

Neonatal Abstinence Syndrome Surveillance Annual Report 2018



Miller AM and McDonald M
Tennessee Department of Health
Division of Family Health and Wellness

A Note to the Reader:

In some cases (particularly in looking at data at the regional level), the counts included in this report are small and therefore may be statistically unreliable. Therefore, readers should interpret all findings with caution. We especially encourage caution in interpreting findings and comparing differences across regions.

If you have questions about particular data points or need assistance in interpreting the data, please contact Angela M. Miller, PhD, MSPH.

Phone: (615) 253-2655
Email: angela.m.miller@tn.gov

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Executive Summary

Since the early 2000s, the use of opioid pain relievers in the US and Tennessee has increased rapidly. Accompanying this increase in drug use has been a ten-fold increase in the incidence of Neonatal Abstinence Syndrome (NAS), a condition in which an infant experiences withdrawal from opioid substances the mother took during pregnancy. In an effort to monitor the extent of the rise in NAS cases, the Tennessee Department of Health established NAS as a reportable condition, effective January 1, 2013.

In 2018, the state **saw the first decline in NAS rates since surveillance began in 2013**. While a single year's decrease does not indicate a trend, it is certainly a success worthy of highlighting. A number of prevention initiatives have occurred across the state, all contributing to the decrease. TDH will continue to monitor NAS, with the hope that rates will continue to drop.

Another success to highlight includes a **sustained shift from diverted prescription exposure to MAT and prescribed medications**. This indicates that pregnant women at risk of delivering a substance dependent infant are working with their medical providers to promote a healthy pregnancy. Reduced access to opioid medications may have also resulted in fewer of these medications being used irresponsibly or made available for diversion. Data from the Controlled Substance Monitoring Database Program shows that the number of Tennessee patients filling prescriptions has decreased for each of the last five years, with the number of opioid prescriptions dispensed in Tennessee dropping 13.2% between 2017 and 2018.

The high percentage of infants diagnosed with NAS with exposure to prescribed medications still points to the ongoing need for primary prevention of NAS—preventing substance misuse/abuse among women of childbearing age, and preventing unintended pregnancies among women at risk of misusing/abusing substances.

Introduction

Neonatal Abstinence Syndrome (NAS) is a condition in which an infant undergoes withdrawal from a substance to which he or she was exposed in-utero. The most common substances causing NAS are the opioid class of drugs, which includes as well as opioid pain medications such as morphine, illicit substances such as heroin and medication-assisted treatment such as buprenorphine and methadone. NAS can occur when a pregnant woman takes prescription medications prescribed to her, an illicit drug, or a prescription medication written for someone else but diverted to her.

Since the early 2000s, the incidence of NAS in Tennessee has increased by 10-fold, far exceeding the national 3-fold increase over the same time period. A sub-cabinet working group focused on NAS and consisting of Commissioner-level representation from the Departments of Health, Children's Services, Mental Health and Substance Abuse Services, Medicaid (TennCare), Safety and the Children's Cabinet was convened in 2012. This group has focused on aligning efforts across state agencies, with a focus on upstream (primary) prevention strategies.

In 2013, Tennessee became the first state in the nation to require reporting of NAS for public health surveillance purposes. Providers are required to report all diagnoses of NAS within 30 days of diagnosis. The data in this report reflect reporting to this surveillance system for CY2018.

Statewide Data

Highlights: Statewide Reporting

- Number of cases decreased from 1,096 in 2017 to 927 in 2018.
- More males were diagnosed with NAS than females.
- In CY 2018, most NAS cases were reported by the infant's birth hospital.

Case Reports

During CY2018, providers reported 927 cases of NAS to the surveillance portal. An additional 102 cases of infants with *in-utero* drug exposure but no clinical signs of withdrawal were also reported; these infants are not included in this analysis as clinical withdrawal is the definitive characteristic of NAS.

The majority of cases (92.3%; n=856) were reported by the baby's birth hospital, and 7.3% (n=68) were reported after the baby was transferred to another facility. Three additional cases were reported after being diagnosed in an outpatient setting or after being readmitted to a hospital after birth.

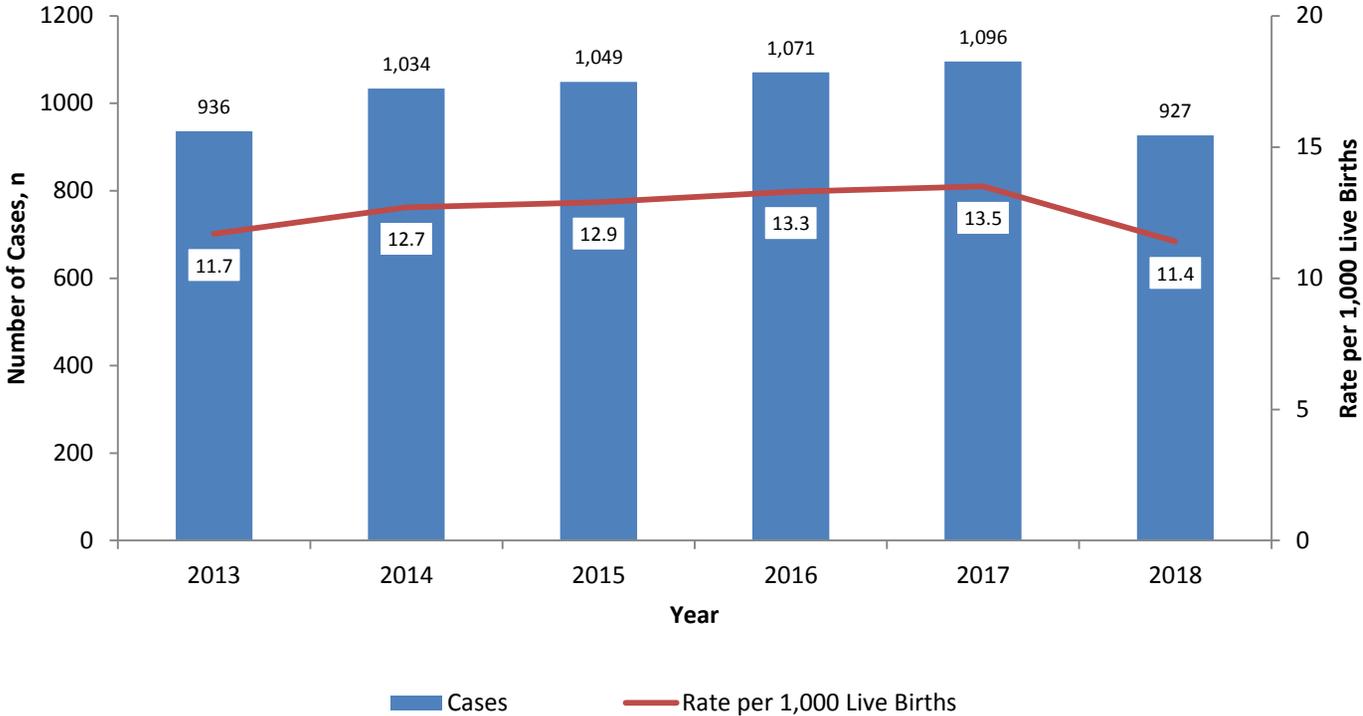
Reported cases of NAS were more likely to be male than female (54.9% versus 45.1%; $p < .01$). This finding is consistent with previous years of NAS Surveillance data, as well as published literature^{1,2}. One infant was reported with unknown sex.

