



Neonatal Abstinence Syndrome Data Summary:
Maternal Characteristics Among Live Births: 2014

Surveillance of Neonatal Abstinence Syndrome (NAS) in Florida Updated 10/19/17

Background

Neonatal abstinence syndrome (NAS) is a condition experienced by neonates exposed to opioid prescription or illicit drugs during the prenatal period. The infant may undergo withdrawal from these substances that manifests as excessive high-pitched crying, irritability, sleep-wake disturbances, alterations in infant tone and movement, feeding difficulties, or gastrointestinal disturbances, usually 1-3 days post-delivery.

Recognizing the public health importance of the increasing trend in the prevalence of opioid prescription drug abuse and increasing incidence of NAS, the Florida Department of Health (DOH) added NAS to the List of Reportable Diseases/Conditions on June 4, 2014.

What are current statistics of NAS in Florida?

Based on data collected by the FBDR, the rate of NAS in Florida increased dramatically from 1998 to 2010, followed by a slower rate of increase from 2011 to 2013 (66.7 and 69.2 per 10,000 live births, respectively). However, in 2014, the rate of NAS increased to 76.6 per 10,000 live births, an 11% increase from 2013. In 2014, NAS rates (per 10,000 live births) were substantially higher among non-Hispanic (NH) white infants (156.2) compared to NH black (26.6) and Hispanic (20.2) infants.

How are cases of NAS currently identified in Florida?

Data sources: To identify NAS cases, DOH currently uses a passive case ascertainment methodology that relies on linked administrative datasets and a series of NAS-related diagnostic codes. First, birth certificate records from the DOH Bureau of Vital Statistics are linked to the infant's birth hospitalization information supplied by hospitals to the Agency for Health Care Administration (AHCA), the latter of which includes International Classification of Diseases, 9th Edition, Clinical Modification (ICD-9-CM) diagnosis codes documented during the hospital encounter.

Case definition: Currently, there is no single ICD-9-CM code that captures NAS with sufficient sensitivity and specificity. Therefore, for NAS reporting, the following ICD-9-CM codes are being used as a proxy for NAS-related diagnoses:

779.5	drug withdrawal syndrome in a newborn
760.72	narcotics affecting fetus or newborn via placenta or breast milk.

Once an infant's birth certificate record has been linked to his/her birth hospitalization, the discharge portion of the linked electronic record is scanned for the presence of any of the above-mentioned diagnosis codes.

With the change from ICD-9-CM to ICD-10-CM beginning in October 2015, the FBDR is evaluating which codes to include in the diagnosis of NAS cases going forward from October

2015 on. The primary issue is that the ICD-10-CM codes that replace the ICD-9-CM codes are not exact matches and could affect the rates reported going forward, so further discussion among the FBDR staff and possible consultation with a clinician are planned in the near future.

What has been learned about the accuracy of the passive surveillance methodology and the data currently being analyzed to describe the prevalence of NAS in Florida?

In 2015, FBDR conducted a statewide evaluation of the accuracy of ICD-9-CM codes that were used to identify potential cases of NAS. These codes were being used for NAS reporting based on passive surveillance, and for part of the case-finding strategy for enhanced surveillance. Preliminary findings suggested that ICD-9-CM codes 779.5 and 760.72 had suboptimal accuracy in identifying infants with NAS. Using a clinical definition established by a previous Epi-Aid investigation led by the Centers for Disease Control and Prevention (CDC), a substantial number of false positive cases of NAS were identified. Detailed results are forthcoming alongside recommendations for improvement in surveillance strategies.

What are limitations of the data?

Currently, there is substantial variation in the diagnosis and reporting of NAS across institutions, providers, and surveillance systems. These inconsistencies result in questionable accuracy and reliability of NAS data. However, it also represents an opportunity for the DOH/FBDR to encourage establishment of a standardized set of recommendations and guidelines for clinical diagnosis, data collection, surveillance, and reporting efforts.

A limitation of using a passive surveillance methodology (without medical record confirmation) to identify NAS cases is the likelihood for misclassification biases. These biases can result in false negatives – the failure to capture an infant born with NAS – or a false positive – identifying as a NAS case an infant who does not meet the clinical definition of NAS. A second limitation is the timeliness of the data - the extent to which surveillance data are rapid, prompt, and responsive.

