



ARIZONA DEPARTMENT  
OF HEALTH SERVICES

**Neonatal Abstinence Syndrome  
Surveillance Report, 2017-2021**

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### **Intended Audience**

This is a technical report on the analysis of the of neonatal abstinence syndrome in Arizona. This report is aimed primarily at those actively involved in the prevention, intervention, and interdiction of maternal substance use outcomes, including healthcare providers, community service providers, researchers, policymakers, law enforcement, and other stakeholders. While publicly available, the intended audience of this report is not the general public, and extra care in the use or interpretation of this report should be taken by those with limited background or subject-matter expertise in the areas of maternal substance use outcomes.

### **How to Use This Report**

This report describes the prevalence of neonatal abstinence syndrome in Arizona, as well as a variety of risk- and associated-factors contributing to these events among persons in Arizona. The key findings

presented in this report should assist in the identification of future targets for intervention and guide effective and evidence-based efforts towards the reduction of maternal substance use outcomes.

### **Disclaimer**

#### *NAS Case Definition*

The case definition of NAS in this report may differ than use by other organizations, and is largely dependent on the data source from which it is derived.

#### *Data Suppression*

Non-zero counts and rates based on non-zero counts less than 6 have been suppressed.

#### *Race and Ethnicity*

Race and ethnicity are collected from the patient or patient's representative at the time of service (up to 3 choices are allowed). Racial/ethnic designations used in this report are White non-Hispanic, Hispanic or Latino, Black or African American, American Indian or Alaska Native (including Aleut and Eskimo), and Asian or Pacific Islander (including Hawaiian). Non-White Hispanics are included in their appropriate race groups. The American Indian figures include those living both on and off the reservation.

This method of combining, or bridging, race/ethnicity for individuals identified as both Hispanic and one other race was used. This method allows us to match the categories of race/ethnicity used by the Arizona Department of Administration to create the population projections used as denominators in this report, as well as to create more meaningful racial/ethnic categories by placing individuals identified with both race and ethnicity into the group representing a smaller proportion of Arizona's population. Individuals identified as Hispanic plus another race are included in the racial/ethnic category with the lowest population in the state. This approach to bridging is defined as the smallest group deterministic whole method. In this method, individuals identified as both White and Hispanic are classified as Hispanic, where individuals identified as Hispanic and any other race (Black or African American, American Indian or Alaska Native, and Asian or Pacific Islander) are categorized by their racial identification.

### **Previous ADHS Reports on NAS**

In 2015, ADHS published a [fact sheet](#) on Neonatal Abstinence Syndrome and Newborn Drug Exposures Arizona Births (2008-2014). In 2014, ADHS published a [research brief](#) on Neonatal Abstinence Syndrome: 2008-2013 Overview. This report differs in that it details NAS trends from the last five years (2017-2021). To view recent opioid overdose trends, please visit [azdhs.gov/opioid](http://azdhs.gov/opioid) to view the dashboards and [Opioid Overdoses Surveillance Report](#) (2020-2021).

### **Commitment to Equity in Data Statement**

Arizona Department of Health Services aspires to present data humbly, recognizing numbers never tell the whole story. We strive to work with individuals and communities to learn and share their stories to improve collective understanding. Knowing that people across life circumstances have inequitable opportunities to achieve optimal health, we commit to pair numbers and stories to inform policy and systems change to improve health for all.

## Executive Summary

Since June 15, 2017, the Arizona Department of Health Services (ADHS) has been monitoring opioid related events as part of under an Emergency Declaration issued by the Arizona Governor on June 5, 2017 to reduce opioid deaths in Arizona. The Arizona Statewide Task Force on Preventing Prenatal Exposure to Alcohol and Other Drugs currently serves as a voluntary group involved in identifying gaps in resources and solutions to issues affecting women, children, and families at risk for prenatal substance use. The Task Force is composed of a number of state agencies and community partners with a stake in preventing the onset and reducing the progression of alcohol and substance use among pregnant women and women of child bearing age. ADHS created an enhanced surveillance system to collect real time data on opioid related events that include cases of neonatal abstinence syndrome (NAS) reported by hospitals. In 2019, ADHS released the Arizona NAS Action Plan, which outlined plans to establish a coordinated approach to increase awareness and improve outcomes for families impacted by opioid use and substance use during pregnancy. ADHS has established an internal NAS workgroup to implement the goals outlined in the Action Plan, improve surveillance, and standardize NAS reporting in alignment with national standards.

NAS occurs in newborns exposed to certain licit and illicit substances *in utero*, especially opioids. NAS rates have been increasing nationally, exacerbated by the nation's opioid epidemic and an increase in opioid use during pregnancy.<sup>1</sup> From 2017 and 2021, Arizona observed a 41% increase of NAS cases from 592 (2017) to 835 (2021), resulting in an increased case rate of 7.5 cases per 1,000 newborn hospitalizations (2017) to 11.3 cases per 1,000 newborn hospitalizations (2021).

In 2021, the two race/ethnicity groups with the highest case rates were American Indian/Alaska Native and Black/African American persons. This differs from trends during 2017-2020; NAS case rates were highest among American Indian/Alaska Native and/or White, non-Hispanic persons.

The 5-year (2017-2021) case rate (per 1,000 newborn hospitalizations) was highest in Pima (14.2), Gila (13.1), and Maricopa (8.7) counties. In 2019-2021, Pima county had the highest case rates (13.9-16.0). In 2017-2018, Gila county had the highest case rates (19.3-21.8).

The 5-year (2017-2021) case rate (per 1,000 newborn hospitalizations) was highest in the cities of Apache Junction (18.4), Tucson (14.6), and Glendale (10.5). The cities of residence with the highest NAS rate in each of the last five years were: Apache Junction (2021; 35.0); Tucson (2020; 13.3); Tucson (2019; 14.4); Tucson (2018; 14.0); Apache Junction (2017; 22.96).

The 5-year (2017-2021) case rate (per 1,000 newborn hospitalizations) was highest in the Primary Care Areas (PCAs) of Tucson Foothills (31.3), Tucson Central (28.0), and Apache Junction (20.0). The PCAs with the highest NAS case rate in each of the last five years were: Salt River- Pima (2021; 78.7); Tucson Foothills (2020; 35.0); Tucson Foothills (2019; 22.0); Tucson Central (2018; 24.5); Pascua Yaqui Tribe (2017; 103.4).

This report utilizes inpatient and emergency department discharge records of newborns with possible NAS from all Arizona licensed hospitals. NAS cases are identified from this discharge data using ICD-10-CM codes. This report will inform the Task Force planning and implementation activities and will support the action steps established in the National Governors Association NAS Action Plan and ADHS actions to further the reach of collaborative prevention efforts. ADHS continues to monitor NAS trends and support individuals and communities impacted by maternal substance use disorder.

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## Introduction

Neonatal abstinence syndrome (NAS) is a withdrawal syndrome that can occur in newborns exposed to certain licit and illicit substances, especially opioids, *in utero*.<sup>2</sup> Jansson et al. noted that a newborn's display of NAS varies and perhaps is influenced by factors that not only include illicit and illicit exposures, but a maternal physiology, epigenetic modifications and genetic disposition.<sup>3</sup> This syndrome is associated with the use of amphetamines, barbiturates, benzodiazepines: diazepam, clonazepam; cocaine, marijuana, opiates and/or narcotics: heroin, methadone, codeine/hydrocodone: Vicodin or oxycodone (e.g., oxycotin). Other substances including alcohol have also been linked to this syndrome. A national increase in NAS cases has been linked to increased use of prescription opioids for pain management, illicit opioid use, and opioid substitution therapy.<sup>2,4</sup>

NAS presents itself in central and autonomic nervous system, respiratory system, and gastrointestinal system disturbances. Common presentations include tremors, irritability, high-pitched crying, and diarrhea, although symptoms may vary in presentation and severity.<sup>3</sup> Infants with NAS are more likely to have adverse neonatal outcomes including low birthweight (LBW), a major risk factor for infant mortality.

NAS is diagnosed every 25 minutes in the United States and is on the rise.<sup>4</sup> Between 1999 and 2014, the U.S. observed a 333% increase in NAS.<sup>5</sup> The rise in NAS cases coincides with the increased use of opioids in the U.S.<sup>6</sup> Arizona observed a significant increase in verified non-fatal opioid overdoses from 2017 to 2020 (1,596 non-fatal overdoses to 3,988 non-fatal overdoses), but non-fatal overdoses have remained relatively stable in recent years (2021: 3,555 non-fatal overdoses). Monitoring NAS trends is complicated by the fact that the U.S. is lacking a national NAS surveillance system and among the jurisdictions conducting NAS surveillance, including Arizona, case definitions may differ.<sup>2,7</sup>

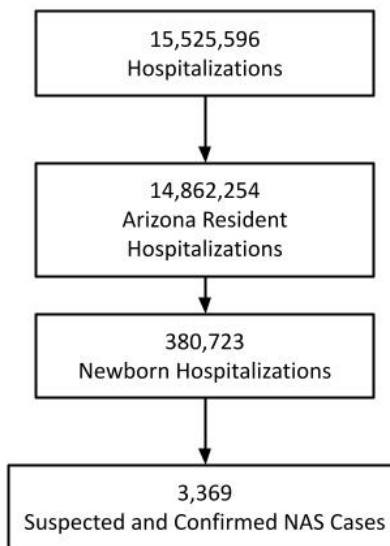
## Methods

The analysis for this report comes from the hospital discharge database (HDD). HDD is a valuable source of information about the patterns of care, public health, and the burden of chronic disease and injury morbidity. ADHS collects hospital discharge records for inpatient and emergency department visits from all Arizona licensed hospitals, excluding Indian Health Service facilities. This collection is required by Arizona Revised Statute (A.R.S.) § 36125-05, and Arizona Administrative Code Title 9, Chapter 11, Articles 4 and 5. This data is released every 6 months. Submission of hospital discharge records for federal (e.g., military) and tribal facilities is voluntary.

