

# Neonatal Abstinence Syndrome Surveillance Annual Report 2014

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### **A Note to the Reader:**

Readers should interpret all findings with caution. In some cases (particularly in looking at data at the regional level), the counts are small and so we encourage caution in 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.

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# 1 Executive Summary

Over the last decade, 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.

Since NAS reporting began, there have been over 2,000 reports of NAS cases made to the surveillance portal. While more infants were diagnosed with NAS in 2014 than in 2013, the case rate, relative to the number of births, did not change significantly. A majority of cases have come from the eastern portions of the state, where opioid drug use is high. Nearly 70% of mothers who delivered babies with NAS were taking at least one drug prescribed to them by a physician. The percentage of women reporting only prescription drug use has steadily increased over the last two years. In 2014, nearly half of women reported taking only prescription drugs during pregnancy, with most being on a replacement therapy. This represents an opportunity for providers to counsel female patients of child-bearing age on the potential dangers of certain medications and the use of voluntary reversible long-acting contraceptives.

In 2014, TDH also began tracking NAS cases born in Tennessee to residents of neighboring states. Fifty-seven out-of-state cases of NAS were reported since July 1, 2014. Forty percent of these cases were born out of state and transferred to a Tennessee hospital to receive advanced care.

## 2 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 morphine and heroin. NAS can occur when a pregnant woman takes prescription drugs prescribed to her, an illicit medication, or a prescription medication written for someone else but diverted to her.

Over the last decade, the incidence of NAS in Tennessee has increased by 15-fold, far exceeding the national increase (3-fold over the same time period). A sub-cabinet working group focused on NAS was convened in 2012, consisting of Commissioner-level representation from the Departments of Health, Children's Services, Mental Health and Substance Abuse Services, Safety and Human Services as well as the Bureau of Health Care Finance And Administration (Medicaid) and the Children's Cabinet. The group is focused on policy and program strategies to reduce NAS, largely through primary prevention.

The Tennessee Department of Health made Neonatal Abstinence Syndrome a reportable condition on January 1, 2013. Providers who diagnose NAS are required to report to the Department of Health through an online portal within 30 days of diagnosis. This report presents data from calendar year 2014, with comparisons to calendar year 2013.

### 3 Statewide Data

#### Highlights: Statewide Reporting

- Increase in number of cases, but rate of cases (cases per 1,000 live births) unchanged
- More males than females affected
- Most cases reported by birthing hospitals

#### 3.1 Case Report Data

Providers submitted 1,178 reports to the NAS reporting portal. Twenty-four cases (2.0%) were reported in duplicate. Reported cases without clinical signs of NAS (n=136; 11.5%) were excluded. A total of 1,018 cases are included in this report.

The majority of cases (84.3%) were reported by birth hospitals, and 15.1% were reported after being transferred to another facility (Table 1). Few cases were reported by outpatient facilities or at readmission. Reported cases were more likely to be male than female (52.8% vs. 47.2%; p=0.08), though not statistically significant. This is consistent with reports in the literature of discrepancies among NAS by sex (O'Connor, 2013).

|               |             | No. of Cases | Percent, % | P-value |
|---------------|-------------|--------------|------------|---------|
| Sex           | Male        | 537          | 52.8       | <0.08   |
|               | Female      | 481          | 47.2       |         |
| Hospital Type | Birth       | 858          | 84.3       | N/A     |
|               | Transfer    | 154          | 15.1       |         |
|               | Outpatient  | 2            | 0.2        |         |
|               | Readmission | 4            | 0.4        |         |

Table 1: Selected Characteristics of Reported Cases

The Tennessee Department of Health requires that all cases of NAS be reported within 30 days of diagnosis. In 2014, the average length of time from the date of birth to the date of reporting was 24.1 days (range: 0-287), with 72.9% reported within the allowed 30 day reporting window.

## 3.2 Elements of Reporting

All cases of NAS included in this report had a minimum requirement of having clinical signs of NAS. Additional data elements supportive of NAS include a maternal history of substances known to cause NAS, a positive maternal screening test for NAS causing substances, or a positive neonatal screening test for NAS causing substances. The majority of cases (n=677; 66.5%) had all three elements – clinical signs of NAS, a maternal history of usage of NAS causing substances, and a positive maternal and/or neonatal screening test for such substances. Thirty-two percent of cases had clinical signs and either a positive screen or a maternal history of NAS causing substance use. Only 1.7% (n=17) exhibited only clinical signs of NAS without additional supporting data (Figure 1).