The Tennessee Department of Health (TDH) requires that all cases of NAS be reported within 30 days of diagnosis. In 2018, the average of length of time between the date of birth and date of reporting was 32.4 days (range 0-265 days), with 63.1% of cases being reported within 30 days of birth.

Number and Rate of Cases

In 2018, 1.14% (n=927) of live births were diagnosed with NAS, a decrease from 1.35% of live births (n=1,096) in 2017. (See *Technical Note*) (**Figure 1**). This is the first year with a decrease in reported cases since surveillance began in 2013.

NAS Rate by Year Tennessee, 2013-2018



Source: Neonatal Abstinence Syndrome Surveillance System, Tennessee Department of Health.

Figure 1: Number of Cases of Neonatal Abstinence Syndrome as a Percentage of Live Births, Tennessee 2013-2018.

Source of Exposure for NAS Infants

Highlights: Source of Exposure

- 70% of infants diagnosed with NAS were exposed to Medication Assisted Treatment (MAT) for treatment of substance use disorder
- 73.6% of infants diagnosed with NAS were exposed to at least one legally prescribed medication
- 93.1% of NAS infants with exposure to only prescription drugs were exposed to MAT

Source of Exposure

The NAS Surveillance System collects nine categories of substances to which an infant was exposed (**Figure 2**). Individual cases could have been exposed to multiple substances, therefore percentages may sum to greater than 100%. Consistent with previous years' data, the majority of infants were exposed to medications used to treat substance use disorders (medication assisted treatment; 67.5%). In 2018, 29.8% of infants were exposed to diverted prescription opioid medications, and 22.2% were exposed to diverted prescription non-opioid medications.

When categorized into mutually exclusive categories of exposure (**Table 1**), 73.6% of NAS infants were exposed to at least one prescription medication with 49.8% of cases exposed to prescription medications only, and 23.9% exposed to a mix of prescription and illicit or diverted drugs (**Figure 3**). A fourth of infants (25.0%) percent were exposed only to illicit or diverted drugs. The remainder (1.3%) had no known exposure, or exposure information was not reported.

Since 2013, there has been a statistically significant **increase** overall in the percentage of NAS cases exposed only to prescription medications ($p=0.04$; **Figure 3**), though there has been a slight decrease in 2017 and 2018. There was an increase in the proportion of cases exposed to illicit drugs or diverted medications in 2017 and 2018, after two years of decrease. This increase resulted in a non-significant trend over time ($p=0.10$).

Of those infants with exposure only to prescription medications (**Figure 4**), most (93.1%) were exposed to medication assisted treatment. This percentage is an increase since 2016, though the overall percentage of infants exposed to MAT has decreased (**Figure 2**). Eleven

percent (11.0%) of prescription only exposures were to legal non-opioid medications, and 8.9% were to legal opioid medications (**Figure 4**).

