Neonatal Abstinence Syndrome in Tennessee 2022

2024 NAS Surveillance Annual Report

Tennessee Department of Health
Division of Family Health and Wellness
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Table of Contents



03
Executive Summary

04
Summary Highlights

05
Introduction

06
Statewide Data

08
IMaternal Characteristics & Infant Outcomes

10
Source of Exposure

10
Non-mutually Exclusive Sources

11
Mutually Exclusive Categories of Exposure

12
Class of Prescription Drug Use

13
Incidence of Reported Cases by Region

14
NAS Case Rate by Region

14
Exposure Source by Region

15
Mutually Exclusive Sources by Region

17
Success Story

18
Recommendations, Conclusions & Next Steps

Executive Summary

The Tennessee Department of Health (TDH) established Neonatal Abstinence Syndrome (NAS) as a reportable condition in 2013. Despite progress in addressing the opioid epidemic and improvements in care for the pregnant woman-infant dyad, NAS remains a significant public health threat in Tennessee and the need for timely data remains. Since being added to the reportable disease list, TDH had seen annual increases in the number of cases of NAS until 2018, which marked the first decrease in the number of cases. This year's report provides an analysis of data reported to TDH during 2022. During the 2022 surveillance period, 797 cases of NAS were reported to the TDH surveillance portal, which is a slight, yet insignificant, increase from the prior year (n=758). Tennessee's NAS rate (9.8 per 1,000 live births) remains markedly higher than the national rate (6.3 per 1,000 live births; based on 2020 data, the most recent data available). In addition, rates of NAS remain highest in the eastern part of the state.

The TDH NAS Surveillance Program continues to monitor and identify trends in the substances associated with NAS. As in recent years, most cases of NAS are associated with medication for opioid use disorder (MOUD), and there was a slight increase in the percent of infants exposed to MOUD from 57.7% in 2021 to 61.6% in 2022. However, the proportion of cases exposed to illicit drugs or diverted medications has increased in recent years, most recently from 32.7% in 2021 to 34.3% in 2022. This report also highlights regional disparities in substance exposure and underscores the association between social determinants of health, such as access to prenatal care, and NAS. For instance, in 2022, 53% (n=454) of women who had infants diagnosed with NAS received inadequate prenatal care.

Findings from this year's report highlight the ongoing need for public health approaches to address substance use in pregnancy and substance exposure among infants. Public health approaches include promoting positive childhood experiences (PCEs), improving access to treatment for substance use disorders (including MOUD) for pregnant women, addressing health disparities in NAS, and connecting families to care coordination programs. TDH looks forward to continued collaboration with partners to expand surveillance capacity and improve the system of care for infants affected by NAS and their families.

Summary Highlights

2022 Statewide Data Highlights

NAS Surveillance System Data (from hospital reporting):

·The number of cases reported to TDH increased from 758 in 2021 to 797 in 2022

·The rate of reported cases of NAS increased from 9.3 per 1,000 live births in 2021 to 9.8 per 1,000 live births in 2022

2022 Exposure Data Highlights

·Of infants diagnosed with NAS, 61.6% were exposed to medication for opioid use disorder(MOUD)

·More than half of women (53.0%; n=454) who had infants diagnosed with NAS received inadequate prenatal care (compared to 20% of all women with live born infants)The number of cases exposed to illicit drugs/diverted medications has increased over the last 5 years

2022 Regional Trends

·The eastern part of the state continues to experience the highest case rate of NAS

·The use of other illicit drugs (not including diverted medications or heroin) increased statewide to 46.4% of NAS cases compared to 33.4% of NAS cases in 2021

·The use of legally obtained non-opioid medication increased statewide from 2.7% in 2021 to 4.5% in 2022



Introduction

NAS is a condition in which an infant undergoes withdrawal from a substance to which he or she was exposed in-utero. Substances, such as opioids, antidepressants, benzodiazepines, and barbiturates, may cause NAS when used during pregnancy. The most common substances causing NAS are opioids. Neonatal opioid withdrawal syndrome (NOWS) is a newer term used to describe opioid-only withdrawal signs. This can include legally prescribed opioids, including pain relievers (e.g., morphine) and medication for opioid use disorder (MOUD; e.g., buprenorphine, methadone), or illicit drugs (illegal drugs; e.g., heroin).

Use of other substances, such as cigarettes, benzodiazepines, and gabapentin, during pregnancy may influence the onset, severity, or duration of the withdrawal syndrome. In addition, a pregnant woman may obtain a substance through drug diversion, i.e., transfer of a legally prescribed controlled substance from the individual for whom it was prescribed to another person for an unprescribed use.

In 2013, Tennessee became the first state in the nation to require reporting of NAS for public health surveillance purposes. Hospitals and providers are required to report all diagnoses of NAS within 30 days of diagnosis. Hospital reporting can provide timely information on number and rate of NAS cases, including geographical differences, and details about each NAS diagnosis, including the source of exposure.