This report includes NAS cases of newborns that are residents of Arizona. Infant readmissions during the first 30 days were included for Arizona residents.

NAS cases are identified from this hospital discharge data using ICD-10-CM codes (Figure 1). Confirmed NAS cases are identified using code P96.1, defined as neonatal withdrawal symptoms from maternal use of drugs of addiction. Suspected NAS cases are identified using codes P04.14, P04.17, and P04.1A, defined as a newborn affected by noxious substances transmitted via placenta or breast milk: opiates, sedative-hypnotics, or anxiolytics. A case considered both suspected and confirmed is classified as a confirmed case. ADHS has adopted (as of 2021) these NAS Case Definitions from CSTE published in 2019 (see [Appendix A](#)). Rates have been calculated based on 1,000 newborn hospitalizations. Rates based on counts of less than 6 have been suppressed.

**Figure 1. NAS Case Ascertainment Flowchart, Hospital Discharge Data, Arizona Newborn Residents, 2017-2021**



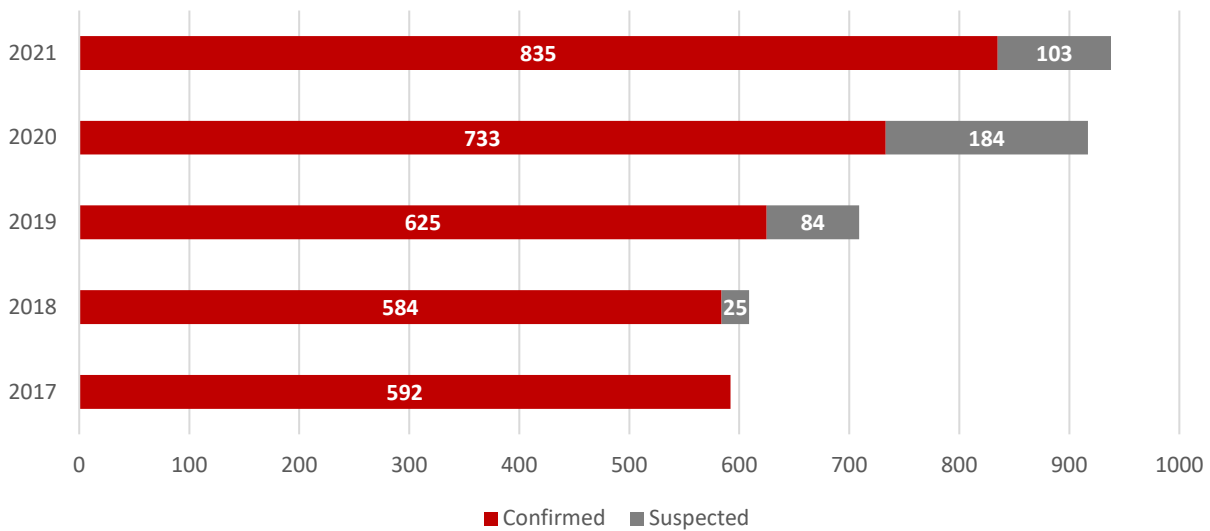
## Findings

This section contains NAS trends for 2017-2021, including case counts, case rates, race and ethnicity, geography, payer, charges, and length of stay.

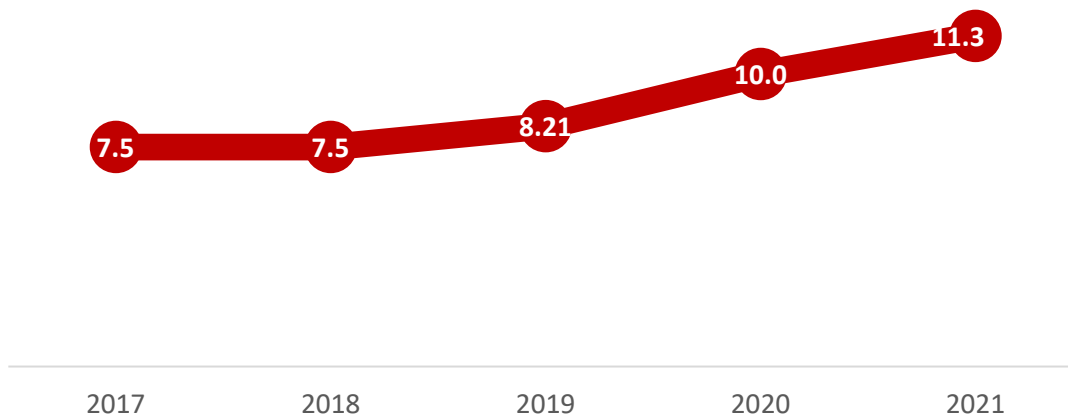
### Overall NAS Case and Rate Trends

Between 2017 and 2021, there were 3,369 confirmed NAS cases. Of the overall 379,681 newborn hospitalizations ([Appendix C](#)) during this time, less than 1% were confirmed or suspected NAS cases. The Arizona NAS case rate was 8.9 NAS cases per 1,000 newborn hospitalizations. From 2017-2021, increases were observed for both the confirmed NAS case number (592 to 835) and case rate (7.5 to 11.3 per 1,000 newborn hospitalizations). The confirmed NAS cases increased during this time by about 41% from 2017-2021.

**Figure 2. Confirmed and Suspected NAS Cases, Arizona, 2017-2021**



**Figure 3. Confirmed NAS Case Rate (per 1,000 Newborn Hospitalizations), Arizona, 2017-2021**



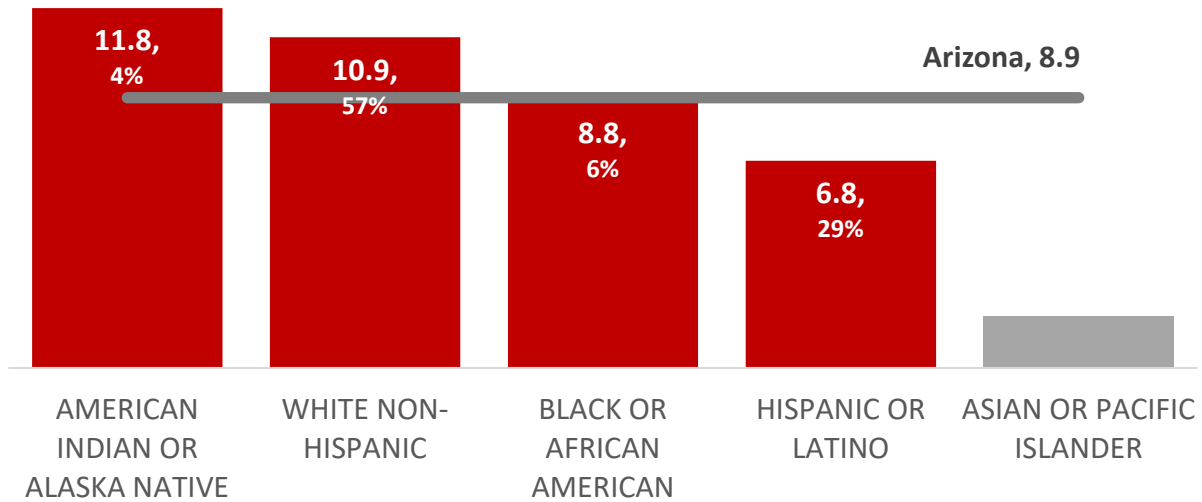


### Race and Ethnicity

#### Confirmed NAS Cases

The rate of confirmed NAS cases (2017-2021, per 1,000 newborn hospitalizations) was highest among American Indian/Alaska Native (11.8) and White, non-Hispanic persons (10.9). American Indian/ Alaska Native persons comprised 4% of NAS cases, while White, non-Hispanic persons comprised 57% of cases, and 29% of cases were Hispanic or Latino persons.

**Figure 4. Confirmed NAS Case Rate and Percentage, By Race/Ethnicity, Arizona, 2017-2021**



The rate for Asian/Pacific Islanders is not displayed because there was less than 6 confirmed cases (on average from 2017-2021)

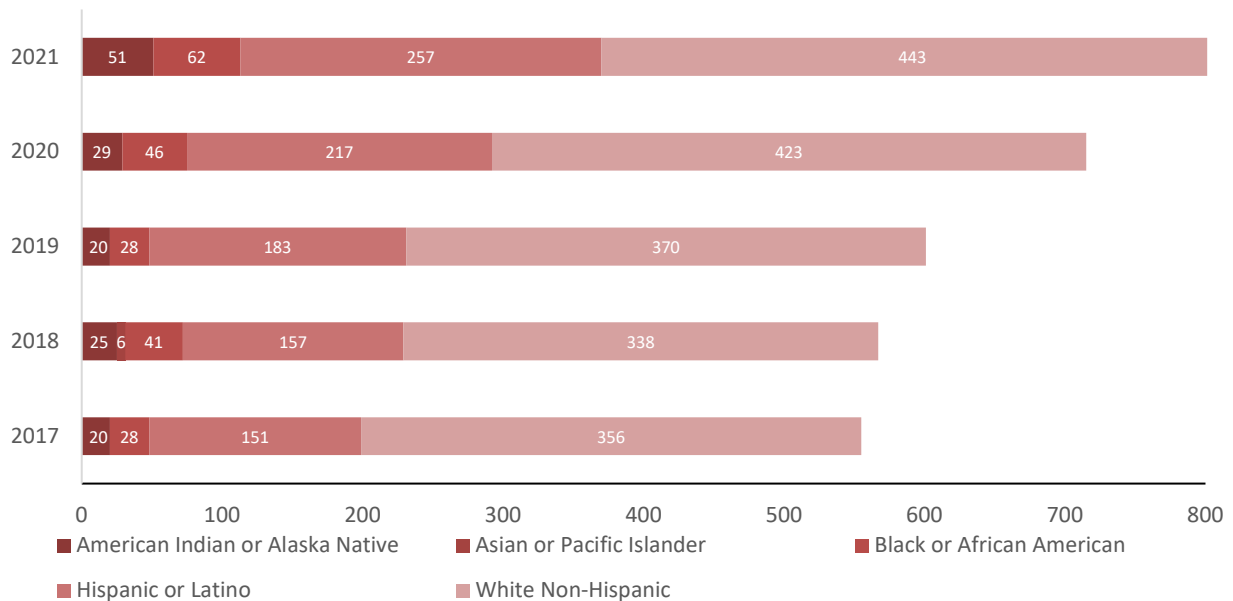
The rate of confirmed NAS cases (per 1,000 newborn hospitalizations) increased among all races and ethnicities from 2017 to 2021. American Indian/Alaska Native and White non-Hispanic persons have consistently had confirmed NAS rates higher than the Arizona total in every year from 2017-2021. In 2021, rates were highest among American Indian/Alaska Native (20.6), Black or African American persons (13.1), and White non-Hispanic persons (12.4).