Are there plans to transition NAS surveillance from being a passive to a more enhanced surveillance system?

The FBDR is currently conducting enhanced surveillance of NAS, which in addition to multi-source passive case finding efforts, incorporates trained abstractor review of maternal and infant hospital medical records in order to capture all relevant clinical information to classify potential NAS cases, determine specific agents to which mother/infant were exposed, and to obtain a more complete understanding of this public health issue.

Despite limitations, the use of an existing surveillance systems allows community leaders to respond to local concerns and provides insight into the epidemic of prescription drug abuse and its effects on babies.

Neonatal Abstinence Syndrome (NAS) by County, Florida, 2010-2014

County Name	2010	2011	2012	2013	2014	Total by County
ALACHUA	18	19	23	27	19	106
BAKER	6	10	<5	6	8	30
BAY	<5	16	11	12	18	57
BRADFORD	8	11	8	10	7	44
BREVARD	67	74	77	80	76	374
BROWARD	59	49	57	54	56	275
CALHOUN	<5	<5	<5	<5	<5	<5
CHARLOTTE	19	15	16	11	9	70
CITRUS	14	16	12	14	8	64
CLAY	19	25	41	38	26	149
COLLIER	32	27	24	22	27	132
COLUMBIA	17	11	9	9	16	62
DESOTO	<5	<5	<5	<5	<5	<5
DIXIE	7	6	6	<5	7	26
DUVAL	115	124	181	145	166	731
ESCAMBIA	35	39	36	42	50	202
FLAGLER	9	11	9	9	17	55
FRANKLIN	<5	<5	<5	<5	<5	<5
GADSDEN	<5	<5	<5	<5	<5	<5
GILCHRIST	<5	<5	<5	<5	<5	<5
GLADES	<5	<5	<5	<5	<5	<5
GULF	<5	<5	<5	<5	<5	<5
HAMILTON	<5	<5	<5	<5	<5	<5
HARDEE	<5	<5	<5	<5	<5	<5
HENDRY	<5	<5	<5	<5	<5	<5
HERNANDO	33	47	44	33	34	191
HIGHLANDS	<5	<5	5	<5	<5	5
HILLSBOROUGH	65	108	102	114	126	515
HOLMES	<5	<5	<5	<5	<5	<5
INDIAN RIVER	6	6	6	11	8	37
JACKSON	<5	<5	<5	<5	<5	<5
JEFFERSON	<5	<5	<5	<5	<5	<5
LAFAYETTE	<5	<5	<5	<5	<5	<5
LAKE	11	17	18	17	35	98
LEE	64	72	54	47	88	325
LEON	5	7	6	5	16	39
LEVY	<5	6	5	<5	<5	11
LIBERTY	<5	<5	<5	<5	<5	<5

County Name	2010	2011	2012	2013	2014	Total by County
MADISON	<5	<5	<5	<5	<5	<5
MANATEE	27	57	47	66	65	262
MARION	22	24	29	51	46	172
MARTIN	<5	<5	5	14	11	30
MIAMI-DADE	18	20	28	27	21	114
MONROE	<5	<5	<5	<5	<5	<5
NASSAU	7	10	16	18	15	66
OKALOOSA	15	15	20	12	30	92
OKEECHOBEE	<5	<5	<5	<5	<5	0
ORANGE	67	65	74	80	91	377
OSCEOLA	<5	7	12	11	13	43
PALM BEACH	24	23	26	47	59	179
PASCO	92	84	97	75	85	433
PINELLAS	73	106	101	69	104	453
POLK	19	30	34	29	28	140
PUTNAM	15	14	14	11	22	76
ST JOHNS	10	11	15	21	15	72
ST LUCIE	6	9	14	13	31	73
SANTA ROSA	12	16	12	18	17	75
SARASOTA	63	69	49	57	57	295
SEMINOLE	16	23	21	20	15	95
SUMTER	<5	8	<5	<5	<5	8
SUWANNEE	6	6	<5	11	6	29
TAYLOR	<5	<5	<5	<5	<5	<5
UNION	<5	<5	<5	<5	6	6
VOLUSIA	57	53	72	76	86	344
WAKULLA	<5	<5	<5	<5	<5	0
WALTON	10	11	6	5	7	39
WASHINGTON	<5	<5	<5	<5	<5	0
UNKNOWN	<5	<5	<5	<5	<5	<5
Total by Year	1168	1377	1442	1437	1647	7071

Results have been suppressed when the estimated case count is between 0 and 4.