Statewide Data

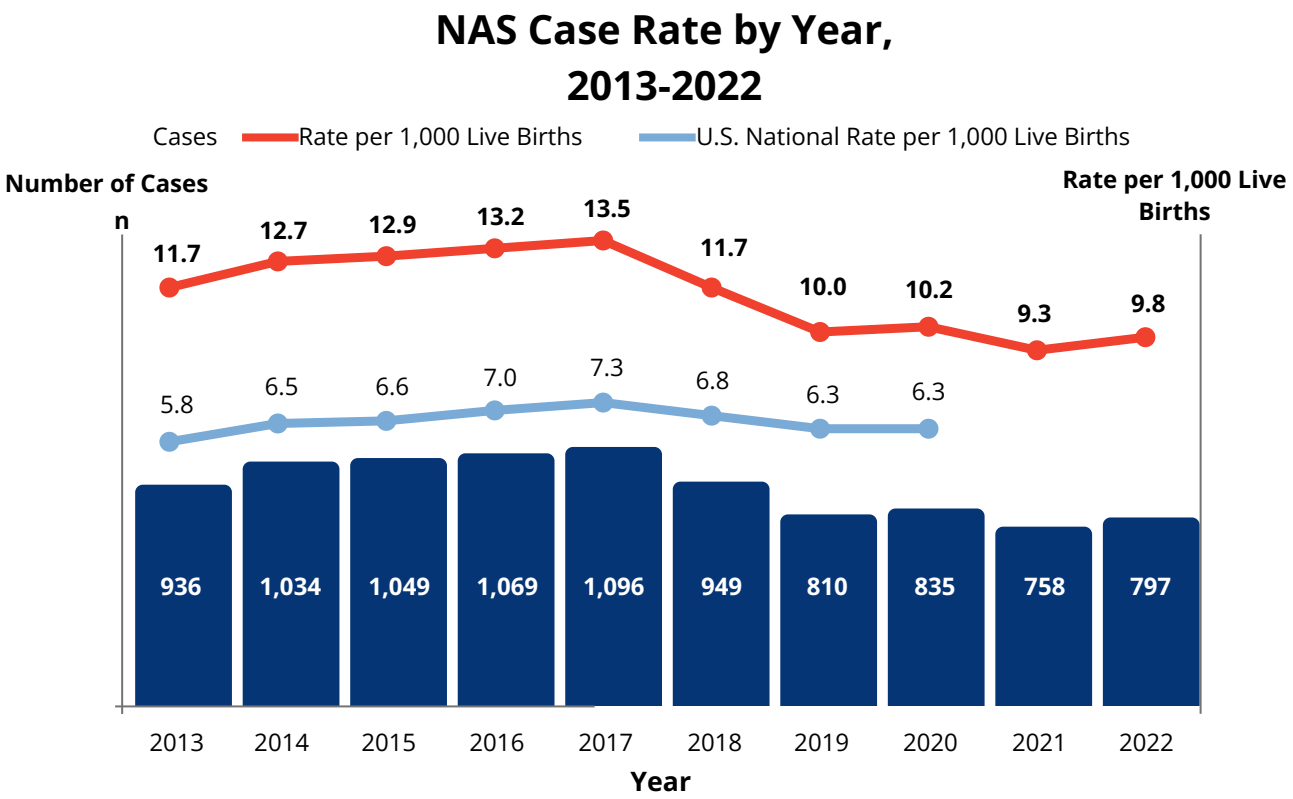
Data Sources

Multiple data sources were utilized in the development of this year's report to provide a more complete picture of NAS in Tennessee. The primary source of data continues to be the NAS Surveillance System, which contains information on NAS cases reported by hospitals. In Tennessee, hospitals and providers are required to report cases of NAS within 30 days of diagnosis. Each reported case was then linked to the Birth Statistical Data Systems allowing administrative data to be reviewed and analyzed. This year's report provides an analysis of data reported to TDH on 2022 cases of NAS among Tennessee resident births.

Case Reports

In 2022, providers reported 797 cases of NAS to the surveillance portal. An additional 280 cases of infants with in-utero drug exposure but no clinical signs of withdrawal were reported; these infants were not included in this analysis as clinical withdrawal is the definitive characteristic of NAS. Many cases (88.1%; n=705) were reported by the baby's birth hospital, and 11.8%were reported after the baby was transferred to another facility.





Source: Neonatal Abstinence Syndrome Surveillance System, Tennessee Department of Health and Healthcare Cost and Utilization Project (HCUP)

Figure 1: Number of Cases of Neonatal Abstinence Syndrome as a Percentage of Live Births in Tennessee and U.S. Rates, 2013-2022.

Number and Rate of Reported Cases

Since being added to the reportable disease list in 2013, the number and rate of NAS cases had increased until 2018, which marked the first decrease in the number of reported cases. Since 2019, there have been slight fluctuations in the number of cases reported each year without any significant trend being noted. In 2022, 1.0% (n=797) of live births were diagnosed with NAS, an increase from 0.9% of live births (n=758) in 2021 (See Technical Note) (Figure 1). Any additional cases from 2022 that are submitted after publication of this report will be included in next year's report. National NAS rates are available through 2020 from the Healthcare Cost and Utilization Project (HCUP). The HCUP database contains administrative data, and cases of NAS were identified by ICD-10-CM codes. When compared to HCUP data, Tennessee's rate of NAS cases continues to stay above the U.S rate.

