NAS-associated discharges were three times as costly as all other types of neonatal discharges (\$17,603 versus \$5,813).

**Racial and economic disparities:** NAS-related discharges were disproportionately high among Caucasians (81%) and Medicaid covered patients (82%).

**Potentially undetected or undocumented maternal substance use:** Only 26% of all NAS-related discharges were linked to maternal substance use.

**Background:** In addition to increasing morbidity and mortality rates among adults, the prescription opioid epidemic also has led to increased risk to infants from *in utero* opioid exposure. From 2006 to 2012, hospitalizations associated with maternal opioid use in the United States increased over twice from 2.3 to 5.4 per 1,000 maternal stays.<sup>1</sup> Neonatal abstinence syndrome (NAS), historically attributed to prenatal opioid abuse or methadone treatment during pregnancy, is an increasing public health concern because of its harmful health effects on exposed infants.

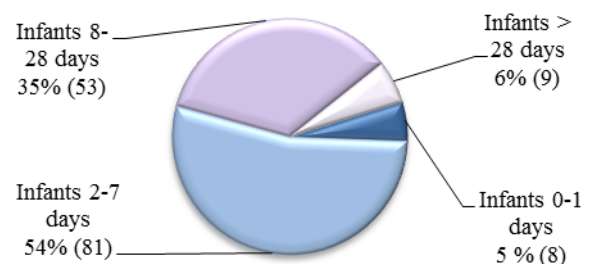
**Objectives:** The goal of this data report was to determine the prevalence, coexisting morbidities, and resource utilization associated with NAS-related hospitalizations in Mississippi. We analyzed Mississippi hospital discharge data for 2010 and 2011.

**Case selection:** The study included infant hospital discharges between 0 and 28 days of age and ICD-9-CM codes 779.5 (drug withdrawal syndrome in newborn) and 760.71 (narcotics affecting fetus or newborn via placenta or breast milk).

**Neonatal abstinence syndrome (NAS)** is a clinical condition in newborns caused by the prolonged exposure of the fetus to narcotics during pregnancy and the sudden discontinuation of these drugs after delivery. According to literature reports, between 55% and 94% of exposed infants develop nonspecific withdrawal symptoms of the nervous and gastrointestinal systems such as restlessness, high-pitched crying, irritability, sleep disturbances, seizures, feeding difficulties, diarrhea, and failure to thrive. Withdrawal symptoms may be evident in the first 24-72 hours of life, but signs of the condition may also be delayed by a week or longer.<sup>2</sup> The nonspecific nature of NAS-related symptoms and short hospitalization stays make this condition difficult to recognize and diagnose.

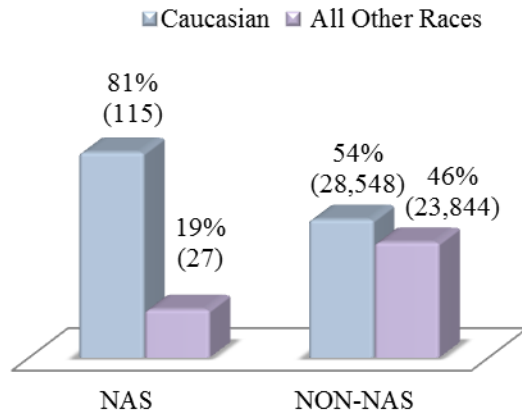
**Number and rate of NAS-related discharges:** From 2010 through 2011, there were 151 NAS-related discharges among infants in Mississippi, and 142 of them occurred during the neonatal period, yielding a rate of 2.7 NAS-related hospitalizations per 1,000 neonatal stays (Figure 1).

Figure 1. Age Distribution

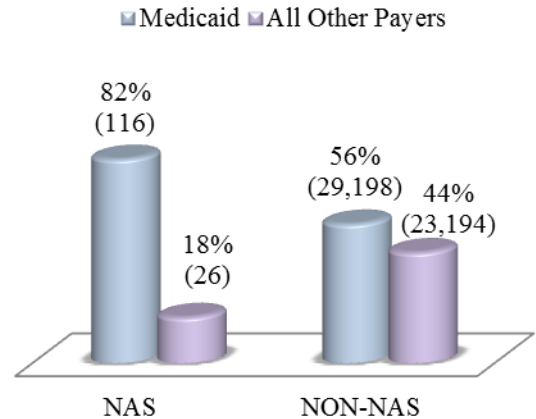


**Demographics:** Among NAS-related discharges, 81% were Caucasian versus 54% of all non-NAS-related discharges ( $p < .001$ ) (Figure 2). Neonatal abstinence syndrome-related discharges were more likely to have health care coverage by Medicaid than non-NAS-related discharges (82% versus 56%,  $p < .001$ ) (Figure 3).