Neonatal Abstinence Syndrome Data Summary:
Maternal Characteristics Among Live Births From 2011 Through 2013

March 2015

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Background

Neonatal abstinence syndrome (NAS) is a condition experienced by neonates exposed to opioid prescription or illicit drugs during the prenatal period.^{1,2} The infant may undergo withdrawal from these substances that manifests as excessive high-pitched crying, irritability, sleep-wake disturbances, alterations in infant tone and movement, feeding difficulties, or gastrointestinal disturbances, usually 1-3 days post-delivery.^{1,2} As the prescription drug abuse epidemic grows, the rate of infants born with NAS is increasing. From 2000–2009, there was a threefold increase in the rate of NAS diagnoses in the United States.³ NAS also has been identified as a growing problem in Florida. From 2008 through 2011, using the Florida Birth Defects Registry's (FBDR) passive case ascertainment methodology, a statistically significant increase in the prevalence rate (PR) of NAS was observed across the state. In 2008, the PR was 25.8 per 10,000 live births. However, by 2011 the PR was 66.7 per 10,000 live births, corresponding to a 2.5-fold increase in NAS prevalence (p-value <0.0001).⁴

In 2013, the Florida Legislature convened the Statewide Task Force on Prescription Drug Abuse and Newborns to better understand the magnitude of the NAS epidemic, evaluate strategies, and develop policies to curtail the problem. One recommendation of the task force was to add NAS to the List of Reportable Diseases/Conditions in Florida.⁵ The Department of Health (DOH) formed an ad hoc advisory committee consisting of epidemiologists, clinicians, maternal and child health program managers, and community partners to research existing data sources and discuss strengths and limitations of proposed surveillance strategies for NAS. The case ascertainment methodology employed by the FBDR passive surveillance system was suggested for surveillance of NAS. The purpose of this analysis is to investigate and document the PR of NAS from 2011 through 2013 by selected maternal demographics.

Methods

Data Sources

Administrative datasets from DOH and the Agency for Health Care Administration (AHCA) were used to conduct these analyses. AHCA's birth hospitalization records and DOH's birth certificate records were unduplicated and linked using a series of deterministic linkage algorithms. This method for linking records has been previously evaluated for identification of infants with birth defects.⁶ All analyses were conducted on this linked dataset of birth hospitalizations with birth certificate records.

NAS Identification

Using the FBDR linking methodology approach described above, diagnosis code fields were searched among the linked dataset for a diagnosis code indicative of NAS during the time period 2011 through 2013. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes indicative of NAS were identified as: 779.5—drug withdrawal syndrome in a newborn and 760.72—narcotics affecting fetus or newborn via placenta or breast milk.⁷ These records were pulled for analysis.

Variables and analysis

Demographic characteristics were obtained from infant birth certificates. Maternal race and ethnicity was coded as white non-Hispanic, black non-Hispanic, Hispanic, and other/unknown. Maternal age groups were categorized as less than 20 years of age, 20-24 years, 25-29 years, 30-34 years, and greater than or equal to 35 years. Maternal education was categorized as less than high school, high school graduate or equivalent, and greater than high school education. Mother's county of residence was used to map PRs of NAS by county across the state. Birth certificate data served as the denominator for calculation of PRs.

SAS 9.3 was used to calculate frequencies by selected variables and ArcGIS was used to model NAS prevalence rates by mother's county of residence.

Results

From 2011 through 2013, there were 636,128 live births in Florida. Of these infants, 4,365 were identified with a diagnosis of NAS and linked to a Florida birth certificate record. The overall PR for NAS was 68.6 per 10,000 live births. PRs for NAS slightly increased from 66.7 per 10,000 live births in 2011 to 69.2 per 10,000 live births in 2013; this increase was not statistically significant (p-value = 0.32) (Figure 1).