**Table 1. Total Confirmed NAS Cases and Rate by Race/Ethnicity, 2017-2021**

	CSTE Confirmed (N)					Confirmed Rate per 1,000 Newborn Hospitalizations				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
<b>Total</b>	592	857	625	733	835	7.5	7.5	8.2	10	11.3
American Indian or Alaska Native	20	25	20	29	51	7.6	10	8.6	12.6	20.6
Asian or Pacific Islander	*	6	*	*	*	*	2.2	*	*	*
Black or African American	28	41	28	46	62	6.2	8.8	5.8	9.9	13.1
Hispanic or Latino	151	157	183	217	257	5	5.3	6.5	8	9.7
White Non-Hispanic	356	338	370	423	443	9.8	9.6	10.4	12.1	12.4

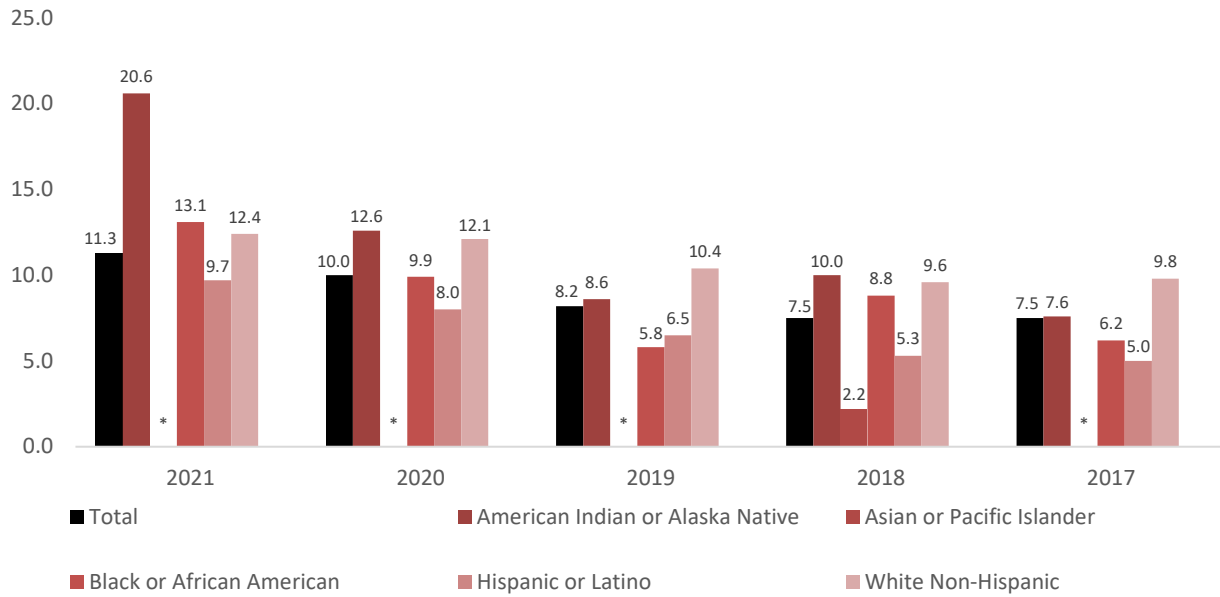
\*Non-zero counts and rates with less than 6 events have been suppressed.

**Figure 5. Confirmed NAS Cases by Race/Ethnicity, 2017-2021**



\*Non-zero counts with less than 6 events have been suppressed.

**Figure 6. Confirmed NAS Rate per 1,000 Newborn Hospitalizations by Race/Ethnicity, yearly comparisons, yearly comparison, 2017-2021**



\*Rates calculated with less than 6 events have been suppressed.

### Suspected NAS Cases

The number of suspected NAS cases increased overall and among American Indian/Alaska Native, Black or African American, and White non-Hispanic persons from 2018 to 2021. No suspected NAS cases were reported in 2017.

**Table 2. Total Suspected NAS Cases by Race/Ethnicity, 2017-2021**

	CSTE Suspected (N)†				
	2021	2020	2019	2018	2017
<b>Total</b>	<b>103</b>	<b>85</b>	<b>84</b>	<b>25</b>	<b>0</b>
American Indian or Alaska Native	8	*	*	*	0
Asian or Pacific Islander	*	*	*	0	0
Black or African American	13	6	*	*	0
Hispanic or Latino	25	28	27	11	0
White Non-Hispanic	56	41	47	11	0

\*Non-zero counts with less than 6 events have been suppressed.

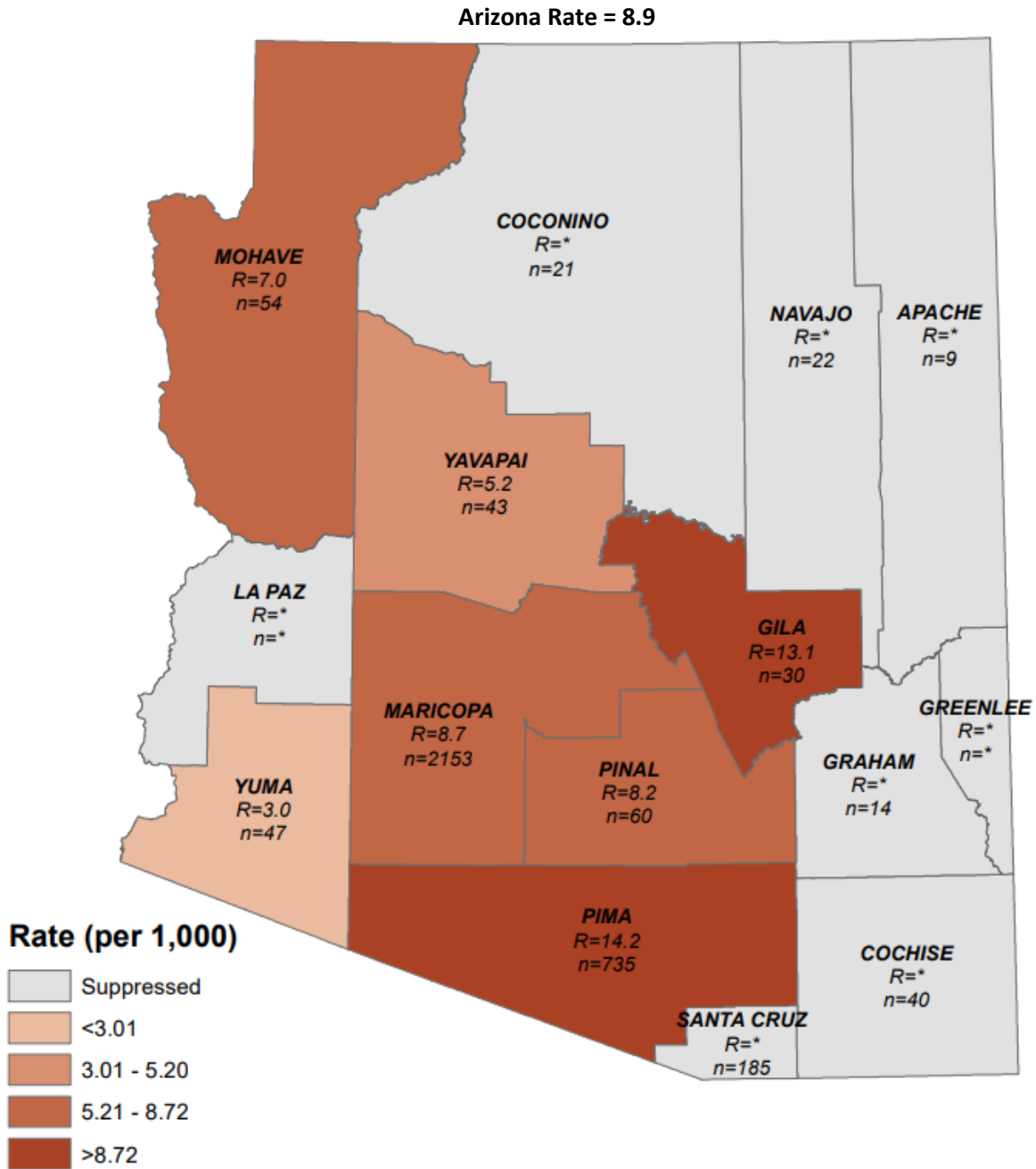
†Case classification (confirmed or suspected) is mutually exclusive; a case considered both suspected and confirmed is classified as a confirmed case.