Maternal Characteristics & Infant Outcomes

86% of women who had an infant diagnosed with NAS were non-Hispanic White



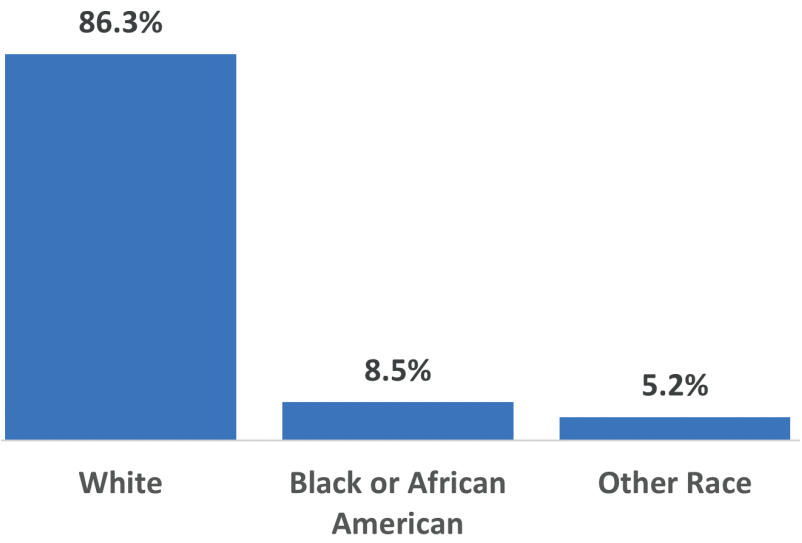


Figure 2: Percentage of NAS cases by Maternal Race, 2022

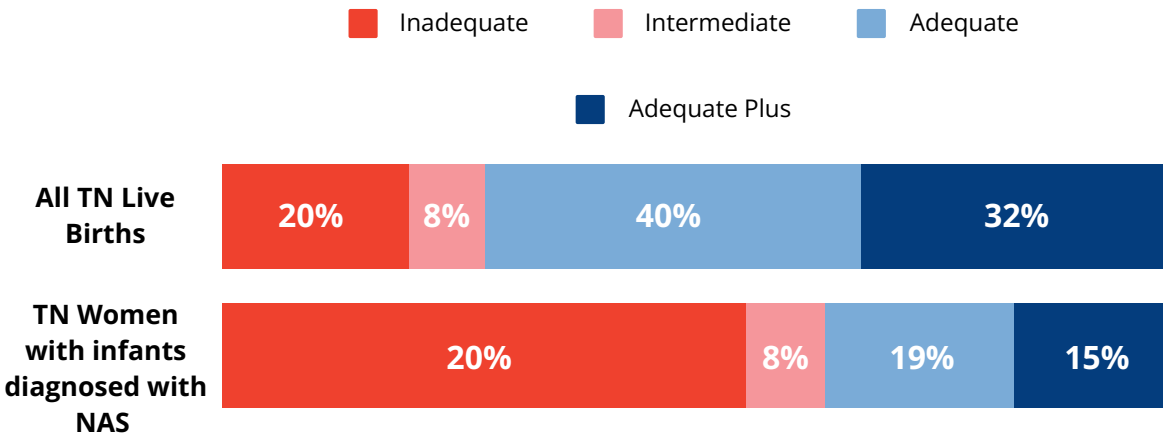
NAS cases were examined by race/ethnicity. Eighty-six percent of infants with NAS were born to Non-Hispanic White women (Figure 2), which is higher than the percentage of all Tennessee births born to Non-Hispanic White women (69.7%) in 2022, Most of the cases (84%) were also on TennCare (Tennessee Medicaid). Of infants diagnosed with NAS, 61.6% were exposed to medication for treatment of opioid use disorder (MOUD). When stratified by race and ethnicity, 65.2% of non-Hispanic White pregnant women received MOUD compared to 27.3% of non-Hispanic Black pregnant women, indicating a need to address disparities in addiction treatment.

Sixty-six percent of women with an infant with NAS reported smoking during pregnancy, which is 6 times higher than the reported smoking rate among women who had a live born infant without NAS. Smoking during pregnancy can affect the onset, severity, or duration of the withdrawal signs and increase the risk of multiple medical problems, including preterm birth and low birth weight.

Twenty-nine percent of infants with in-utero exposure were admitted to the NICU. It is also important to note that 27.3% of women who had an infant diagnosed with NAS were positive for Hepatitis C Virus compared to 1.1% of women in Tennessee who gave birth in 2022.

Women who receive early and adequate prenatal care have better outcomes than women who do not. In 2022, more than half of women (53.0%; n=454) who had babies diagnosed with NAS received inadequate prenatal care compared to 20% of all women with live born infants. Of the women who received inadequate prenatal care, 38.3% (n=158) received no prenatal care. The percent of prenatal care levels among women with live births is shown in Figure 3. Prenatal care adequacy is measured using the Adequacy of Prenatal Care Utilization Index. This index combines information about the timing of prenatal care, the number of visits, and the infant's gestational age to classify prenatal care into one of four categories (inadequate, intermediate, adequate, and adequate plus).

53% of women who gave birth to an infant with NAS received inadequate prenatal care





Source of Exposure for NAS Infants

The NAS Surveillance System collects nine categories of substances to which an infant was exposed (Figure 4). Individual cases could have been exposed to multiple substances; therefore, percentages may sum to greater than 100%. Consistent with previous years' data, most infants were exposed to medication for opioid use disorder (MOUD; 61.6%). MOUD in combination with therapy is the standard of care for pregnant women with opioid use disorder (OUD). In 2022, 22.1.% (n=177) of infants were exposed to diverted prescription opioid medications. This was an increase from the prior year in which 19.3% (N=146) of infants were exposed to diverted prescription opioid medications. In addition, there was a significant increase in the percentage of cases exposed to other non-prescription substances, from 36.8% (n=279) in 2021 to 43.9% (n=350) in 2022.

Non-mutually Exclusive Sources

Here are the percent of non-mutually exclusive sources of exposure for NAS cases between 2019-2022.

Exposure Source	2019	2020	2021	2022	Trend
Medication assisted treatment (MAT)	64.9	62	57.7	61.6	
Prescription opioid without prescription	26.5	23.5	19.3	22.1	
Other non-prescription substance	23.4	25.2	36.8	43.9	
Non-opioid prescription without a prescription	11	11.5	29.9	32.4	
Legal prescription of an opioid pain reliever	5.2	2.7	3	2.6	
Legal prescription of a non-opioid	6.7	5.5	6.3	4.8	
Heroin	8.2	10.3	9.1	9.2	
Other	4.6	5.1	0	0	

Figure 6: Mutually Exclusive Sources of Exposure for Neonatal Abstinence Syndrome Cases, Tennessee 2017-2022.

62%

Similar to previous years, the highest percentage of cases were exposed to MOUD. MOUD plus therapy is the standard of care for pregnant women with OUD.

44%

We saw a significant increase in 2022 from prior years in the number of cases exposed to other non-prescription substances

When separated into mutually exclusive categories of exposure,* 69.0% of infants with NAS were exposed to at least one prescription medication, an increase from 67.0% in 2021. Forty-three percent of cases were exposed to prescription medications only, 34.3% were exposed to illicit drugs/diverted medications only, and 22.2% were exposed to a combination of prescription and illicit or diverted drugs (Figure 5). In 2022, 42.9% of cases were exposed to prescription medication only, a 4.5 percentage point increase compared to 2021. Overall, the proportion of NAS cases exposed to illicit drugs or diverted medications has increased in recent years. The proportion of cases exposed to illicit drugs or diverted medications also saw a slight increase (34.3% of cases in 2022 compared to 32.7% in 2021).