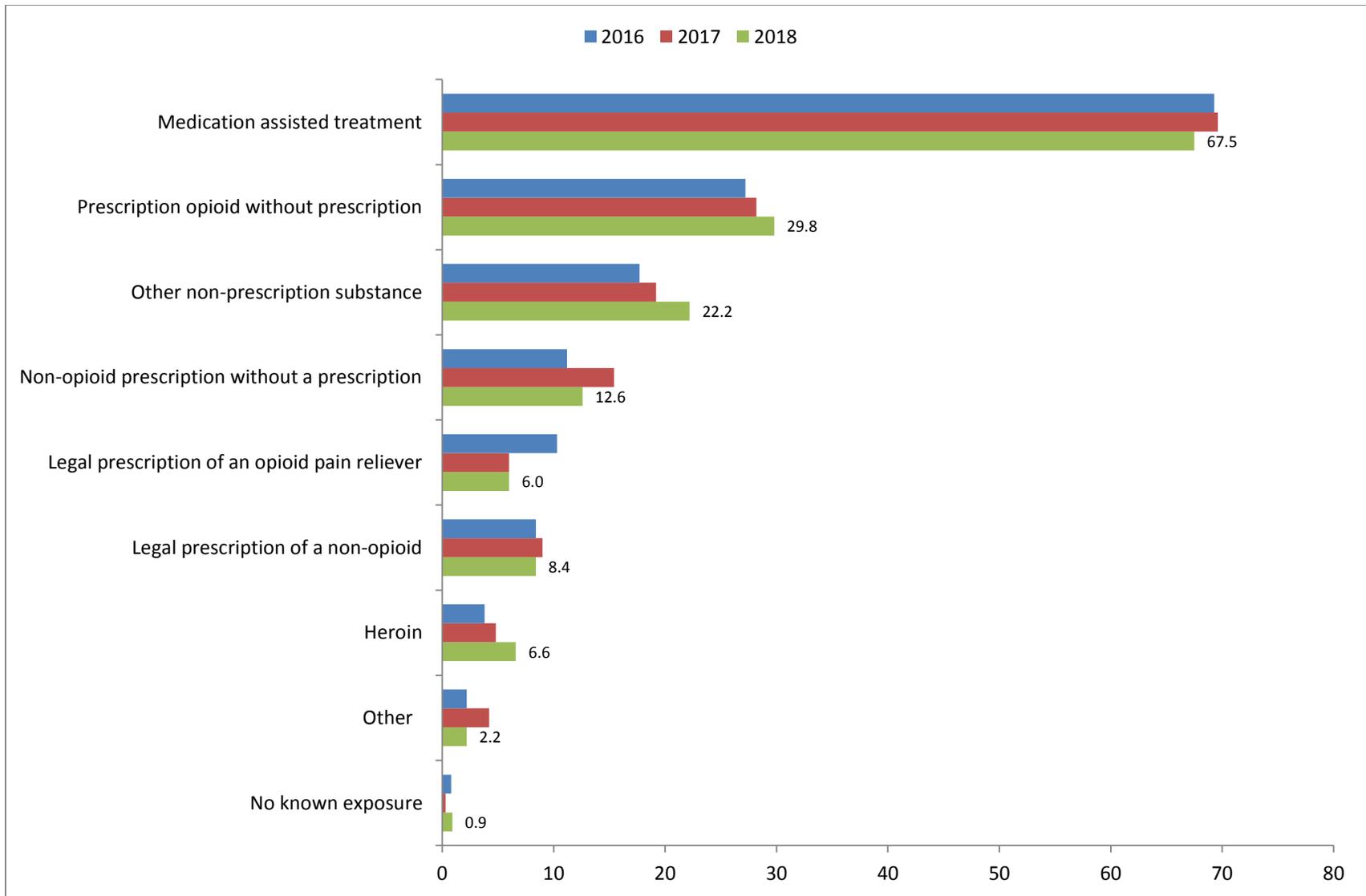


Figure 2: Non-mutually Exclusive Sources of Exposure for NAS Cases, 2016-2018.

Table 1: Derivation of Mutually Exclusive Categories of Exposure from Individual Exposures

| Prescription Medications Only | Illicit Drugs or Diverted Medications Only | Combination of Prescription Medications and Illicit Drugs/ Diverted Medications | Unknown |
|--|--|---|--|
| <p>Exposure to one or more of the following ONLY:</p> <ul style="list-style-type: none"> • Medication Assisted Treatment (MAT) • Legal prescription of an opioid pain reliever • Legal prescription of a non-opioid medication | <p>Exposure to one or more of the following ONLY:</p> <ul style="list-style-type: none"> • Prescription opioid medication obtained without a prescription • Non-opioid prescription medication obtained without a prescription • Heroin • Other non-prescription drug | <p>At least one medication from "Prescription Medications Only"</p> <p>AND</p> <p>At least one substance from "Illicit Drugs or Diverted Medications Only"</p> | <p>"No known source of exposure but clinical signs consistent with NAS" was selected at time of report</p> <p>OR</p> <p>No exposure options were selected at time of report</p> |