### County of Residence

#### Confirmed NAS Cases

The average annual rate of confirmed NAS cases (2017-2021) was highest in Pima, Gila, and Maricopa counties (14.2, 13.1, and 8.7) overall from 2017-2021.

**Figure 7. Confirmed Average Annual NAS Rate (per 1,000 Newborn Hospitalizations), By Arizona County of Residence, 2017-2021**



\*Non-zero counts less than 6 confirmed cases (total confirmed cases 2017-2021) and rates for counties with less than 6 confirmed cases (annually, on average from 2017-2021) are suppressed and counties are shaded grey

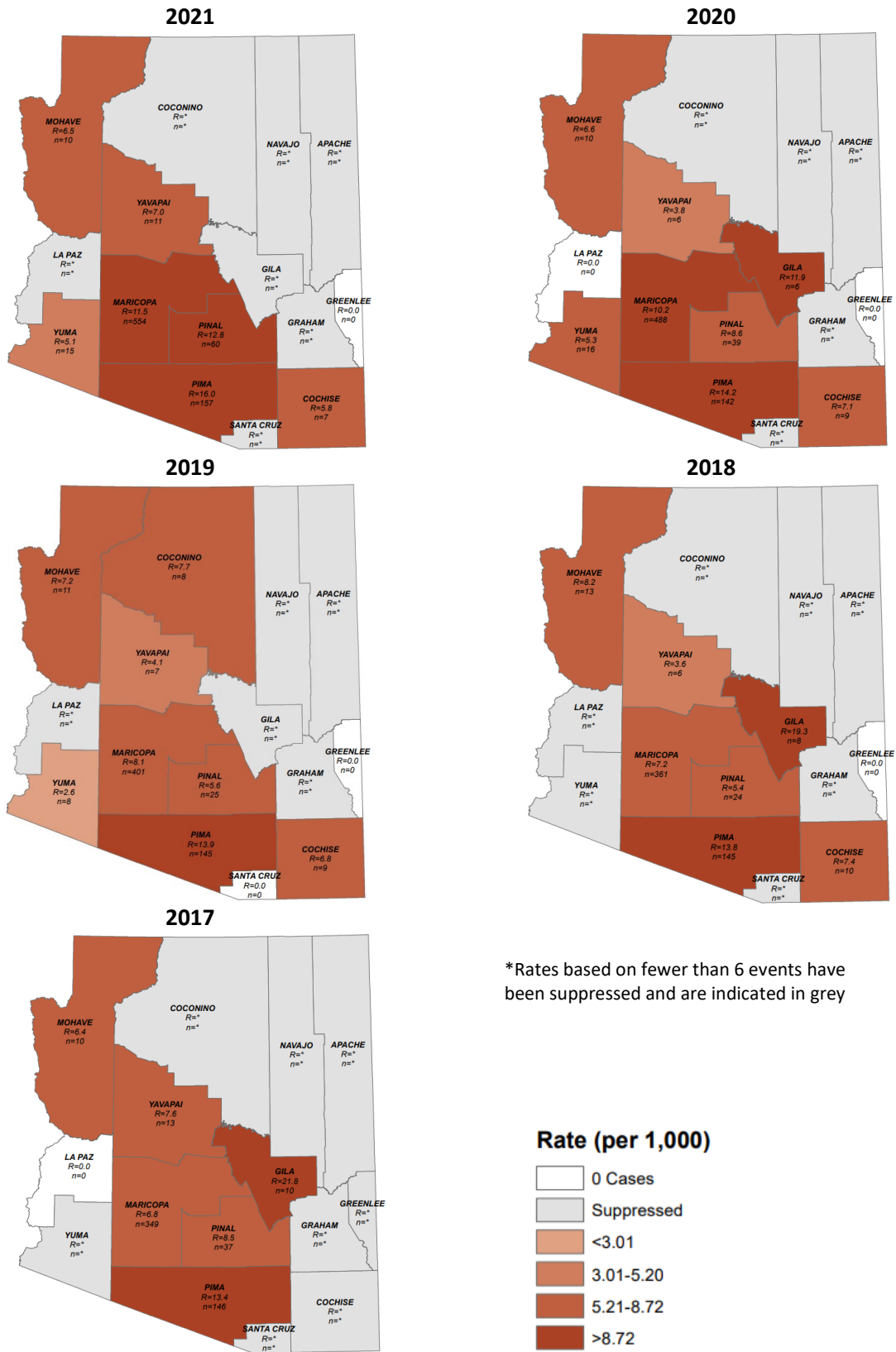
The rates of confirmed NAS cases have varied greatly between counties from 2017-2021. In 2021, the highest rates of confirmed NAS cases per (1,000 newborn hospitalizations) in Arizona were in Pima (16.0), Pinal (12.8), and Maricopa counties (11.5). Rates of confirmed NAS cases increased in Pima, Pinal, Maricopa counties from 2017-2021.

**Table 3. Total Confirmed NAS Cases and Rate by County, 2017-2021**

	CSTE Confirmed (N)					Confirmed Rate per 1,000 Newborn Hospitalizations				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
<b>Total</b>	592	857	625	733	835	7.5	7.5	8.2	10	11.3
Apache	*	*	*	*	*	*	*	*	*	*
Cochise	*	10	9	9	7	*	7.4	6.8	*	5.8
Coconino	*	*	8	*	*	*	*	7.6	*	*
Gila	10	8	*	6	*	21.8	19.3	*	11.9	*
Graham	*	*	*	*	*	*	*	*	*	*
Greenlee	*	0	0	0	0	*	0	0	0	0
La Paz	0	*	*	0	*	0	*	*	0	*
Maricopa	349	361	401	488	554	6.8	7.2	8.1	10.2	11.5
Mohave	10	13	11	10	10	6.4	8.2	7.2	6.6	6.5
Navajo	*	*	*	*	*	*	*	*	*	*
Pima	146	145	145	142	157	13.4	13.8	13.9	14.2	16
Pinal	37	24	25	39	60	8.5	5.4	5.6	8.6	12.8
Santa Cruz	*	*	0	*	*	*	*	0	*	*
Yavapai	13	6	7	6	11	7.6	3.6	4.1	3.8	6.9
Yuma	*	*	8	16	15	*	*	2.5	5.3	5.1

\*Non-zero counts and rates with less than 6 events have been suppressed.

Figure 8. Total Confirmed NAS Rates by County of Residence, 2017-2021†



\*Rates based on fewer than 6 events have been suppressed and are indicated in grey

### Suspected NAS Cases

The highest number of suspected NAS cases was in Maricopa and Pima counties from 2018-2021. No suspected NAS cases were reported in 2017.

**Table 4. Total Suspected NAS Cases by County, 2017-2021**

	CSTE Suspected (N)†				
	2017	2018	2019	2020	2021
<b>Total</b>	0	25	84	85	103
Apache	0	0	0	0	*
Cochise	0	0	*	*	*
Coconino	0	0	*	*	*
Gila	0	0	*	*	*
Graham	0	*	0	0	0
Greenlee	0	0	0	0	0
La Paz	0	0	0	*	0
Maricopa	0	16	60	51	69
Mohave	0	0	*	*	*
Navajo	0	0	*	*	8
Pima	0	*	*	11	11
Pinal	0	0	*	*	*
Santa Cruz	0	0	*	0	0
Yavapai	0	*	*	*	0
Yuma	0	0	*	*	*

\*Non-zero counts with less than 6 events have been suppressed.

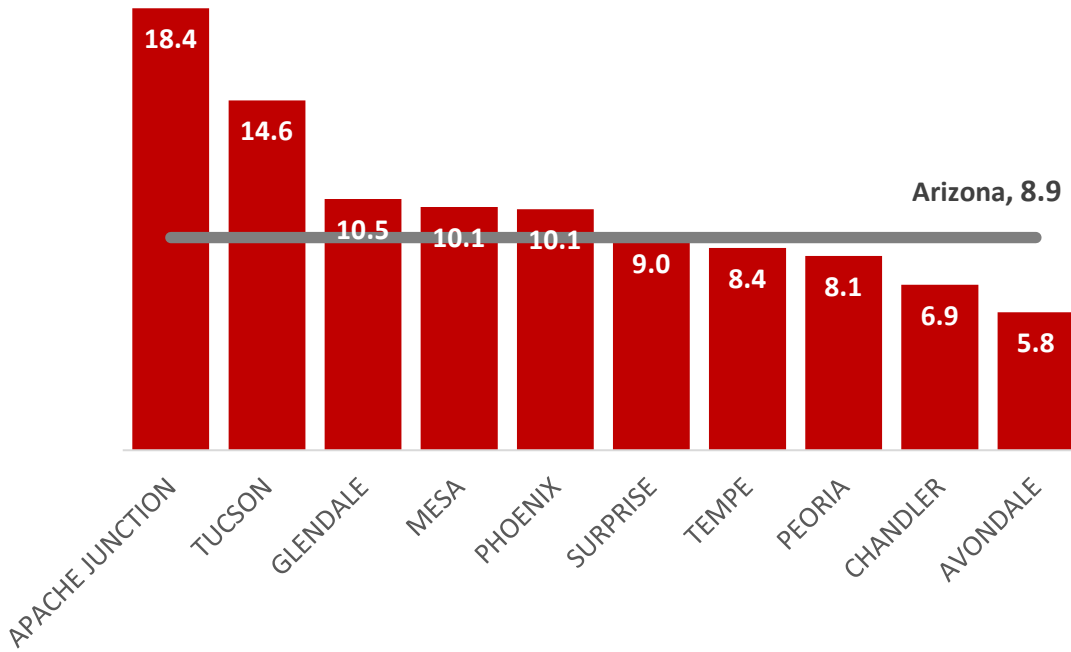
†Case classification (confirmed or suspected) is mutually exclusive; a case considered both suspected and confirmed is classified as a confirmed case.