Of infants with clinical signs of NAS, nearly all (97.8%; n=996) had at least one screening test (urine, hair, meconium, or umbilical cord) for NAS causing substances. Nearly half had at least one pending screening test at the time of report, and 81.2% (n=809) had at least one completed screening test. Of the 809 with at least one screening test completed at the time of report, 61.6% screened positive (Figure 2).

## 3.3 Number and Rate of Cases by Birth Month

In 2014, there were 1,018 cases of NAS, compared to 936 (*see Technical Note*) cases in 2013 (Figure 3). The case rate in 2014, 12.7 (95% CI: 11.9, 13.5) cases per 1,000 live births, was not significantly different from the case rate of 11.7 (95% CI: 11.0, 12.5) cases of NAS per 1,000 live births observed in 2013. The rate of NAS cases reported by month (per 1,000 live births) did not vary significantly throughout the year (Figure 4).

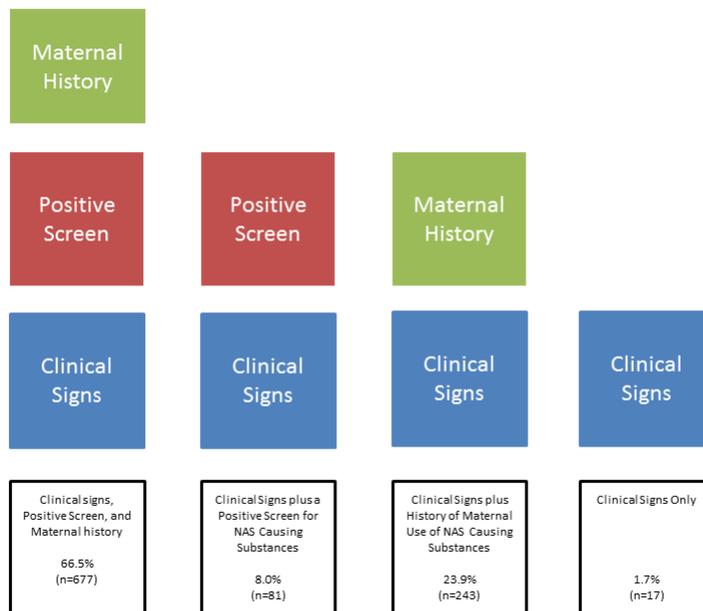


Figure 1: Elements of Case Reporting

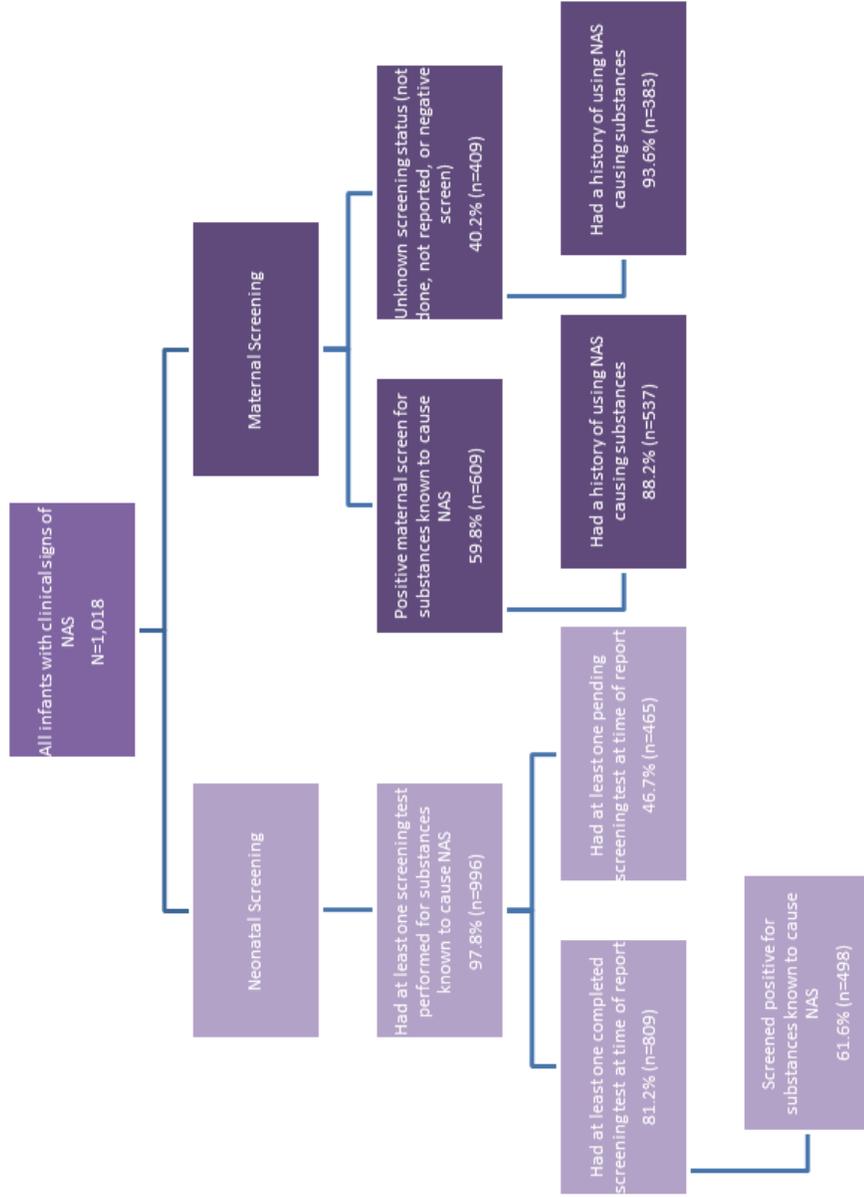


Figure 2: Screening Patterns at Hospitals Reporting NAS Cases

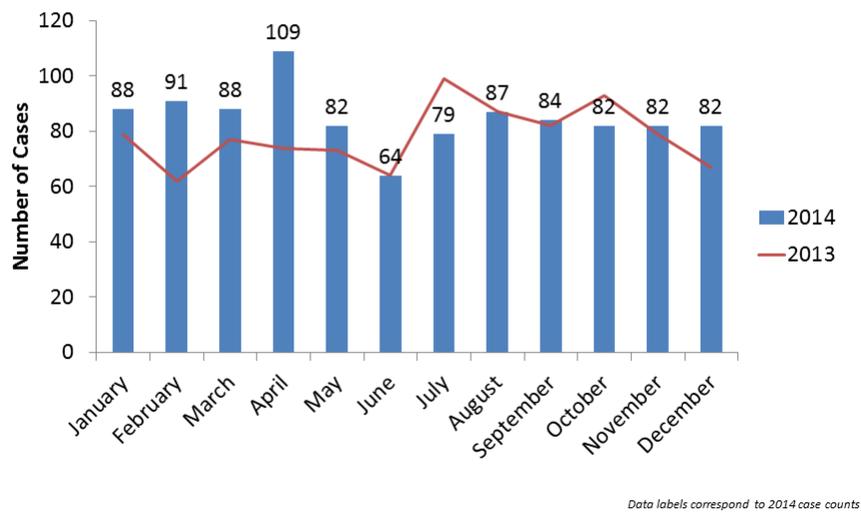
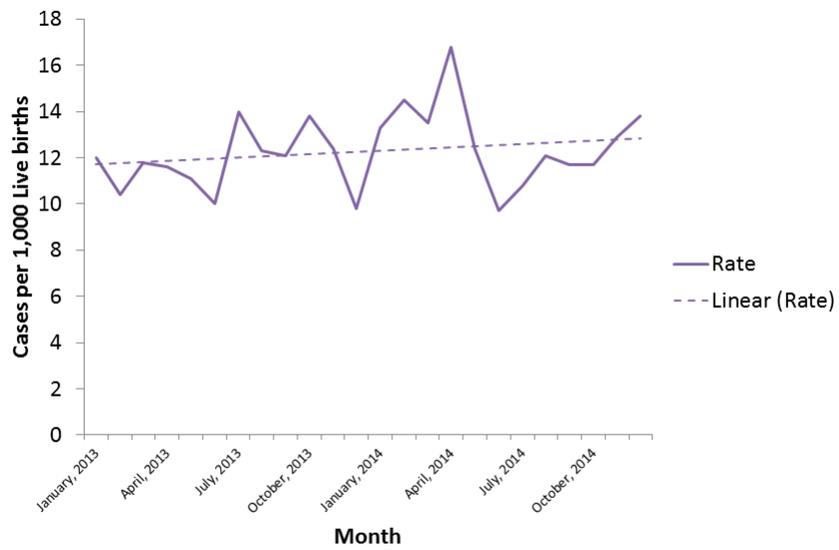