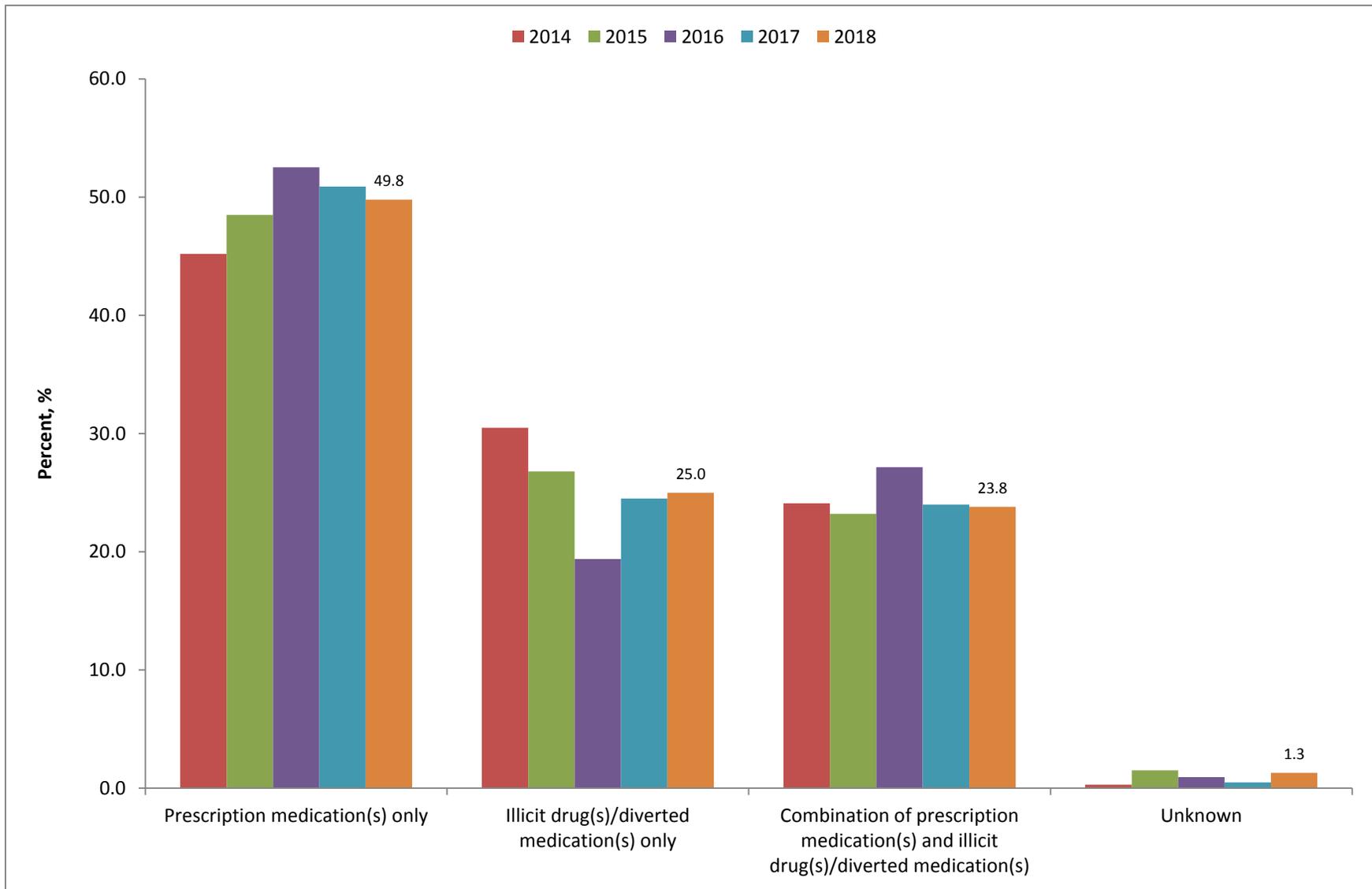


Figure 3: Mutually Exclusive Sources of Exposure for Neonatal Abstinence Syndrome Cases, Tennessee 2014-2018.

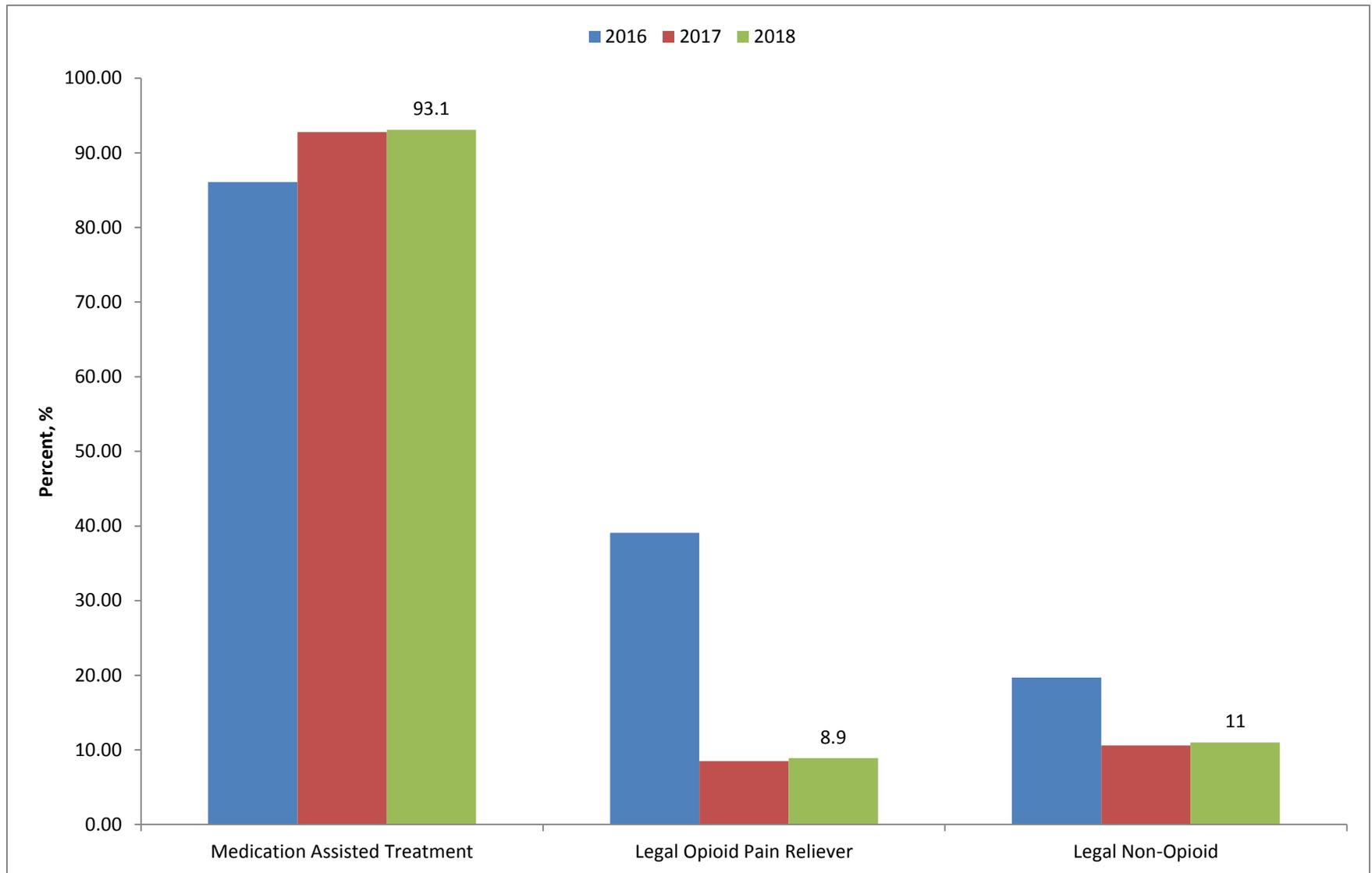


Figure 4: Class of Prescription Drug Use Among Those with Prescription Medication Exposure Only, 2016-2018.

Regional Data

Highlights: Regional Trends for NAS

- Rates of NAS increase when moving from west to east across Tennessee.
- Patterns of exposure source vary, with prescription only exposures most common in East Tennessee, and illicit drug only exposure most common in West Tennessee.

NAS Incidence by Region

Rates of NAS vary by health region. Rates of NAS are lowest in West Tennessee and increase in an easterly fashion. Corresponding to the statewide decrease in NAS, most regions saw a decrease in the rate for 2018, when compared to 2017 (**Figure 5**). East Health Region has shown a statistically significant decrease in NAS rates over time ($p=0.025$). South East Region and Hamilton County saw slight increases.