### City of Residence

#### Confirmed NAS Cases

The chart below only includes the ten Arizona cities of residence with the highest rate of confirmed NAS cases from 2017-2021. The rate of confirmed NAS cases (2017-2021) was highest in the cities of Apache Junction (18.4 NAS cases per 1,000 newborn hospitalizations), Tucson (14.6), Glendale (10.5), Mesa (10.1), and Phoenix (10.1).

**Figure 9. Confirmed Rate of NAS Cases per 1,000 Newborn Hospitalizations, By City of Residence (Ranked Top 10), 2017-2021**





The rates of confirmed NAS cases varied greatly between Arizona cities from 2017-2021 as shown by the top 10 cities (in each given year). The highest annual rates of confirmed NAS cases (per 1,000 newborn hospitalizations) in Arizona occurred fairly consistently in the cities of Tucson, Phoenix, Glendale, Mesa, and Peoria; all of which had higher rates in 2021 compared with 2017. In 2021, the highest rates of confirmed NAS cases were in the cities of Apache Junction (35.0), Tucson (16.8), Tempe (15.0), Glendale (14.1), Surprise (13.5), and Phoenix (13.1).

**Table 5. Total Confirmed NAS Cases and Rate by Top 10 Cities (based on number of confirmed cases), 2017-2021**

	CSTE Confirmed (N)					Confirmed Rate per 1,000 Newborn Hospitalizations				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
<b>Total</b>	592	857	625	733	835	7.5	7.5	8.2	10	11.3
Apache Junction	10	-	-	-	15	22.9	-	-	-	35
Avondale	8	-	-	-	-	6	-	-	-	-
Chandler	17	16	16	23	26	5.7	5.5	5.5	8.5	9.5
Gilbert	21	15	11	15	-	6.8	5.1	3.8	5.6	
Glendale	38	33	37	41	52	9.3	8.5	9.8	11.1	14.1
Goodyear	-	-	11	-	-	-	-	11.7	-	-
Mesa	63	47	62	76	75	9.6	7.3	9.6	12.7	11.8
Peoria	19	7	11	18	23	9.9	3.6	5.7	9.4	12
Phoenix	137	171	179	229	238	6.9	8.8	9.4	12.5	13.1
San Tan Valley	12	-	-	-	-	10.9	-	-	-	-
Scottsdale	-	12	9	12	18	-	5.9	4.5	6.1	9
Surprise	-	11	-	11	20	-	8.2	-	8.2	13.5
Tempe	-	12	17	-	23	-	7.6	10.7	-	15
Tucson	141	131	132	131	144	14.6	14	14.4	13.3	16.8
Yuma	-	-	-	14	-	-	-	-	7	-

\*Non-zero counts and rates based on fewer than 6 events have been suppressed.

- Ranked Top 10 cities varied from year-to-year from 2017-2021. Cities not represented in the top 10 cities (based on the number of confirmed cases) for that reported year.

### Suspected NAS Cases

The highest number of suspected NAS cases in Arizona from 2018-2021 occurred fairly consistently in the cities of Tucson, Phoenix, Glendale, and Mesa; all of which (except Glendale) had a higher number in 2021 compared with 2018. Phoenix, Mesa, Tucson, and Glendale had the highest number of suspected NAS cases in 2021. No suspected NAS cases were reported in 2017.

**Table 6. Total Suspected NAS Cases by Top 10 Cities (based on number of confirmed cases), 2017-2021**

	CSTE Suspected (N)†				
	2017	2018	2019	2020	2021
<b>Total</b>	0	25	84	85	103
Apache Junction	0	-	-	-	*
Avondale	0	-	-	-	-
Chandler	0	*	*	*	*
Gilbert	0	*	*	*	-
Glendale	0	6	6	*	6
Goodyear	-	-	*	-	-
Mesa	0	*	*	7	13
Peoria	0	*	*	*	*
Phoenix	0	*	31	26	36
San Tan Valley	0	-	-	-	-
Scottsdale	-	*	*	*	*
Surprise	-	*	-	*	0
Tempe	-	*	*	-	*
Tucson	0	*	*	9	11
Yuma	-	-	-	*	-

\*Non-zero counts based on fewer than 6 events have been suppressed.

- Ranked Top 10 cities varied from year-to-year from 2017-2021. Cities not represented in the top 10 cities (based on the number of confirmed cases) for that reported year.

†Case classification (confirmed or suspected) is mutually exclusive; a case considered both suspected and confirmed is classified as a confirmed case.

### **Primary Care Area (PCA) of Residence**

A [Primary Care Area \(PCA\)](#) is a geographic area in which most residents seek primary health services from the same place(s). The PCA is meant to depict the “primary care service seeking patterns” of the residents. Map included in [Appendix B](#).

### Confirmed NAS Cases

The chart below only includes highest rates for Arizona PCAs of residence. The rate of confirmed NAS cases (2017-2021) was highest in the PCAs of Tucson Foothills (31.3 NAS cases per 1,000 newborn hospitalizations), Tucson Central (28.0), Apache Junction (20.0), Encanto Village (19.2), Tucson East (15.9), and North Mountain Village (15.4).

The rates of confirmed NAS cases varied greatly between PCAs from 2017-2021. The highest rates of confirmed NAS cases (per 1,000 newborn hospitalizations) in Arizona from 2017-2021 occurred fairly consistently in the PCAs of Tucson Foothills, Tucson Central, Central City Village, North Mountain Village, Glendale North, and Mesa West; all of which (except Tucson Central) had higher rates in 2021 compared with 2017. The rate of confirmed NAS cases in 2021 was highest in the PCAs of Salt River- Pima (78.7 NAS cases per 1,000 newborn hospitalizations), Apache Junction (36.5), Gila River Indian Community (32.3), Tucson Foothills (28.7), Encanto Village (24.9), and Tucson Central (24.0). See [Appendix C](#) for more details.

**Table 7. Confirmed NAS Cases (per 1,000 Newborn Hospitalizations), By Primary Care Areas (PCA), 2017-2021**

<b>Primary Care Area (PCA)</b>	<b>Confirmed NAS Rate per 1,000 Newborn Hospitalizations</b>
TUCSON FOOTHILLS	31.3
TUCSON CENTRAL	28.0
APACHE JUNCTION	20.0
ENCANTO VILLAGE	19.2
TUCSON EAST	15.9
NORTH MOUNTAIN VILLAGE	15.4
CENTRAL CITY VILLAGE	14.7
TUCSON SOUTH	12.4
MESA WEST	12.1
GLENDALE NORTH	11.7
MESA CENTRAL	11.7
TEMPE NORTH	11.6
ALHAMBRA VILLAGE	11.5
SOUTH MOUNTAIN VILLAGE & GUADALUPE	11.0
CASAS ADOBES	10.6
CAMELBACK EAST VILLAGE	10.3
MESA EAST	10.0
DEER VALLEY VILLAGE	9.9
SURPRISE SOUTH	9.5
GLENDALE CENTRAL	9.3
PEORIA SOUTH	9.0
CHANDLER NORTH	8.7
MESA NORTH	8.5
MARYVALE VILLAGE	7.9
ESTRELLA VILLAGE & TOLLESON	7.5
GILBERT NORTH	7.4
PARADISE VALLEY VILLAGE	6.8
MESA GATEWAY	6.8
CHANDLER CENTRAL	6.5
PEORIA NORTH	6.2
GOODYEAR & LITCHFIELD PARK	5.9
AVONDALE	5.8
SAN TAN VALLEY	5.3
YUMA	4.0

Rates for PCAs with less than 6 confirmed cases (on average from 2017-2021) are not displayed

### Types of Substances (ICD-10 Codes)

The most common substances involved in confirmed and suspected NAS cases from 2017-2021 were opiates (P04.14), other drugs of addiction (P04.49), and amphetamines (P04.16); all of which increased from 2017 to 2021. In 2021, the three most common substances involved in NAS cases were coded as opiates (n=385), other drugs of addiction (n=312), and amphetamines (n=153). Other drugs of addiction (P04.49) include substances such as alcohol, barbiturates, benzodiazepine, diazepam, gabapentin, nicotine, and sleeping drugs, among others.

**Table 8. Number of ICD-10 Codes for Confirmed and Suspected NAS Cases, 2017-2021**

Code(s)	Case Definition	Count				
		2017	2018	2019	2020	2021
P96.1 (CSTE Confirmed Classification)	Neonatal withdrawal symptoms from maternal use of drugs of addiction	592	584	625	733	835
P04.14, P04.17, P04.1A (CSTE Suspected Classification)	Newborns affected by noxious substances transmitted via placenta or breast milk: opiates, sedative-hypnotics, or anxiolytics	0	56	200	269	391
<b>Substance Category</b>						
<b>Opiates</b>						
P04.14	Opiates	0	55	197	266	385
<b>Other Medications</b>						
P04.13	Anticonvulsants	0	0	0	0	*
P04.15	Antidepressants	0	0	*	10	8
P04.16	Amphetamines	0	8	35	66	153
P04.17	Sedative-Hypnotics	0	*	*	*	6
P04.1A	Anxiolytics	0	0	0	*	*
P04.18	Other Maternal Medication	0	0	6	*	6
P04.19	Unspecified Medication	0	0	*	0	*
<b>Non-Medication Substances</b>						
P04.40	Unspecified Drug of Addiction	0	6	25	30	32
P04.41	Cocaine	7	11	11	9	22
P04.42	Hallucinogen	0	0	*	*	*
P04.49	Other Drugs of Addiction	142	206	221	380	312
P04.81	Cannabis	0	7	25	46	68
P04.89	Other Maternal Noxious Substances	0	0	*	*	*

\*Non-zero counts based on fewer than 6 events have been suppressed.