**Figure 2. Race**

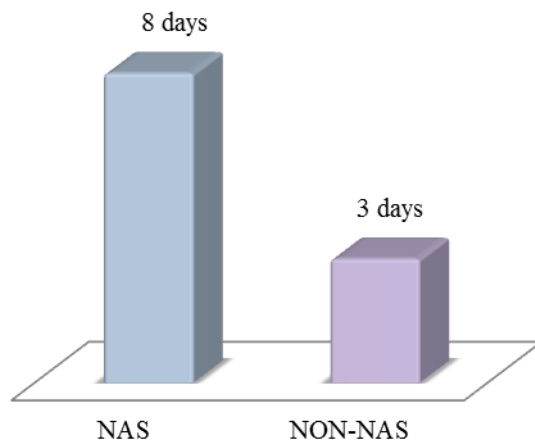


**Figure 3. Primary Expected Payer**

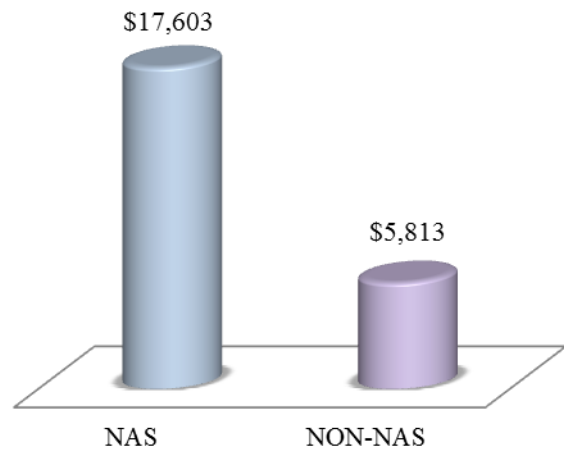


**Resource utilization:** On average, the mean length of stay was over twice as high (8 days versus 3 days,  $p < .001$ ) and the mean hospital charges were over three times higher (\$17,603 versus \$5,813,  $p < .001$ ) for NAS-related discharges compared to all other neonatal discharges (Figure 4 and Figure 5).

**Figure 4. Mean Length of Stay**



**Figure 5. Mean Hospital Charges**

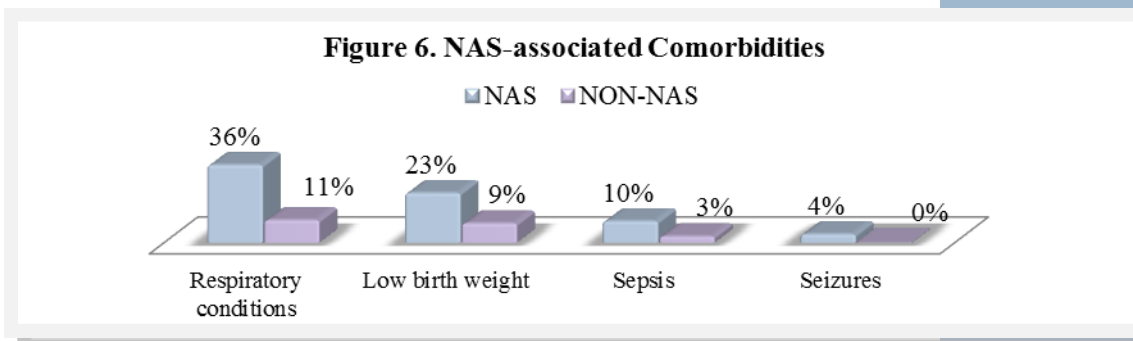


**Comorbidities:** We assessed NAS-related discharges for associated comorbid conditions including congenital anomalies, low birth weight, respiratory distress syndrome and other respiratory conditions, sepsis, seizures, and feeding difficulties (Table 1). Four of these conditions were significantly associated with NAS-related discharges at  $p < .001$  (Figure 6).

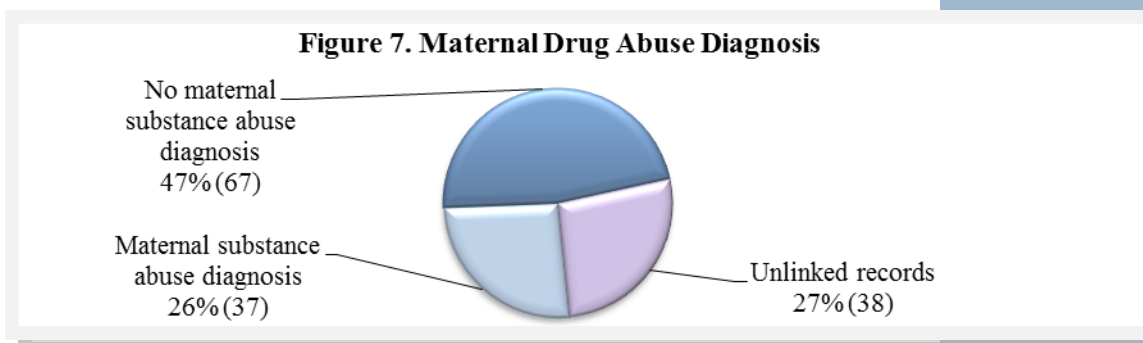
Infants with a NAS-related diagnosis were more likely to have a diagnosis indicating respiratory disorders (36% versus 11%), low birth weight (23% versus 9%), sepsis (10% versus 3%), and seizures (4% versus 0%) compared to infants without a NAS diagnosis. Congenital anomalies and feeding difficulties were not significantly associated with NAS-related neonatal discharges.