Mutually Exclusive Sources of Exposure, NAS 2018-2022

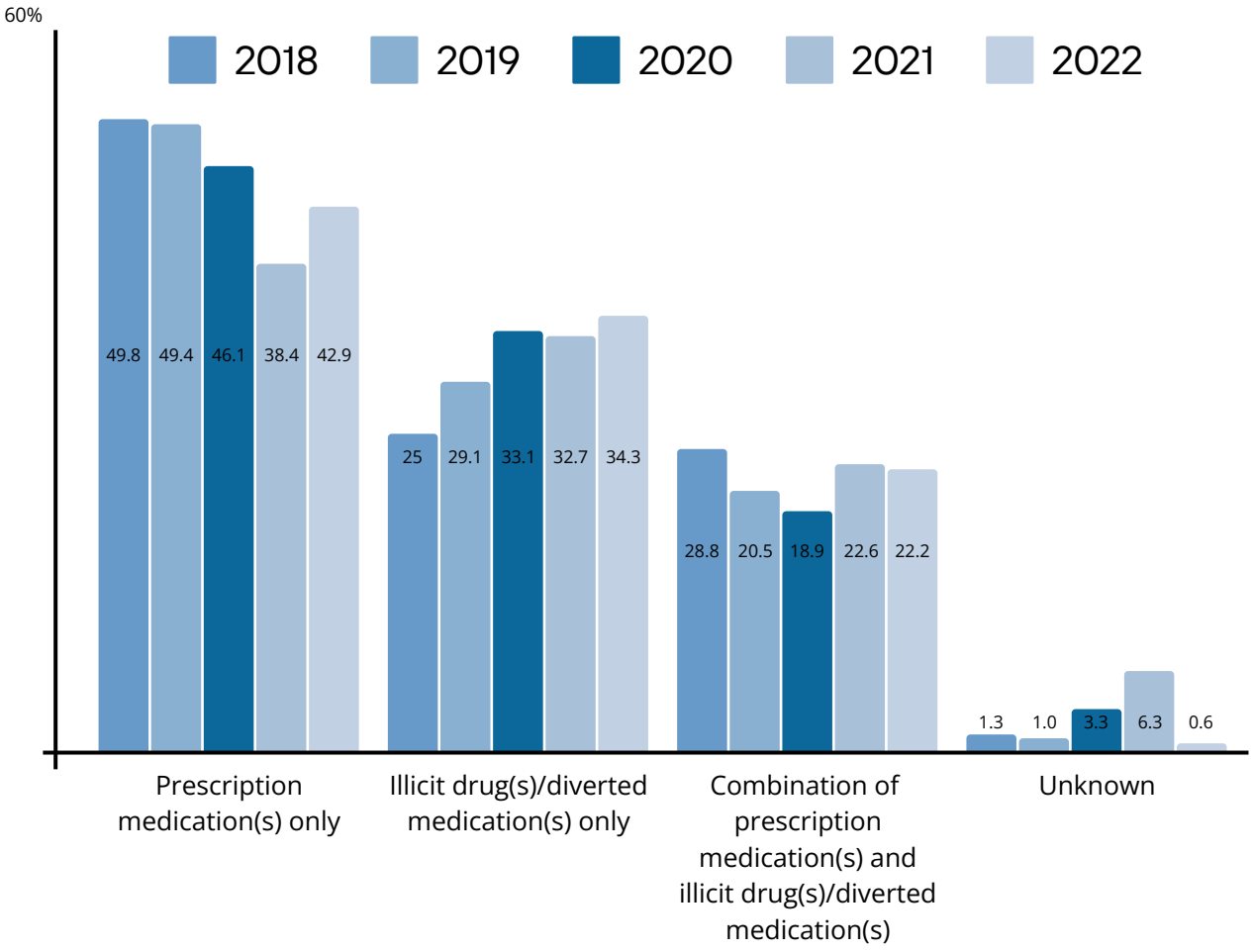


Figure 5: Mutually Exclusive Sources of Exposure* for Neonatal Abstinence Syndrome Cases, Tennessee 2018-2022.

*Derivation of mutually exclusive categories of exposure:
1. Prescription medications only = MOUD and/or legal prescription of an opioid and/or legal prescription of a non-opioid
2. Illicit drugs or diverted medications only = Opioid medication obtained without a prescription, non-opioid medication obtained without a prescription and/or heroin, and/or other illicit drugs
3. Combination of prescription medications and illicit drugs/diverted medications = At least one medication from the "prescription medications only" category AND at least one substance from the "illicit drugs or diverted medications only" category
4. Unknown = Information about the source of exposure was not reported

Figure 6 provides further detail on the prescription type (MOUD, legal opioid medication, or legal non-opioid medication) among those with prescription drug exposure. In 2022, most infants (89.3%) with exposure to prescription medications were exposed to MOUD. The percentage of infants exposed to MOUD among those with prescription drug exposure has increased from 2018-2022. In contrast, the percentage of infants exposed to a legal opioid pain reliever among those with prescription-only exposure decreased from 2018 to 2022 (7.9% to 3.8%) The percentage of infants exposed to legal non-opioid medications among those with prescription-only exposure has also decreased from 2018 to 2022 (9.8% to 6.9%).