The highest PR during the 3-year period occurred among infants born to white non-Hispanic women (PR = 131.5 per 10,000 live births). The PR was 18.6 and 16.8 per 10,000 live births among black non-Hispanic and Hispanic women, respectively. Both PRs were significantly lower compared to the PR for white non-Hispanic women (p-value = 0.0001) (Figure 2). The PR among infants born to mothers aged 25-29 years (88.1 per 10,000 live births) was significantly higher compared to other maternal age categories (p-value \leq 0.01) (Figure 3). Finally, infants born to women with less than a high school education had the highest PR of NAS at 114.7 per 10,000 live births compared to infants born to women with high school, high school equivalent, or advanced levels of education (p-value = 0.0001) (Figure 4).

The GIS representation of three-year NAS PR by maternal county of residence revealed that the region north of the Interstate-4 corridor and along Interstate-75 had PRs of NAS that were higher than the state PR (Figure 5). Another region with PRs higher than the state PR was the western panhandle. In comparison, the eastern panhandle and southeast Florida had PRs that were lower than the state PR. The highest number of cases for the three-year time period was observed in Duval County; 450 NAS cases with a PR of 121.7 per 10,000 live births (Table 1).

Summary

Previously released data reported a dramatic increasing trend in NAS prevalence in Florida, a 2.5 fold increase from 25.8 per 10,000 live births in 2008 to 66.7 per 10,000 live births in 2011.⁴ The current report, analyzing data from 2011 through 2013, revealed that the previous increasing trend has leveled to PRs between 66.7 to 69.6 per 10,000 live births (Figure 1). Infants born to white non-Hispanic women have the highest reported PR of NAS (PR = 131.5 per 10,000 live births). Live births among women with less than high school education also have a high NAS PR (114.7 per 10,000 live births).

NAS PRs by county revealed three areas of very high concern: north central to northeastern Florida, the western panhandle, and southwest Florida. However, PRs in central and south Florida, as well as the eastern panhandle, are low, with several counties reporting <5 cases over the three-year time period. More investigation is needed to determine 1) why these areas have such elevated rates of NAS and 2) what interventions can be implemented to reduce the prevalence of NAS.

In June 2011, Governor Rick Scott signed the “anti-pill mill” bill (HB 7095), which toughens criminal and administrative penalties for doctors and clinics distributing opioids through a combination of dispensing bans and aggressive regulatory actions to close pill mills.⁸ The efforts of law enforcement and health care professional regulation reduced the number of Florida doctors dispensing high quantities of oxycodone.⁸ While these actions did not result in dramatic reductions in NAS PRs, a stabilization of rates was observed.

The primary analysis is subject to limitations. First, the deterministic linkage methodology used to match AHCA records to birth certificate records relies on the accuracy and availability of certain data fields (e.g., social security number, date of birth); additional analysis has revealed that linkage among women where these fields are missing or incorrect, specifically Hispanic women, is more difficult and can lead to under-ascertainment of cases among these women.⁵ The impact of this limitation on reported PR for NAS is estimated to be minimal, as NAS occurs more often among white non-Hispanic women.

Despite limitations, the use of an existing passive surveillance system allows community leaders to respond to local concerns and provides insight into the epidemic of prescription drug abuse and its effects on babies, specifically identifying high maternal risk populations. Next steps include quality control analyses to explore sensitivity, specificity, and bias potentially related to the use of a passive surveillance system for the identification of infants born with NAS in Florida.

Figure 1. Prevalence Rates of Neonatal Abstinence Syndrome Per 10,000 Live Births, 2008-2013