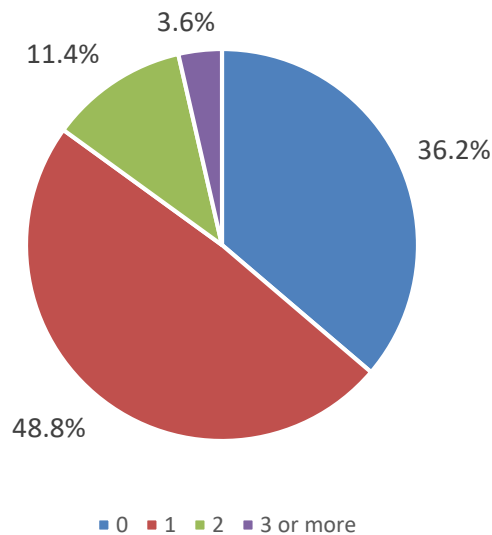
The number of substances involved among suspected and confirmed cases increased from 2017-2021; most commonly including 1+ or 2+ substances. In 2021, 758 NAS cases involved 1 or more substances. Specific type of substance may not always be known and/or coded for an encounter.

**Table 9. Number of Substances Among Suspected and Confirmed Cases, 2017-2021**

Among P04 Series	Count				
	2017	2018	2019	2020	2021
0	421	331	258	145	180
1	161	232	352	512	539
2	9	40	78	134	160
3	*	*	17	26	53
4	0	*	*	*	*
<b>1 or more</b>	<b>171</b>	<b>278</b>	<b>451</b>	<b>668</b>	<b>758</b>

\*Non-zero counts with less than 6 events have been suppressed.  
Substances include tobacco and alcohol.

**Figure 10. Distribution of Number of Substances (P04 Series) Among NAS Suspected and Confirmed Cases, 2017-2021**



### Payer Type

The two most common primary payers for suspected and confirmed NAS cases from 2017-2021 were the Arizona Health Care Cost Containment System (AHCCCS/Medicaid) (51-54%) and Health Maintenance Organization (HMO) (23-24%). These are the same as the most common primary payers for all Arizona births from 2017-2021 (AHCCCS Medicaid and HMO, see [Appendix C](#) for more details on all Arizona births).

**Table 10. Total Suspected and Confirmed NAS Cases by Primary Payer Type, 2017-2021\*\***

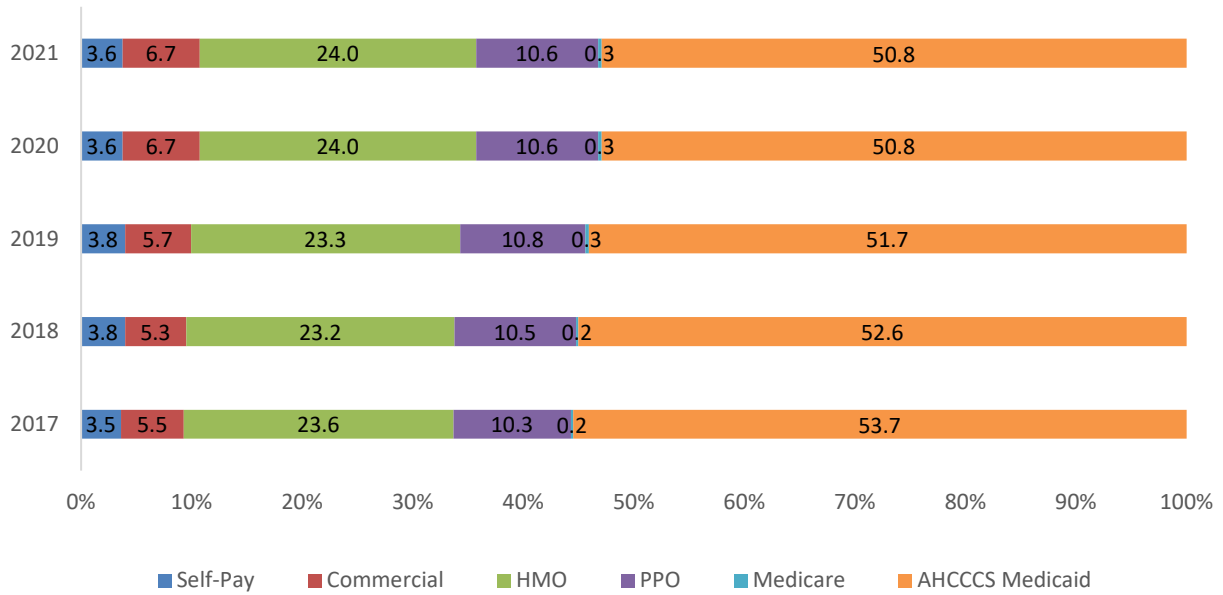
	CSTE Suspected (N)†					CSTE Confirmed (N)				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
<b>Total</b>	0	56	200	269	391	592	584	625	733	835
AHCCCS Medicaid	0	47	179	254	360	539	538	580	684	783
HMO	0	*	*	*	12	23	15	17	21	20
Self-Pay	0	*	6	*	8	11	7	7	7	13
PPO	0	*	*	*	*	6	10	8	*	8
Other	0	*	0	*	*	0	*	*	7	*
Medicare	0	*	*	0	*	*	*	*	*	*
TRICARE	0	0	0	*	*	*	*	*	*	*
Commercial	0	0	*	*	0	*	*	7	*	*
Worker's Compensation	0	*	0	0	0	*	*	0	0	0
Medicare Risk	0	0	0	0	0	0	0	0	*	0
Charity	0	0	0	0	0	0	0	0	0	0

\*Counts with less than 6 events have been suppressed.

†Case classification (confirmed or suspected) is mutually exclusive; a case considered both suspected and confirmed is classified as a confirmed case.

\*\*This analysis only includes Arizona residents and infants born in hospitals. In addition, this analysis excludes transfers. Therefore, the number is lower than the reported overall number of Arizona births in each year.

**Figure 11. Percent of Total Suspected and Confirmed NAS Cases by Primary Payer Type, 2017-2021\*\***



\*Percentages based on non-zero counts less than 6 have been suppressed. Due to small numbers, not all categories are displayed (not shown: Tricare, Worker’s Compensation, Medicare Risk, Other)

\*\*This analysis only includes Arizona residents and infants born in hospitals. In addition, this analysis excludes transfers. Therefore, the number is lower than the reported overall births.



### Hospital Encounter Charges

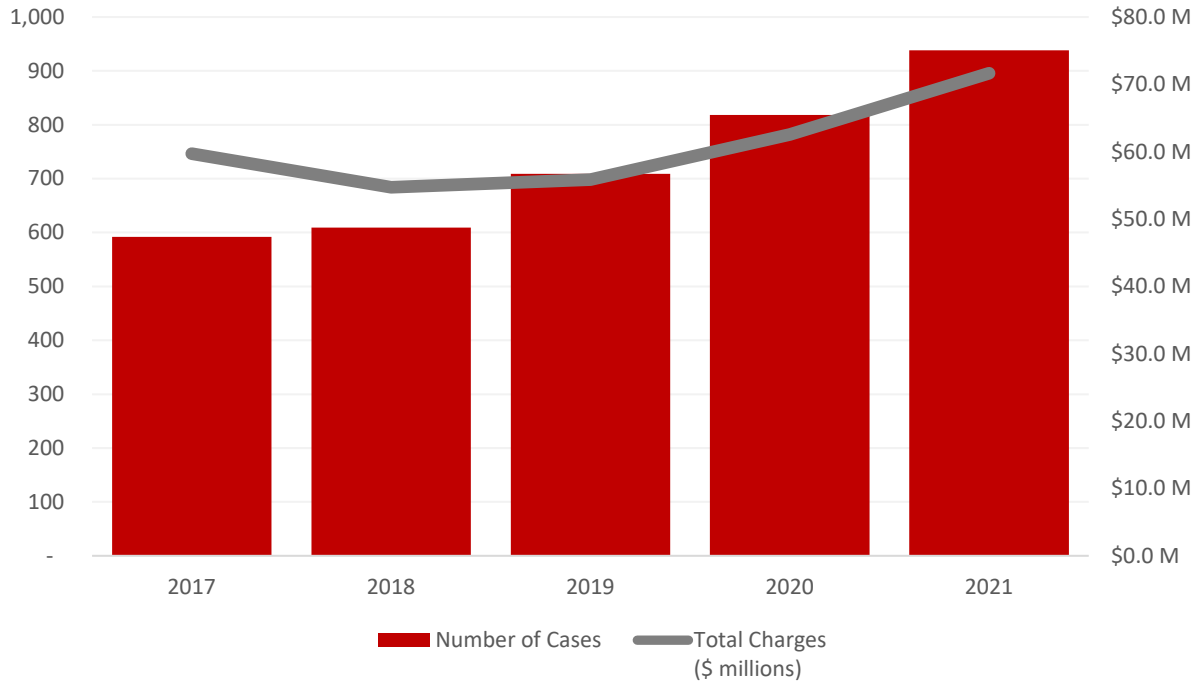
The annual costs of suspected and confirmed NAS cases increased from 2017-2021. This coincided with the increase in the number of suspected and confirmed NAS cases during the same time period. The largest increases were observed from 2019-2021. In 2021, the total charges for suspected and confirmed NAS cases was over \$71 million, with a 15% net annual change in associated costs from 2020 (\$62.6 million).

**Table 11. Total Charges, Charges Per Encounter, and Net Annual Change in Total Charges, 2017-2021\*\***

	Total Charges (\$ millions)	Per Encounter Charges (\$)	Net Annual Change in Total Charges
<b>Total</b>	\$134.2 M	\$76,432	
2021	\$71.6 M	\$76,385	15%
2020	\$62.6 M	\$76,486	12%
2019	\$55.9 M	\$78,781	2%
2018	\$54.7 M	\$89,853	-8%
2017	\$59.7 M	\$100,874	.