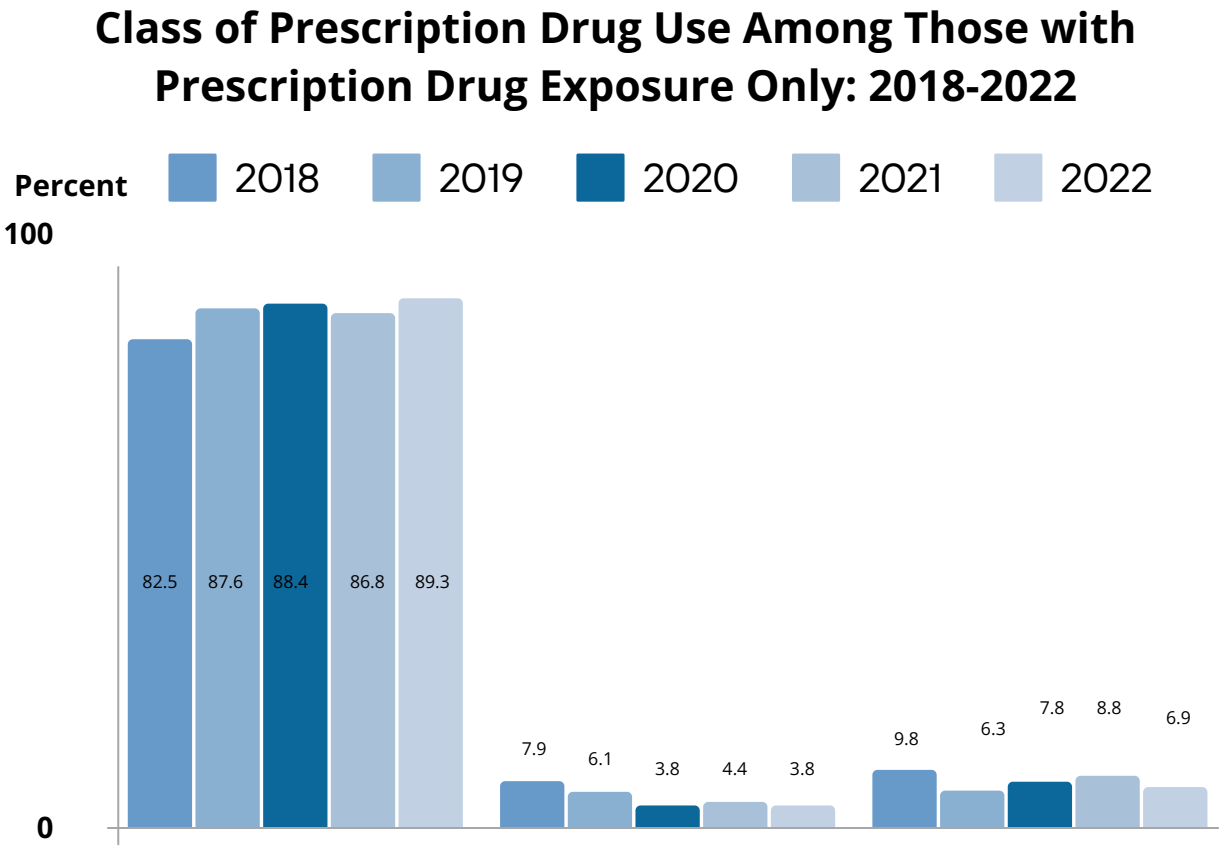


Figure 8: Class of Prescription Drug Use Among Those with Prescription Medication Exposure Only, 2017-2022.

Regional Data

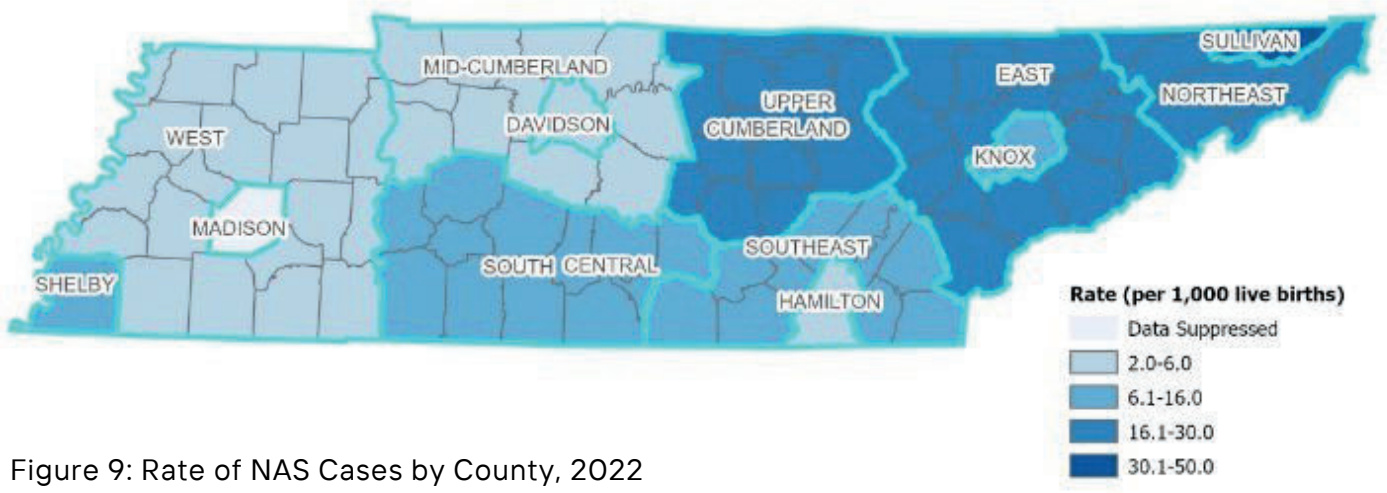


Figure 9: Rate of NAS Cases by County, 2022

Incidence of Reported Cases by Region

As in previous years, NAS Surveillance System data (hospital reporting data) were used to analyze the rates of NAS cases by health region. Rates of NAS cases were lowest in West Tennessee and increased in an easterly fashion (Figure 7). Data for Jackson-Madison were suppressed due to small case counts (less than 11 reported cases in 2022).

Figure 8 shows the annual NAS case rate by region from 2019-2022. In 2022, the East Region and Knox County showed a statistically significant overall decrease in the rate of cases of NAS compared to 2021 ($p < 0.05$). However, Upper Cumberland Region had statistically significant ($p<0.05$) increases in the number and rate of cases of NAS in 2022 compared to the prior two years.



NAS Case Rate, by Region

Here are the rates per 1,000 live births by region/metro for 2019-2022.

Region/Metro	2019	2020	2021	2022	Trend	2022 Rate
Sullivan	46.5	57.7	50.5	47.2		
Northeast	36.1	32.7	29.2	30.0		
East	20.9	24.0	26.3	20.7		
Upper Cumberland	17.1	11.2	16.6	20.4		
Knox	14.5	18.0	14.2	12.6		
South Central	12.9	12.1	8.6	8.6		
Southeast	7.9	5.5	4.9	7.1		
Shelby	4.0	6.3	6.0	6.3		
Davidson	2.8	4.4	3.1	5.8		
Mid-Cumberland	5.5	4.0	2.3	4.5		
West	4.2	2.1	3.8	3.8		
Hamilton	5.6	5.8	2.9	3.0		
Jackson-Madison	<11	<11	<11	<11		<11

Figure 11: Rate per 1,000 Live Births of NAS Cases by TDH Health Region, 2019-2022.

Exposure Source by Region

Geographic variation in the substance causing NAS has been noted in previous years and continues to be observed throughout the state (Figure 9). The following regions had the highest proportions of cases with prescription medication(s) only identified as the source of exposure: Upper Cumberland Region with 51.3% of casesand South Central Region with 50% of cases (Figure 9). Consistent with prior years, the highest proportion of cases exposed to illicit drugs/diverted medications continues to be observed in Shelby County (61.8% of cases).