Decreases in NAS rates can also be observed at the county level. From 2015-2018 (**Figure 6 - Figure 9**), rates of NAS in the western portion of the state have continued to decrease (progressively lighter over time). In 2018, many counties in West and South Central Health Regions are suppressed because of the small number of cases in each county. Data are suppressed either due to privacy concerns or statistical validity. In East Tennessee, rates remain high, though there are fewer counties in the darkest shade.

Exposure Source by Region

There also appears to be geographic variation in the substance causing NAS (**Figure 10**). Similar to the geographic distribution of the NAS case rate, exposure to prescription medications only increases from West Tennessee to East Tennessee. In East Tennessee, exposure to prescription medications only represented 81.2% of NAS cases in North East Health Region and 70.4% in Sullivan County, yet only 14.6% in Shelby County. Exposure to only illicit drugs is more common in West Tennessee (over 50% in Shelby County and West Health Region), and least common in East Tennessee.

Exposure to medication assisted treatment (MAT) is varies geographically, ranging from 40% (Shelby County, West Health Region) to 86% in Sullivan County (**Figure 11**).

Use of legally obtained medications is less common statewide (6.0% for opioid medications, 8.4% for non-opioid medications), though nearly 20% of cases in South East Health Region

were exposed to legally obtained opioids (**Figure 12**). The west to east geographic gradients seen with other exposure categories is less evident with diverted medications. However, exposure to diverted opioid medications more common than diverted non-opioid medications. The highest proportion of NAS cases exposed to diverted opioids were observed in Knox, Davidson and Shelby Counties and the East Health Region (**Figure 13**). Though less than 10% of NAS cases (n=61) overall, 41.7% of NAS cases in Shelby county were exposed to heroin (**Figure 14**). Exposure to other illicit substances was more common in metros than in rural health regions.

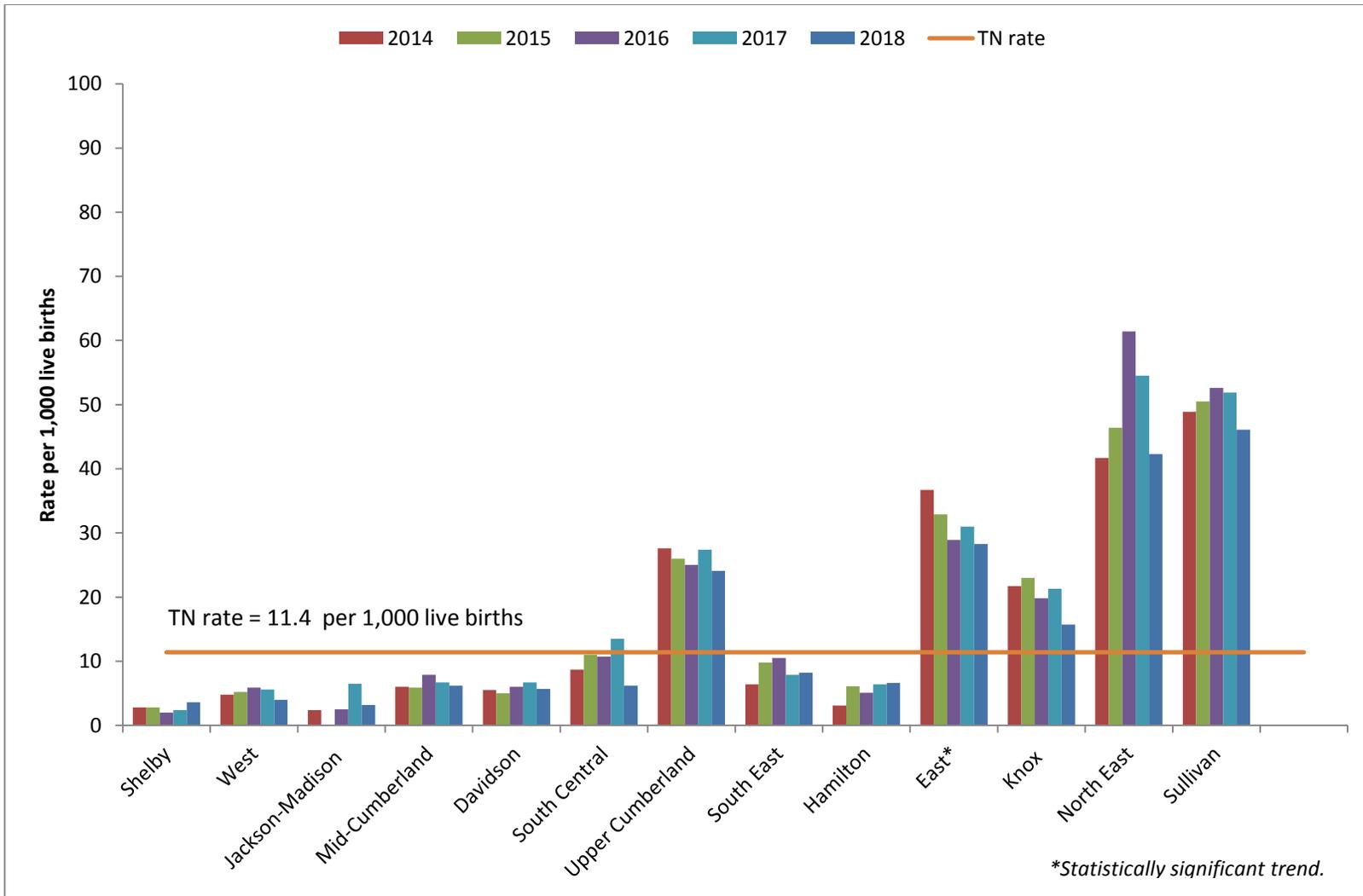


Figure 5: NAS Rates by TDH Health Region, 2014-2018.