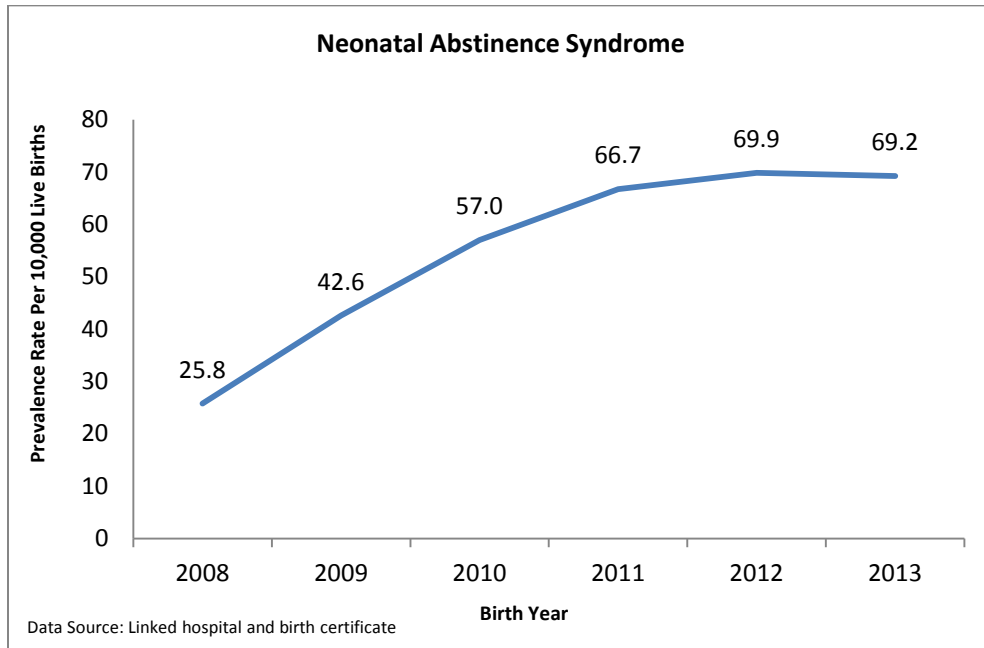


Figure 2. Prevalence Rates of Neonatal Abstinence Syndrome Per 10,000 Live Births by Maternal Race and Ethnicity, 2011-2013

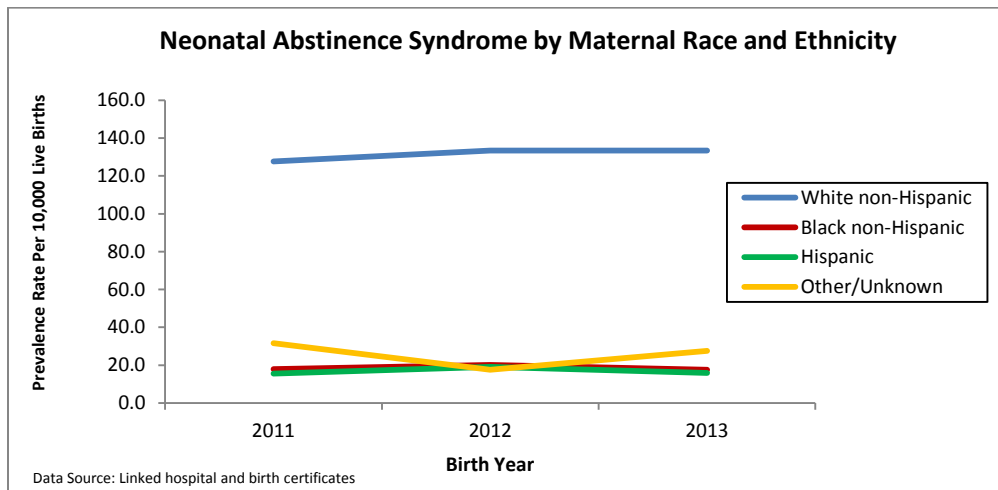


Figure 3. Prevalence Rates of Neonatal Abstinence Syndrome Per 10,000 Live Births by Maternal Age Group, 2011-2013