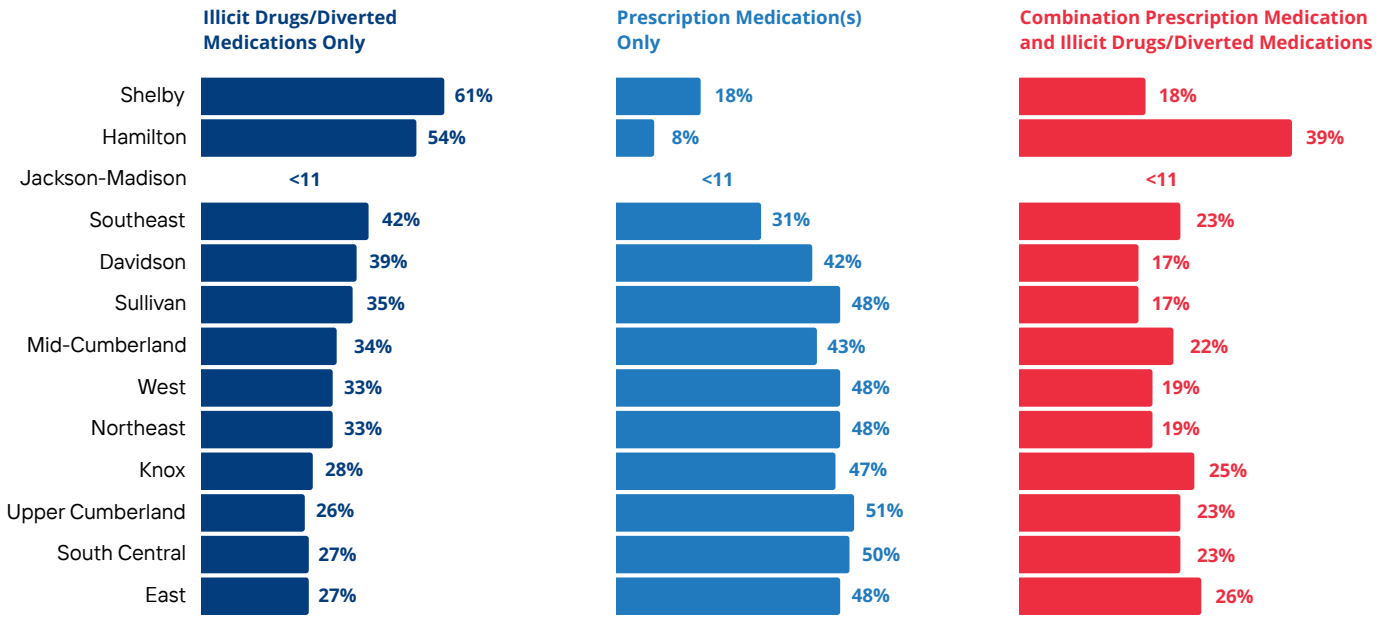


Figure 9: Distribution of Mutually Exclusive Sources of Exposure by Health Region for Neonatal Abstinence Syndrome Cases, 2022

Similar to prior years, exposure to diverted non-opioid medications was more common than diverted opioid medications. The highest proportion of cases of NAS exposed to diverted non-opioids was observed in Hamilton County, Sullivan County, and the Mid-Cumberland Region (Figure 10).

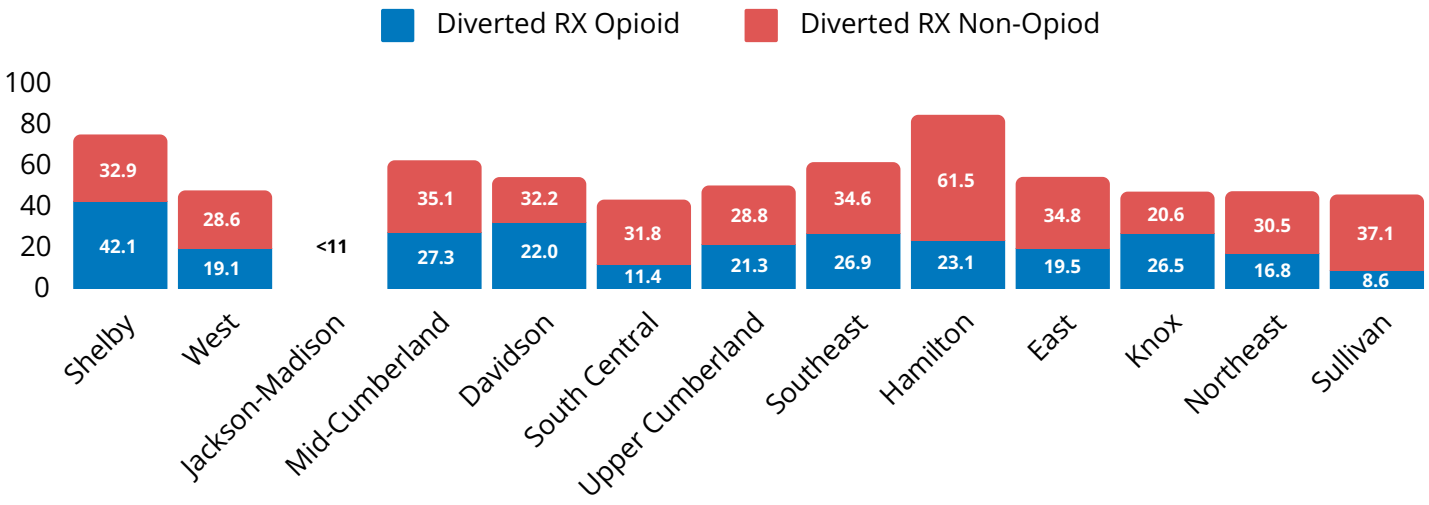


Figure 10: Prevalence of Exposure to Diverted Prescription Medications among NAS Cases by Region, 2022