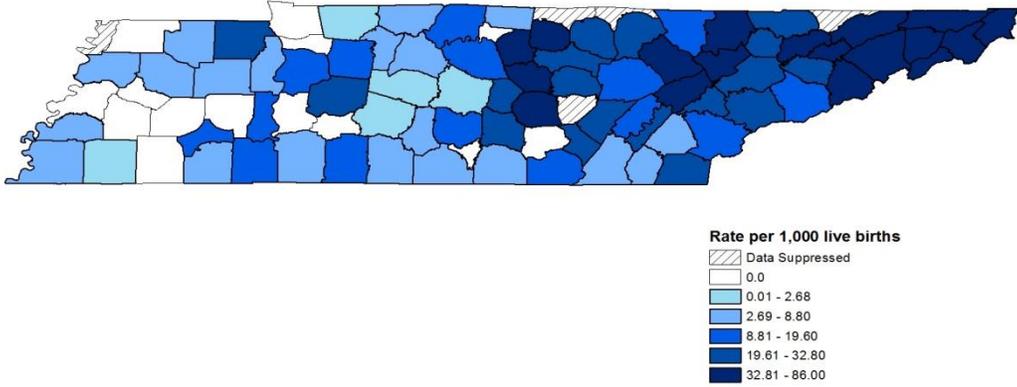


Figure 6: Rate of NAS Cases by County, 2015

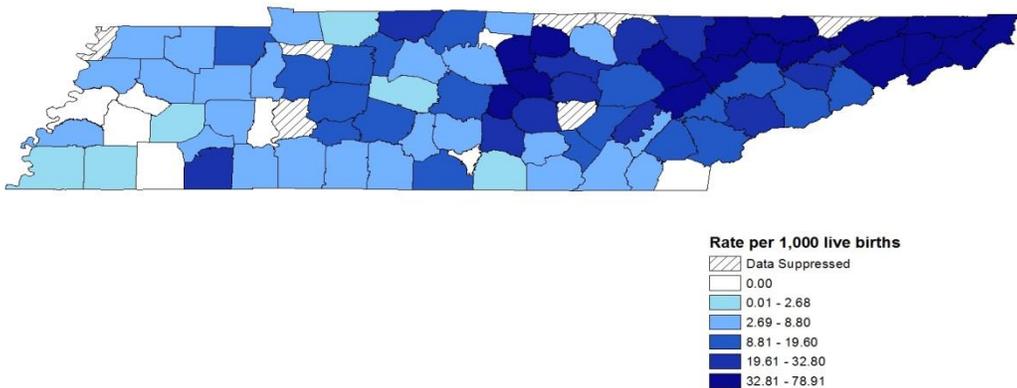


Figure 7: Rate of NAS Cases by County, 2016

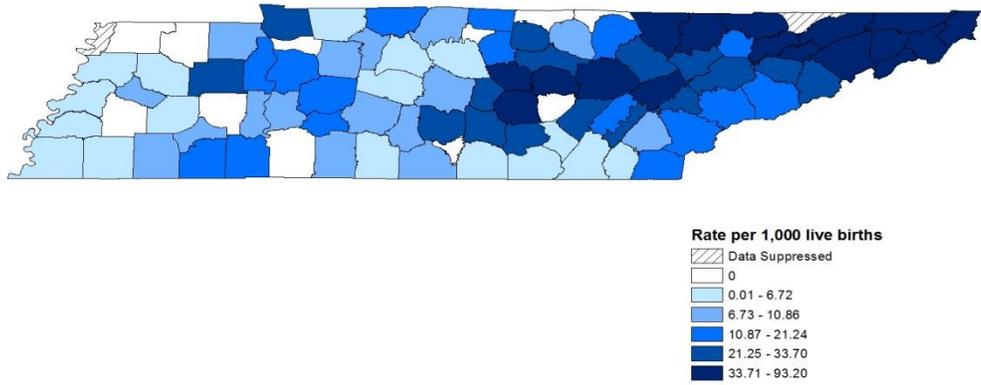


Figure 8: Rate of NAS Cases by County, 2017

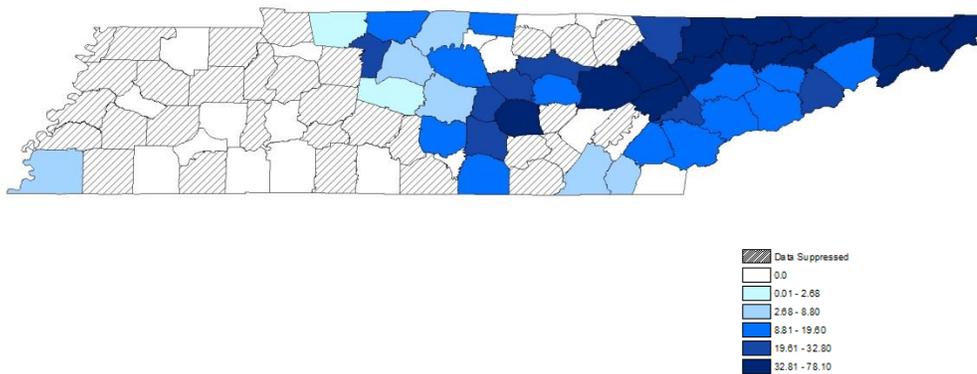


Figure 9: Rate of NAS Cases by County, 2018

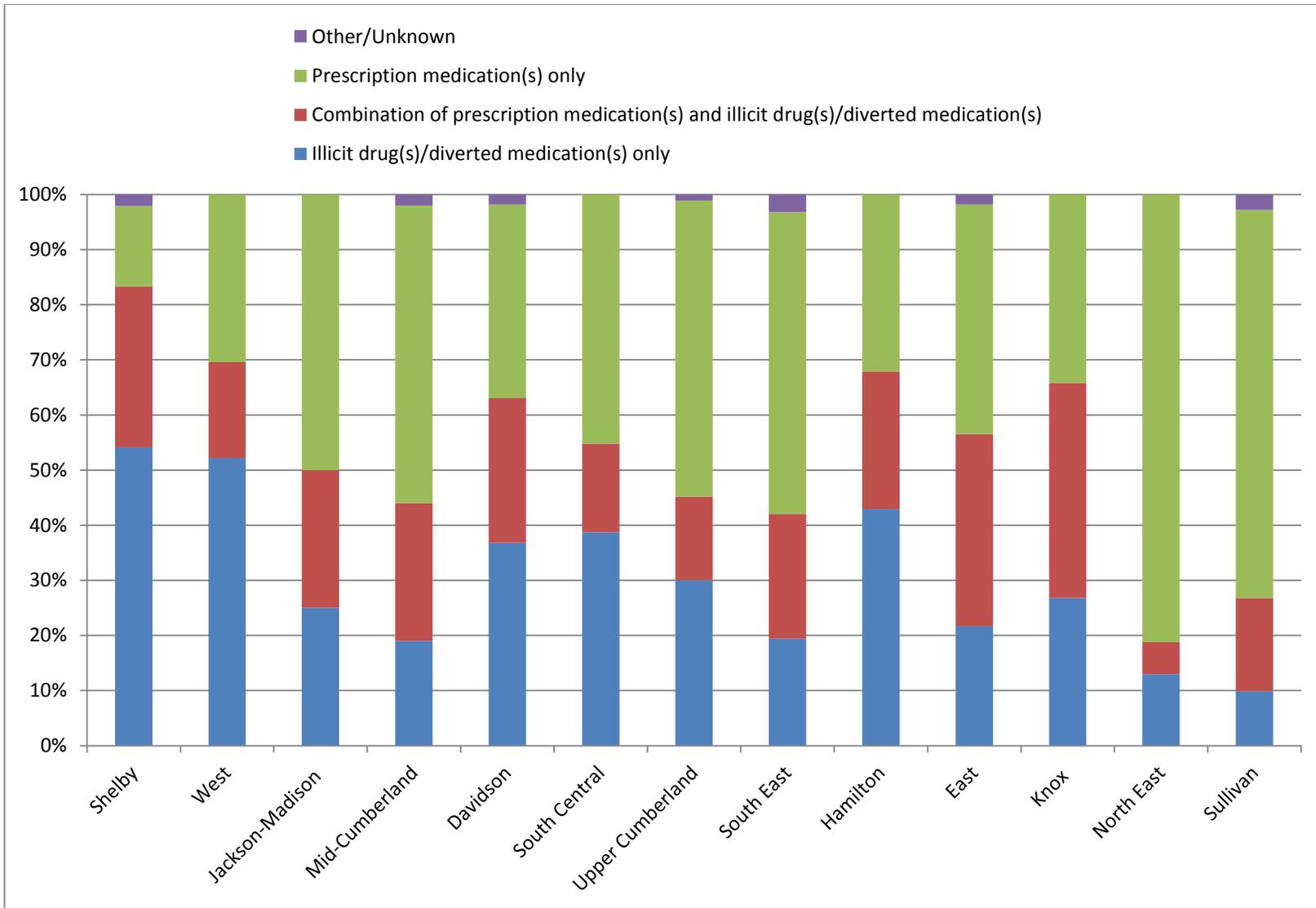