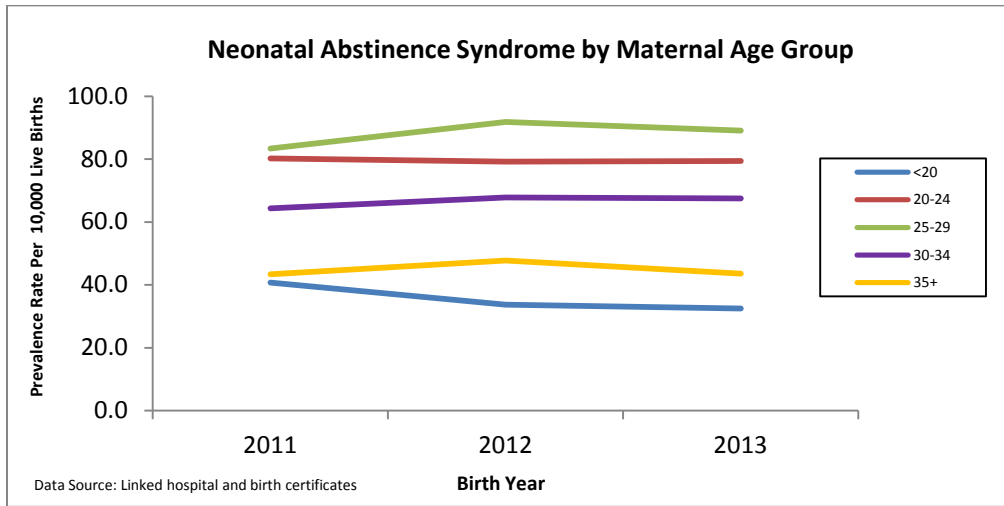


Figure 4. Prevalence Rates of Neonatal Abstinence Syndrome Per 10,000 Live Births by Maternal Education Level, 2011-2013

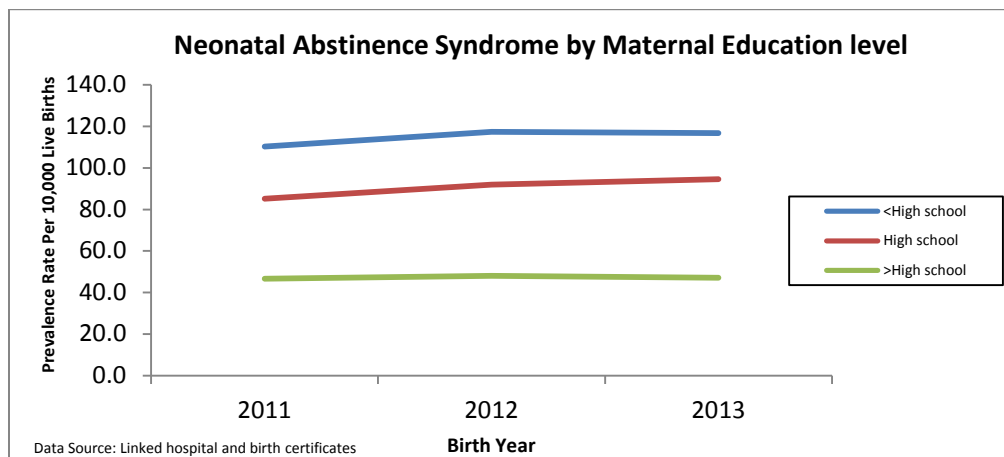
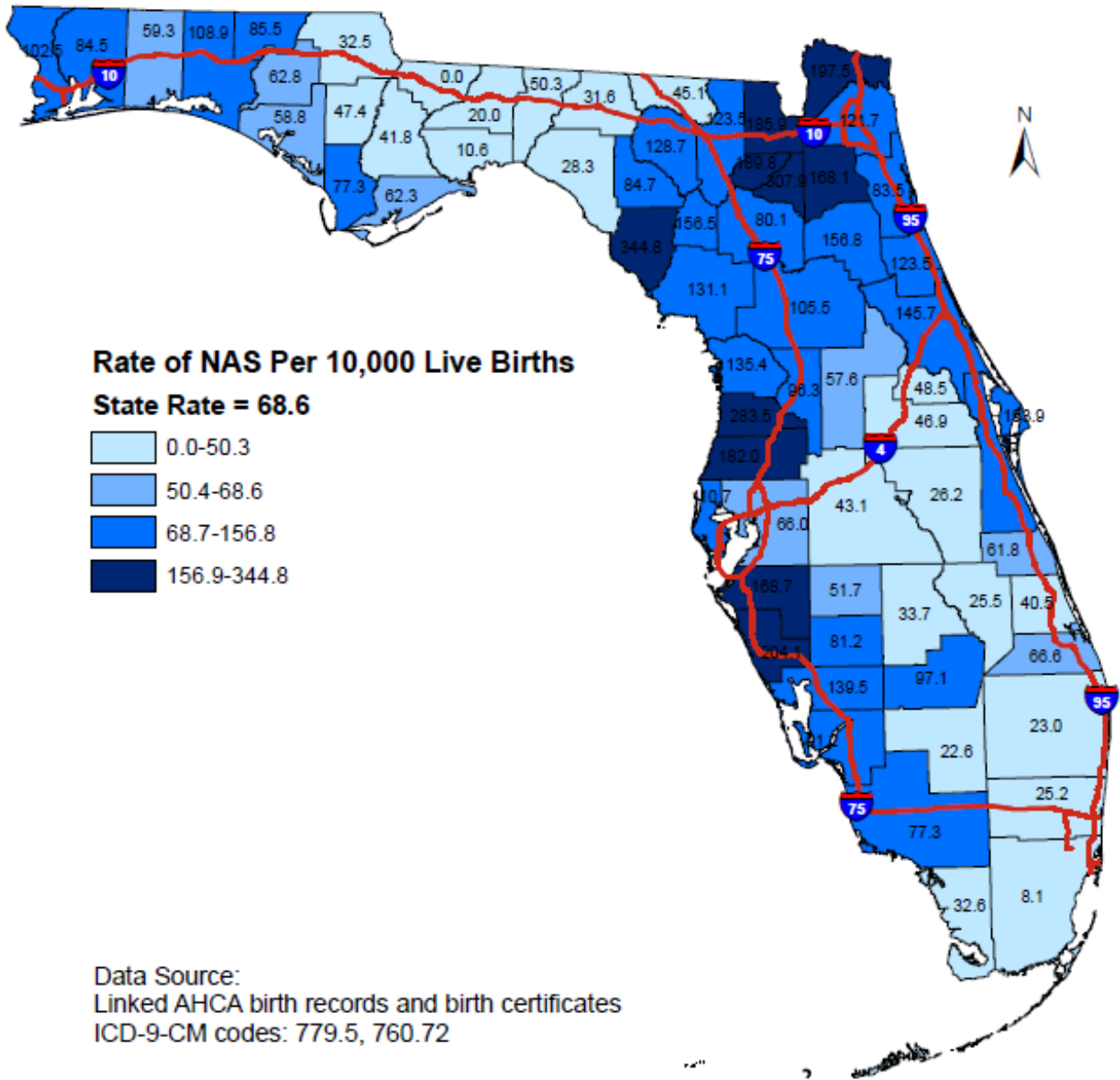