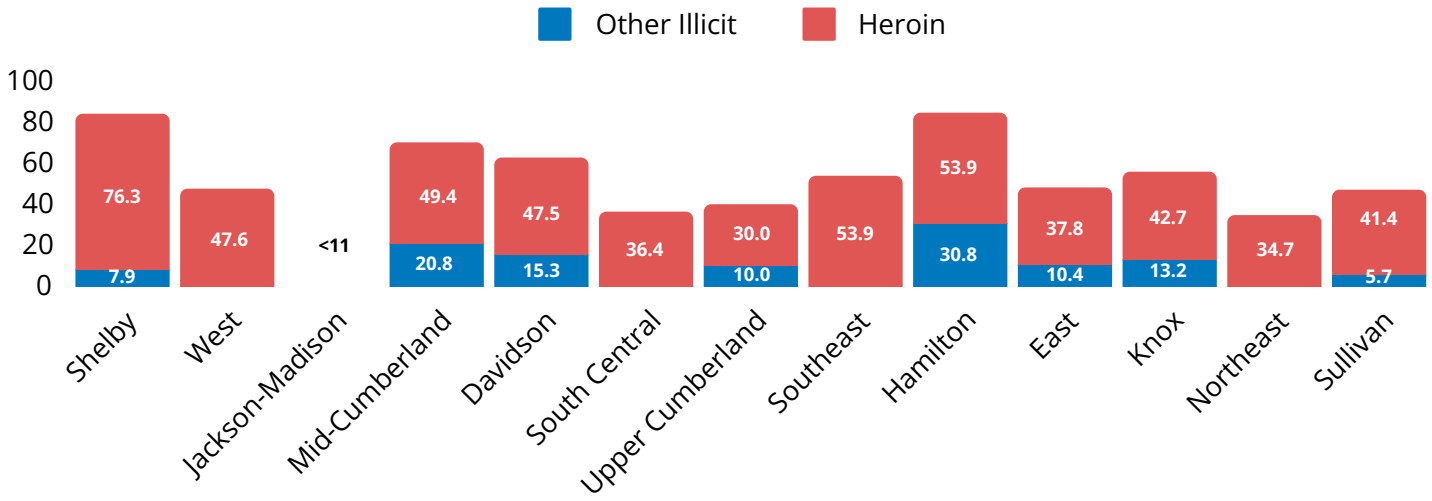


Figure 11: Prevalence of Exposure to Illicit Drugs among NAS Cases by Region, 2022

Exposure of NAS cases to heroin remained stable statewide at 9.3% of cases (n=74) but continues to differ by region. In 2022, there was an increase in the number of NAS cases exposed to heroin in Mid-Cumberland (20.8% compared to 10.5% in 2021) and Hamilton County (30.8% compared to 9.1% in 2021) (Figure 11). In contrast, there was a decrease in the number of NAS cases exposed to heroin in Davidson County (32.3% to 15.3%) and Knox County (22.7% to 13.2%).

In 2022, the use of MOUD also saw a statewide increase from 2021 (with an average of 58.8% in 2022 and range of 34.2%-71.3%) (Figure 12).

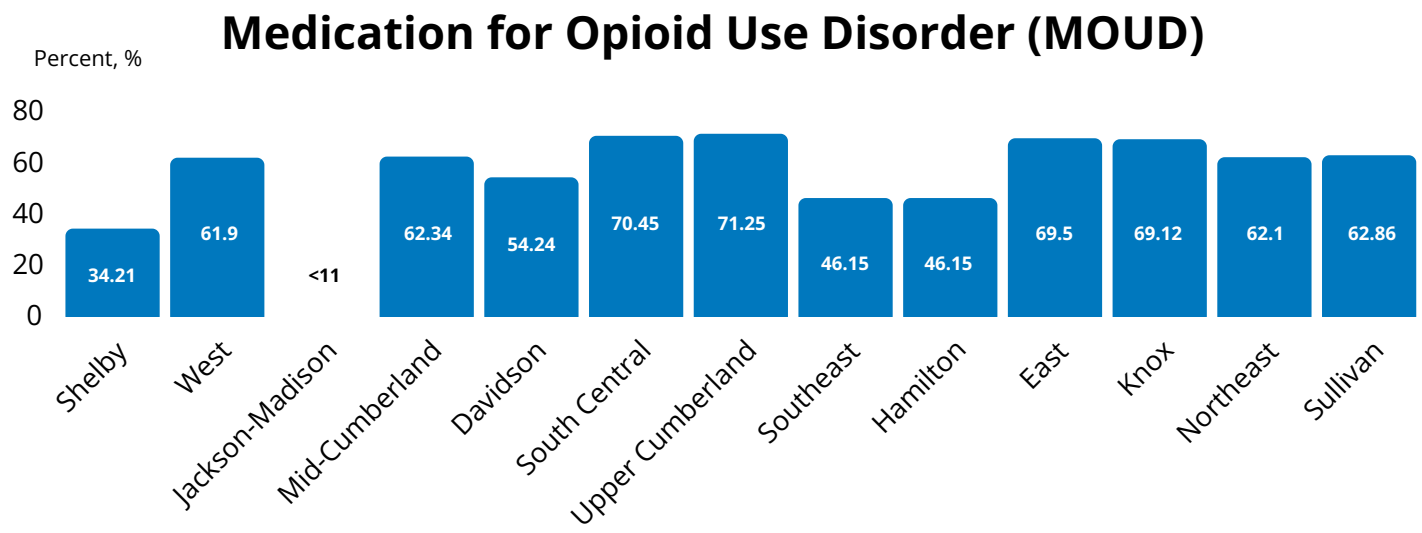


Figure 12: Prevalence of Exposure to MOUD among NAS Cases by Region, 2022

Success Story

Firefly is an outpatient treatment program for pregnant and postpartum women with substance use disorder (SUD) and their infants, based in the Center for Women's Health at Vanderbilt University Medical Center. The program's interdisciplinary multispecialty team provide wholistic, trauma-informed care to women struggling with SUD and their families.

Firefly strives to remove barriers to sustained health and support long-term recovery by addressing all aspects of a patient's mental, physical, and health-related social needs. In addition to providing medications for substance use disorder, perinatal and well-woman care, mental health treatment, infectious disease treatment, social work and peer support, the program also supports women with free diapers, donated clothing and food, transportation assistance, maternal and infant items through a contingency management program, group therapy, community resource referrals, and more.