\*\*This analysis only includes Arizona residents and infants born in hospitals. In addition, this analysis excludes transfers. Therefore, the number is lower than the reported overall births. Total reported charges, not adjusted to estimate the actual amount paid of the provider for healthcare services received. Estimated costs are reasonable, not precise, estimates of actual cost, and a far more accurate measure than reported charges.

**Figure 12. Number of Confirmed and Suspected NAS Cases and Total Charges, 2017-2021\*\***

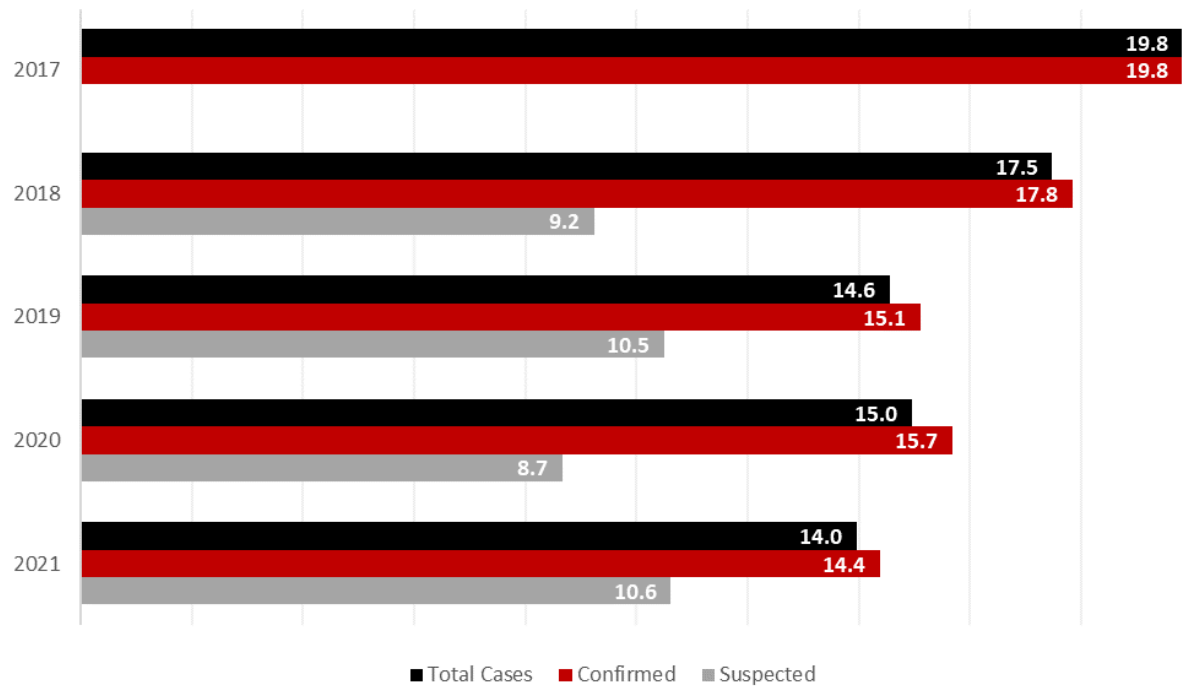


\*\*This analysis only includes Arizona residents and infants born in hospitals. In addition, this analysis excludes transfers. Therefore, the number is lower than the reported overall births. Total reported charges, not adjusted to estimate the actual amount paid of the provider for healthcare services received. Estimated costs are reasonable, not precise, estimates of actual cost, and a far more accurate measure than reported charges.

### Length of Stay

The average length of stay was higher for confirmed cases (16.4 days) compared to suspected cases (9.9 days) overall from 2017-2021. The average length of stay decreased for confirmed and suspected NAS cases (combined) from 2017 (19.8 days) to 2021 (14.0 days). No suspected NAS cases were reported in 2017.

**Figure 13. Length of Stay (Days\*) for Confirmed and Suspected NAS Cases, 2017-2021**



\*Length of stay with an admission and discharge on the same days is calculated as 1 day

## Limitations

Several limitations should be kept in mind when reviewing data included in this report.

Nationally, a striking decline in emergency department (ED) visits was observed in year 2020, with the highest declines in regions where the pandemic was most severe, suggesting that the pandemic altered the use of the ED by the public.<sup>8</sup> It is unclear to what extent (during 2020) the spread of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), may have impacted the trends of NAS, however all of the observed trends for ED visits should be interpreted cautiously. In addition, several states, including Arizona, saw significant increases in homebirths from 2019-2020.<sup>9</sup> NAS cases captured by hospital discharge data may not accurately portray all NAS cases during this time.

Hospital discharge data are a valuable source of information about the patterns of care, public health, and the burden of chronic disease and injury morbidity. ADHS collects hospital discharge records for inpatient and emergency department visits from all Arizona licensed hospitals. Federal hospitals, such as Veteran's Administration and Indian Health Service, data are not captured. Hospital records for Arizona residents who use hospitals in another state (state border crossings) are also not captured.

These data were not linked with vital records (birth or death certificates, thus we were not able to further describe the outcome associated with the birth (e.g., low birth weight, prematurity, mortality) nor were we able to describe maternal characteristics or maternal risk factors.

Misclassification of NAS cases by race may occur, especially for American Indian/Alaska Native persons.<sup>10</sup> This could lead to over or underestimation of NAS among this group. Discharge data is an administrative data sets and may include misclassification of characteristics at the hospital-level.

In addition, the data utilized in this report is based on encounters and may include duplicate cases for the same person resulting in an overestimate of the number of cases and associated rates.

## Future Directions for Analysis

ADHS implementation (projected 2023) of improved surveillance of NAS cases using a recommended CSTE definition and state-based reporting system (MEDSIS) warrants a direct comparison of the two systems and observed findings to identify what the most reliable and valid estimates are.

There are several ways NAS data is collected and reported, and not all counts in this report will match reports utilizing other data sources and methods. The data source used in this report could be linked to MEDSIS or vital records, to further understand exposures *in utero*, birth characteristics, and identify maternal characteristics for public health action.

The opioid "crisis" looks significantly different in 2021 than it did in 2017 with respect to the most prominent [substance involved in overdoses](#) (i.e., fentanyl vs. overuse of licit prescription drugs). An ICD-10 code for fentanyl was implemented for use in late-2020. In the future it may be worthwhile to explore the influence of fentanyl compared with other types of substance specifically on NAS case birth outcomes and characteristics.

## Conclusions

In 2017-2021, there was a total of 3,369 NAS cases among Arizona residents. We observed a 41% increase in cases from 2017-2021 (592 confirmed cases occurred in 2017 and 835 cases occurred in 2021). The Arizona case rate was 8.9 cases per 1,000 newborn hospitalizations. The NAS case rate increased from 7.5 cases per 1,000 newborn hospitalizations in 2017 to 11.3 in 2021.

American Indian/Alaska Native and White, non-Hispanic persons had the highest NAS case rates (11.8 and 10.9 cases per 1,000 newborn hospitalizations), however American Indian/ Alaska Native persons comprised 4% of NAS cases and White, non-Hispanic persons comprised 57% of cases.

The rate of confirmed NAS cases (2017-2021) was highest, and above the state case rate, in Pima and Gila counties (14.2 and 13.1 NAS cases per 1,000 newborn hospitalizations). The rate of confirmed NAS cases (2017-2021) was highest, and above the state case rate, in the cities of Apache Junction (18.4 NAS cases per 1,000 newborn hospitalizations), Tucson (14.6), Glendale (10.5), Mesa (10.1), Phoenix (10.1), and Surprise (9.0).

The three Primary Care Areas (PCAs) with the highest rate of confirmed NAS cases (2017-2021) were Tucson Foothills (31.3 NAS cases per 1,000 newborn hospitalizations), Tucson Central (28.0), and Apache Junction (20.0).

This report will inform the Task Force planning and implementation activities and will support the action steps established in the National Governors Association NAS Action Plan and ADHS actions to further the reach of collaborative prevention efforts. ADHS continues to improve NAS surveillance and monitor NAS trends and support individuals and communities impacted by maternal substance use disorder.