Figure 10: Distribution of Mutually Exclusive Sources of Exposure by Health Region for Neonatal Abstinence Syndrome Cases, 2018

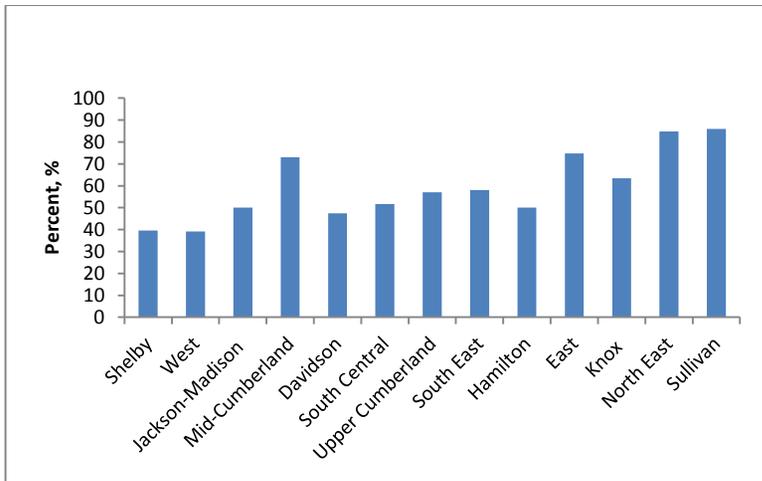


Figure 11: Prevalence of Exposure to Medication Assisted Treatment among NAS Cases by Region, 2018

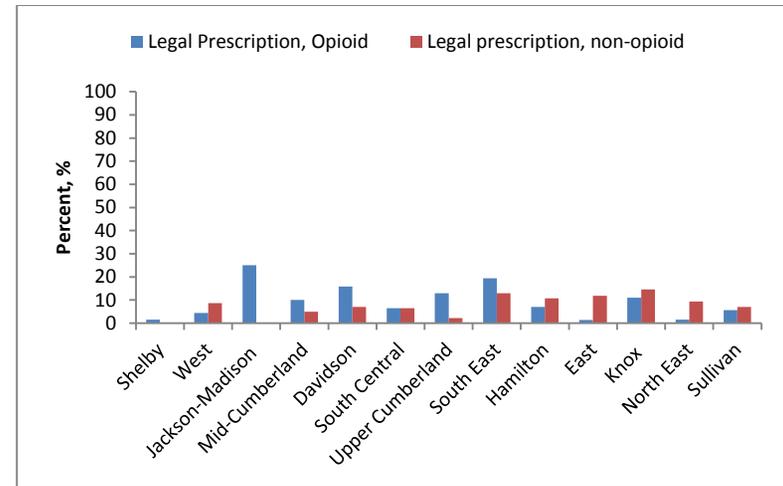


Figure 12: Prevalence of Exposure to Legally Obtained Prescription Medications among NAS Cases by Region, 2018