Firefly treats over 300 patients per year from 26 counties in Middle Tennessee, 87% of whom are Medicaid recipients. As a result of Firefly's services, rates of pre-term birth have decreased, NICU admissions have decreased, infant length of stay has decreased, and breastfeeding rates have increased. Approximately 91% of Firefly babies are discharged home with their biological mom, which demonstrates the effectiveness of comprehensive prenatal treatment. More information is available at fireflytn.org.

Recommendations, Conclusions & Next Steps

Recommendations for Partners and Policy Makers

Findings from this year's report highlight the ongoing need for public health approaches to address substance use in pregnancy and substance exposure among infants:

Pre-Pregnancy

1. Expand programs and initiatives to prevent substance use disorders among women of childbearing age (e.g., improved prescribing practices).
2. Improve access to programs and primary care aimed to optimize preconception health.
3. Improve access to client-centered family planning. Client-centered care is respectful of and responsive to individual client preferences, needs, and values.
4. Promote Positive Childhood Experiences (PCEs). PCEs stem from supportive and nurturing environments and have the potential to mitigate or prevent traumatic events or adverse childhood experiences (ACEs).

Prenatal

1. Screen for substance use in pregnancy using a validated screening tool (e.g., NIDA Quick Screen or 4 Ps).
2. Improve access to treatment for substance use disorders and other mental health conditions for pregnant women. FindhelpnowTN.org is an online directory of licensed substance use disorder treatment facilities in Tennessee. The website allows users to find providers based on the type of treatment needed, type of payment and insurance accepted, availability of wrap-around services, and the desired location.
3. Reduce the stigma associated with substance use disorders and other mental health conditions during pregnancy.
4. Connect pregnant women to services and programs such as Evidence- Based Home Visiting, Tennessee Tobacco QuitLine, and Pregnancy Smoking Cessation
5. Connect families to resources available at local health departments, including WIC.
6. Identify and address health disparities in access to substance use disorder treatment.

Neonatal

1. Improve the surveillance of NAS and infants with prenatal substance exposure.
2. Improve the standardization of care for infants with prenatal substance exposure.
3. Identify and address health disparities in NAS and prenatal substance exposure.
4. Connect infants and families to care coordination and support services, such as Evidence-Based Home Visiting, TEIS, and CHANT.

Childhood

1. Support research on the long-term risks of prenatal substance exposure.
2. Connect children and families to support services, such as TEIS, and programs, such as Head Start and Early Head Start.

Conclusions

The TDH NAS Surveillance Program was established in 2013 when NAS first became a reportable condition. The 2013 to 2020 annual reports featured data on NAS cases reported by hospitals. Beginning in 2021, data from new sources (hospital discharge data and birth statistical data) were analyzed and incorporated. The inclusion of additional data sources provides a more comprehensive picture of NAS in Tennessee.

In 2022, there was a slight increase in the number of reported cases (n=797), which followed a slight decrease in 2021 (n=758). Geographic variability continues to be observed among reported cases, and the eastern part of the state continues to see the highest rate of reported cases. This year's report also included U.S. rates of NAS, which is available through 2020. From 2013-2020, Tennessee continued to see above average rates of NAS compared to the rest of the country.

As in previous reports, the source of exposure for NAS continues to be analyzed. Since 2013, there has been a shift in the exposure sources associated with NAS, with more women who give birth to infants with NAS taking medications prescribed by a provider. The high proportion of cases of NAS involving medication for opioid use disorder, or MOUD, suggest that women with a history of substance use disorder are receiving treatment during pregnancy. There was a slight increase in the percent of infants exposed to MOUD from 57.7% in 2021 to 61.6% in 2022. While the source of exposure for most infants with NAS remains prescription medications, it is important to note that the proportion of cases exposed to illicit drugs/diverted medications has increased in recent years, most recently from 32.7% in 2021 to 34.3% in 2022. Furthermore, there are regional and racial/ethnic disparities in the proportion of NAS cases associated with MOUD (signifying access to substance use disorder treatment) versus illicit drugs or diverted medications.

New analyses included in this year's report highlight the intersection of social determinants of health and NAS. In 2022, 53% of women who had a baby diagnosed with NAS received inadequate prenatal care, and among these women, 38.3% (n=158) received no prenatal care. Twenty-nine percent of infants with in-utero exposure were admitted to the NICU, and most of the women (84%) had insurance through Tennessee Medicaid (TennCare). Sixty-six percent of women reported smoking during pregnancy, which is 6 times higher than the reported smoking rate among women who had a live born infant without NAS.

Next Steps

The NAS Surveillance Program has focused on expanding its surveillance capacity, improving care coordination efforts, and strengthening collaboration with partners, such as the TDH Overdose Response Coordination Office. In 2020, the program was selected to participate in the Council of State and Territorial Epidemiologist's (CSTE) NAS standardized case definition implementation project. In 2023, TDH was awarded funding from the Centers of Disease Control and Prevention to expand current NAS surveillance efforts and improve the system of care for infants with NAS and their families.

Furthermore, the NAS Surveillance Program launched a case management system, which improves the process of referring infants and families to services, such as the Tennessee Early Intervention System (TEIS) and the care coordination program CHANT. The NAS surveillance Program looks forward to continued collaboration with partners to guide the future of NAS prevention efforts, surveillance, and care coordination for infants.

In fall 2023, TDH was awarded a five-year Maternal Mental Health and Substance Use Disorder (MMHSUD) grant from the Health Resources and Services Administration (HRSA). The TDH MMHSUD Program aims to increase routine behavioral health screening for pregnant and postpartum women, routine detection, assessment, brief intervention, treatment, and referral for maternal mental health conditions.



Acknowledgements

The NAS Surveillance Program would like to thank healthcare providers, hospital staff, and partners for their continued support and guidance.

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Technical Notes

1. At publication of the 2021 Neonatal Abstinence Syndrome Surveillance Annual Report, 734 cases with a birthyear of 2021 had been reported. After publication of the 2021 report, an additional 25 cases were reported and are included here.
2. All rates for 2022 were calculated using data on Tennessee resident births from the 2022 Birth Statistical File as the denominator.

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