## Appendix A: NAS Case Definitions

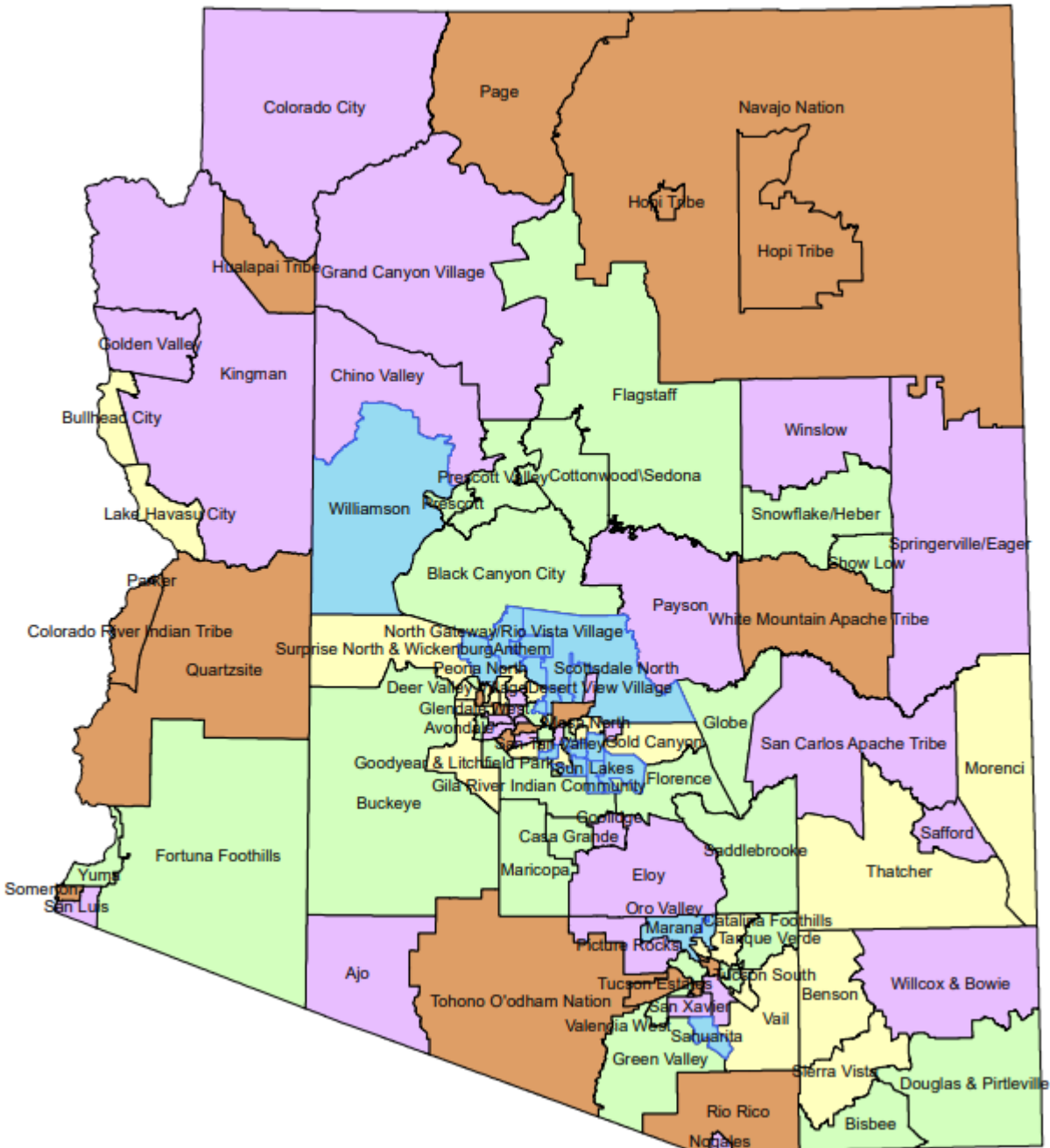
### Neonatal Abstinence Syndrome Case Definitions<sup>11</sup>

*Confirmed NAS:* ICD-10-CM Code P96.1 is used as the standard case definition code for confirmed NAS in Hospital Discharge Data by the Council of State and Territorial Epidemiologists; Neonatal withdrawal symptoms from maternal use of drugs of addiction

*Suspected NAS:* ICD-10-CM Codes P04.14, P04.17, and P04.1A are used as the standard case definition code for suspected NAS in Hospital Discharge Data by the Council of State and Territorial Epidemiologists; does not include confirmed cases; Newborn affected by noxious substances transmitted via placenta or breast milk: opiates, sedative-hypnotics, or anxiolytics

## Appendix B: Primary Care Area (PCA) Map

Arizona Primary Care Areas (PCA), 2021



Arizona Department of Health Services, Bureau of Women's and Children's Health,  
<https://www.azdhs.gov/documents/prevention/health-systems-development/data-reports-maps/maps/azpca.pdf?v=20221003>

## Appendix C: Additional Data Tables

**Table C1. Total (Overall Births) and Percentages by Primary Payer Type, 2017-2021\*\***

	Count					Percentage (%)				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Self-Pay	2742	2949	2857	2623	3072	3.5	3.8	3.8	3.6	3.6
Commercial	4288	4066	4312	4906	4938	5.5	5.3	5.7	6.7	6.7
HMO	18582	17967	17732	17647	17817	23.6	23.2	23.3	24	24
PPO	8100	8160	8252	7821	7930	10.3	10.5	10.8	10.6	10.6
Medicare	160	184	208	211	59	0.2	0.2	0.3	0.3	0.3
AHCCCS Medicaid	42227	40756	39409	37474	37315	53.7	52.6	51.7	50.8	50.8
TRICARE	1982	2045	2039	2097	1980	2.5	2.6	2.7	2.9	2.9
Worker's Compensation	133	93	65	76	*	0.2	0.1	0.1	0.1	*
Medicare Risk	102	8	*	8	*	0.1	0	*	0	*
Charity	17	19	21	28	33	0	0	0	0	0
Other	301	1172	1262	741	957	0.4	1.5	1.7	1	1
<b>TOTAL</b>	<b>78634</b>	<b>77419</b>	<b>76161</b>	<b>73632</b>	<b>74105</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

\*Counts and percentages with less than 6 events have been suppressed.

\*\*This analysis only includes Arizona residents and infants born in hospitals. In addition, this analysis excludes transfers. Therefore, the number is lower than the reported overall births.

**Table C2. Total Confirmed NAS Cases and Rate by Primary Care Areas (with 6+ confirmed cases), 2017-2021**

	CSTE Confirmed (N)					Confirmed Rate per 1,000 Newborn Hospitalizations				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
<b>Total</b>	592	857	625	733	835	7.5	7.5	8.2	10	11.3
Alhambra Village	16	20	22	28	34	7	9.3	10	13.4	17.1
Apache Junction	10	-	6	8	15	23.9	-	14.2	19	36.5
Avondale	8	-	7	8	11	5.8	-	5.1	6.1	8.3
Buckeye	-	6	-	6	7	-	4.7	-	4	4.6
Bullhead City	6	8	-	-	-	11.7	14.4	-	-	-
Camelback East Village	11	22	15	19	21	6.7	12.3	8.8	11.7	12.8
Casas Grande	-	-	6	8	-	-	-	8	10.7	-
Casas Adobes	11	-	11	6	6	15.6	-	14.8	9.1	9.5
Central City Village	9	14	13	13	18	9.7	14.6	13.7	15	21.2
Chandler Central	9	6	10	11	13	5.7	4	6.5	7.7	9
Chandler North	7	8	-	11	11	7.7	8.7	-	12.9	13
Deer Valley Village	21	15	22	20	23	9.6	7.5	10.6	10	11.4
Drexel Heights	6	-	-	-	-	20.5	-	-	-	-
El Mirage & Youngtown	-	-	-	6	7	-	-	-	9.9	12.4
Encanto Village	13	14	-	16	17	18	19.6	-	22.3	24.9
Estrella Village & Tolleson	10	12	-	15	25	5.7	6.8	-	9	14.3
Gila River Indian Community	-	-	-	7	7	-	-	-	29.8	32.3
Gilbert Central	-	9	-	-	19	-	6.9	-	-	15.3
Gilbert North	11	-	6	6	-	13.5	-	7.3	7.4	-
Gilbert South	6	-	-	6	-	6	-	-	8.6	-



Glendale Central	11	13	15	20	19	6	7.4	9.4	12.1	12.5
Glendale North	15	12	14	15	23	10.9	8.8	10	11.9	17.5
Goodyear & Litchfield Park	-	-	11	7	-	-	-	10.5	6.7	-
Kingman	-	-	-	7	-	-	-	-	12.5	-
Laveen Village	-	-	-	7	7	-	-	-	7.6	7.8
Maricopa	-	6	-	-	8	-	8.7	-	-	10.9
Maryvale Village	17	20	27	50	39	4.1	5	7.1	13.5	10.8
Mesa Central	19	14	14	18	16	12.7	9.4	10	14.8	11.8
Mesa East	-	9	9	9	7	-	11.5	11.8	11.7	9.5
Mesa Gateway	9	6	7	13	10	7	4.8	5.2	10.3	6.6
Mesa North	10	-	8	11	10	9.7	-	7.7	11	9.7
Mesa West	19	13	24	25	30	9.9	6.7	12.8	14.5	17.3
North Mountain Village	28	32	28	41	38	12.4	14	12.9	20.2	18.2
Paradise Valley Village	6	15	16	15	11	3.1	7.7	8.5	8.6	6.3
Pascua Yaqui Tribe	6	-	-	-	-	103.4	-	-	-	-
Peoria North	11	-	-	-	8	11.2	-	-	-	7.9
Peoria South	8	-	6	13	14	8	-	6.1	14.3	15.4
Prescott Valley	-	-	6	-	-	-	-	10.2	-	-
Salt River-Pima	-	-	-	-	7	-	-	-	-	78.7
San Tan Valley	13	-	-	9	7	10	-	-	6.3	5
Sierra Vista	-	7	-	-	-	-	11.4	-	-	-
South Mountain Village & Guadalupe	9	14	27	19	29	4.3	6.9	13.9	10.2	16.2
Surprise South	-	8	6	9	17	-	6.9	5.4	8.1	14.5

Tempe North	-	9	14	7	15	-	9.1	13.4	6.8	15.4
Tempe South	-	-	-	-	9	-	-	-	-	16.2
Tucson Central	31	29	23	24	26	24.6	24.5	20.1	20.3	24
Tucson East	15	21	23	13	17	13.2	17.8	20.1	12.3	15.8
Tucson Foothills	21	25	24	35	27	18.7	23.6	22	35	28.7
Tucson South	26	23	25	21	35	10.2	9.5	11	9.7	15.9
Tucson South East	-	9	-	-	-	-	17	-	-	-
Tucson West	6	8	-	-	-	16.2	23.7	-	-	-
Valencia West	-	-	-	6	-	-	-	-	21	-
Yuma	-	-	7	14	8	-	-	4	8	4.8

\*Non-zero counts and rates with less than 6 events have been suppressed.

- Locations are not represented in the Primary Care Areas for that reported year.

## Appendix D: References

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