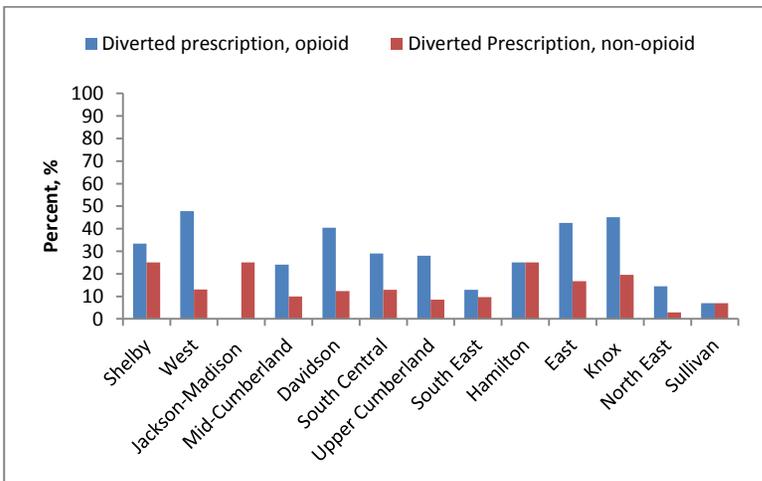


Figure 13: Prevalence of Exposure to Diverted Prescription Medications among NAS Cases by Region, 2018

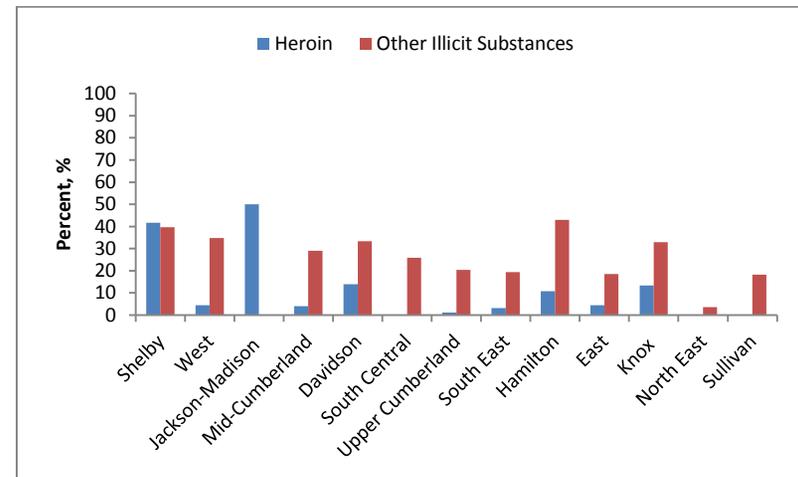


Figure 14: Prevalence of Exposure to Illicit Drugs among NAS Cases by Region, 2018

Non-Residential NAS Cases

Highlights: Non-Residential NAS Cases

- In CY2018, Tennessee hospitals reported 98 NAS cases in which the infant was from another state.
- Approximately half (49.0%) of non-residential NAS cases were from Virginia.

Effective July 1, 2014, reporting hospitals were asked to report cases of NAS treated at Tennessee hospitals that were residents of states that border Tennessee. These states include Alabama, Arkansas, Georgia, Kentucky, Mississippi, Missouri, North Carolina and Virginia.

In 2018, 98 cases of NAS from other states were treated in Tennessee. The distribution of out of state cases, by maternal state of residence, is shown in **Table 2**. The majority of non-resident cases continue to come from Virginia (49.0%).

A majority (82.8%, n=59) of out of state NAS cases were born in Tennessee (for example, the baby's mother was from North Carolina but delivered in Tennessee). The remainder (17.2%) were born in out of state hospitals and transferred to a Tennessee hospital for care (for example, the baby was born in Virginia but transferred to Tennessee for care).

Table 2: State of Residence for Non-Resident Cases of Neonatal Abstinence Syndrome Reported in Tennessee, 2018

| State | No. of Cases | % of Cases |
|----------------|--------------|------------|
| Alabama | 2 | 2.0 |
| Arkansas | 3 | 3.1 |
| Georgia | 13 | 13.3 |
| Kentucky | 20 | 20.4 |
| Mississippi | 3 | 3.1 |
| Missouri | 0 | 0 |
| North Carolina | 5 | 5.1 |
| Virginia | 48 | 49.0 |
| Other | 4 | 4.1 |
| Total | 98 | 100.1 |

Conclusion

Since becoming a reportable condition in 2013, the proportion of births affected by Neonatal Abstinence Syndrome each year has risen through 2017, with the first decrease seen in 2018. The largest decreases were seen in South Central and North East Health Regions and Knox and Sullivan Counties. East Health Region showed both a decrease from 2018 and a statistically significant decrease over time since 2013.

Since 2013, there has been a shift in the exposure sources associated with NAS, with more mothers of NAS infants taking medications prescribed by a provider. That nearly 70% of mothers of all NAS infants were receiving medication assisted treatment is suggestive that women with a history of substance use disorder are becoming more engaged with medical providers during pregnancy. However, geographic differences persist, with less than 40% of infants exposed to MAT in West Tennessee, compared to over 80% in some regions of East Tennessee.

The patterns of exposure (with nearly 75% of cases being exposed to at least one substance prescribed by a healthcare provider) highlight opportunities for primary prevention. Healthcare providers should explore non-opioid treatment modalities in women of childbearing age, and should promote effective contraceptive methods to prevent unintended pregnancies among women who use opioids.

Acknowledgements

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References

1. Charles MK, Cooper WO, Jansson LM, et al. Male Sex Associated with Increased Risk of Neonatal Abstinence Syndrome. *Hosp Pediatr* 2017 Jun; 7(6):328-334. DOI:10.1542/hpeds.2016-0218.
2. O'Connor AB, O'Brien L, Alto WA. Are there gender related differences in neonatal abstinence syndrome following buprenorphine during pregnancy?. *J Perinat Med* 2013 Sep;41(5):621-3. DOI: 10.1515/jpm-2012-0288.

Technical Notes

1. At publication of the 2017 Neonatal Abstinence Syndrome Surveillance Annual Report, 1,090 cases with a birth year of 2017 had been reported. After publication of the 2017 report, an additional 6 cases were reported and are included here.

2. All rates for 2018 were calculated using the 2017 Birth Statistical File as the denominator.

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