Comorbidity	All Discharges with this Condition (0-28 days)	NAS		Non-NAS		p-value
		Number	% of total NAS (N= 142)	Number	% of total Non-NAS (N= 52,534)	
Congenital anomalies	3,083	10	7%	3,073	6%	.551
Respiratory conditions	5,567	51	36%	5,516	11%	<.001*
Low birth weight	4,697	32	23%	4,665	9%	<.001*
Sepsis	1,332	14	10%	1,318	3%	<.001*
Feeding difficulties	940	6	4%	934	2%	.028
Seizures	113	5	4%	108	0%	<.001*

\*The differences were significant at  $p < .001$ .



**Linked maternal and infant data:** Out of the 142 NAS-related neonatal records, 104 were linked to maternal hospitalization records. Among the linked records, 37 maternal discharges had a recorded substance abuse diagnosis, signifying that only 26% of all NAS-related discharges were linked to cases of documented maternal drug abuse (Figure 7). Almost half (18 or 49%) of the 37 maternal discharges associated with substance abuse were due to opioid misuse and 6 (16%) maternal records had more than one substance abuse-related diagnosis.



## PUBLIC HEALTH GOALS

The goal of this study is to increase awareness among the medical community and public health structures of neonatal abstinence syndrome, a condition associated with severe health outcomes and high societal costs.

Specifically, we would like to engage the maternity hospitals in our state to collaborate on the development and implementation of standardized protocols for the identification, management, and follow-up of infants exposed to narcotics during pregnancy.

Additionally, we hope to reach out to prenatal care providers to underline the necessity of screening for substance abuse disorders during the prenatal period as well as the need for the timely treatment and follow-up of such disorders.

Finally, we hope to build support groups for newborns affected by this condition and their mothers. Drug abuse is a disease. Mothers and babies affected by substance abuse need family, community, and social support.

**Statistical methodology:** We compared means for continuous variables using t-tests and assessed the association between categorical variables using chi-square tests or Fisher's exact tests for low frequency discharges. Maternal and infant hospital discharges were linked on two key data elements, patients' addresses and last names. The International Classification of Diseases, 9th Revision, Clinical Modifications (ICD-9-CM) diagnostic codes used in the study are presented in Table 2. The categories for congenital anomalies, respiratory conditions, low birth weight, sepsis, feeding difficulties, and seizure may overlap and these conditions are not mutually exclusive.

Table 2. ICD-9-CM Codes	
ICD-9-CM Group Description	ICD-9-CM Codes
<b>Comorbid Diagnostic Codes for Neonatal Discharges</b>	
Congenital anomalies	740.xx –759.xx, V13.6
Newborn respiratory distress syndrome and other respiratory conditions	769, 770.xx
Low birth weight (less than 2,500 grams)	764.01-08; 764.11-18; 764.21-28; 764.91-98; 765.01-08; 765.11-18; V21.31-35
Sepsis	038.xx, 771.81, 7907
Feeding difficulties	779.3
Seizures	779.0 780.3
<b>Maternal Substance Abuse Codes</b>	
Drug dependence	304.xx
Non-dependent drug abuse	305.xx, except for 305.0 (non-dependent alcohol abuse)
Overdose (poisoning and accidental poisoning)	965.0, 969.x, 967, E 850.0-2, E851-3, E854.0-2, E854.8
Drug adverse effects	E935.0-2, E937, E939.0-9

**The Mississippi Opioid Epidemic Project** is a collaborative effort between the Public Health Pharmacy, Office of Epidemiology and Office of Preventive Health at the Mississippi State Department of Health. The project's mission is to use evidence-based research methods to evaluate the scope of the opioid epidemic in Mississippi and build statewide surveillance systems utilizing different data sources.

For additional information on opioid drug abuse statistics as well as state and national initiatives targeting this epidemic, please visit the Mississippi State Department of Health's website at: <http://msdh.ms.gov>.

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#### References

1. Fingar K, Stocks C (AHRQ), Weiss AJ, Owens PL. Neonatal and Maternal Hospital Stays Related to Substance Use, 2006-2012. HCUP Statistical Brief #193. July 2015. Agency for Healthcare Research and Quality, Rockville, MD. Accessed at: <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb193-Neonatal-Maternal-Hospitalizations-Substance-Use.pdf>.
2. Hudak ML, Tan RC. Neonatal Drug Withdrawal. Pediatrics. 2012;129 (2). Accessed at <http://pediatrics.aappublications.org/content/129/2/e540>. <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb193-Neonatal-Maternal-Hospitalizations-Substance-Use.pdf>.