Table 1. Neonatal Abstinence Syndrome Frequencies by County, 2011-2013

County	Frequency	County	Frequency
Alachua	69	Lee	173
Baker	19	Leon	18
Bay	39	Levy	15
Bradford	29	Liberty	<5
Brevard	231	Madison	<5
Broward	160	Manatee	170
Calhoun	<5	Marion	104
Charlotte	42	Martin	23
Citrus	42	Miami-Dade	75
Clay	104	Monroe	7
Collier	73	Nassau	44
Columbia	29	Okaloosa	47
DeSoto	9	Okeechobee	<5
Dixie	16	Orange	219
Duval	450	Osceola	30
Escambia	117	Palm Beach	96
Flagler	29	Pasco	256
Franklin	<5	Pinellas	276
Gadsden	<5	Polk	93
Gilchrist	9	Putnam	39
Glades	<5	St. Johns	47
Gulf	<5	St. Lucie	36
Hamilton	<5	Santa Rosa	46
Hardee	6	Sarasota	175
Hendry	<5	Seminole	64
Hernando	124	Sumter	13
Highlands	9	Suwannee	18
Hillsborough	324	Taylor	<5
Holmes	<5	Union	10
Indian River	23	Volusia	201
Jackson	<5	Wakulla	<5
Jefferson	<5	Walton	22
Lafayette	<5	Washington	<5
Lake	52		

Figure 5. Prevalence Rates of Neonatal Abstinence Syndrome by Maternal County of Residence Per 10,000 Live Births, 2011-2013



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