Figure 3: Cases of NAS by Month of Birth, 2013-2014



*Trend not statistically significant (p=0.32)*

Figure 4: Rate of NAS Cases by Month of Birth, 2013-2014

## 4 Infant Exposure Data

### Highlights: Exposure Source

- 69% of mothers were taking at least one drug prescribed to them by a health care provider
- Of those only taking prescribed drugs, 80% were on replacement therapies
- Statistically significant decrease in infant exposure to illicit/diverted drugs, but an increase in prescription drug exposure since 2013

### 4.1 Source of Exposure

The distribution of exposure to substances known to cause NAS in 2013 and 2014 is shown below in Table 2. Individual cases could have been exposed to multiple substances. Therefore, the number of cases in Table 2 is greater than the number of NAS cases reported.

When categorized into mutually exclusive sources of exposure, 63.3% of cases reported in 2014 were exposed to at least one prescription drug, either prescription drugs only, or in combination with an illicit or diverted substance (Table 3). Of those exposed only to prescription drugs, 80.4% were on medication assisted treatment for substance abuse such as methadone or buprenorphine (supervised replacement therapies). Twenty-one percent (21.1%) were exposed to supervised pain therapies, and 10.8% were exposed to psychiatric or neurologic therapies. Classes of prescription drug use are not mutually exclusive.

| Source   | 2013         |            | 2014         |            | P-value |
|--|--------------|------------|--------------|------------|---------|
|  | No. of Cases | % of Cases | No. of Cases | % of Cases |         |
| Supervised Replacement Therapy                           | 436          | 46.6       | 574          | 56.4       | <.0001  |
| Supervised Pain Therapy                                  | 178          | 19.0       | 132          | 13.0       | 0.0003  |
| Psychiatric or Neurologic Therapies                      | 69           | 7.4        | 75           | 7.4        | 0.99    |
| Prescription Substance without a Prescription            | 375          | 40.1       | 393          | 38.6       | 0.51    |
| Non-prescription Substance                               | 252          | 26.9       | 214          | 21.0       | 0.0022  |
| No Known Exposure but Clinical Signs Consistent with NAS | 13           | 1.4        | 3            | 0.3        | 0.0073  |
| No Response  | 19           | 2.0        | 18           | 1.8        | 0.67    |

Table 2: Reported Sources of Exposure for NAS Cases, 2013-2014

| Source                         | 2013         |            | 2014         |            | P-value |
|--------------------------------|--------------|------------|--------------|------------|---------|
|                                | No. of Cases | % of Cases | No. of Cases | % of Cases |         |
| Prescription Drugs Only        | 394          | 42.1       | 474          | 46.6       | 0.03    |
| Illicit/Diverted Drugs Only    | 309          | 33.0       | 292          | 28.7       |         |
| Prescription and Illicit Drugs | 201          | 21.5       | 231          | 22.7       |         |
| Unknown                        | 32           | 3.4        | 21           | 2.1        |         |
| TOTAL                          | 936          | 100.0      | 1018         | 100.1      |         |

Table 3: Mutually Exclusive Sources of Exposure for NAS Cases, 2013-2014

## 4.2 Exposure Source Over Time

The trends for mutually exclusive categories of exposure are shown in Figure 5. From January 2013 to December 2014, there was a statistically significant decrease in illicit/diverted drugs associated with NAS ( $p=0.0037$ ), but a statistically significant increase in prescription drug use ( $p=0.02$ ). The trend for use of a combination of illicit and prescription drugs was not statistically significant over time ( $p=0.29$ ).

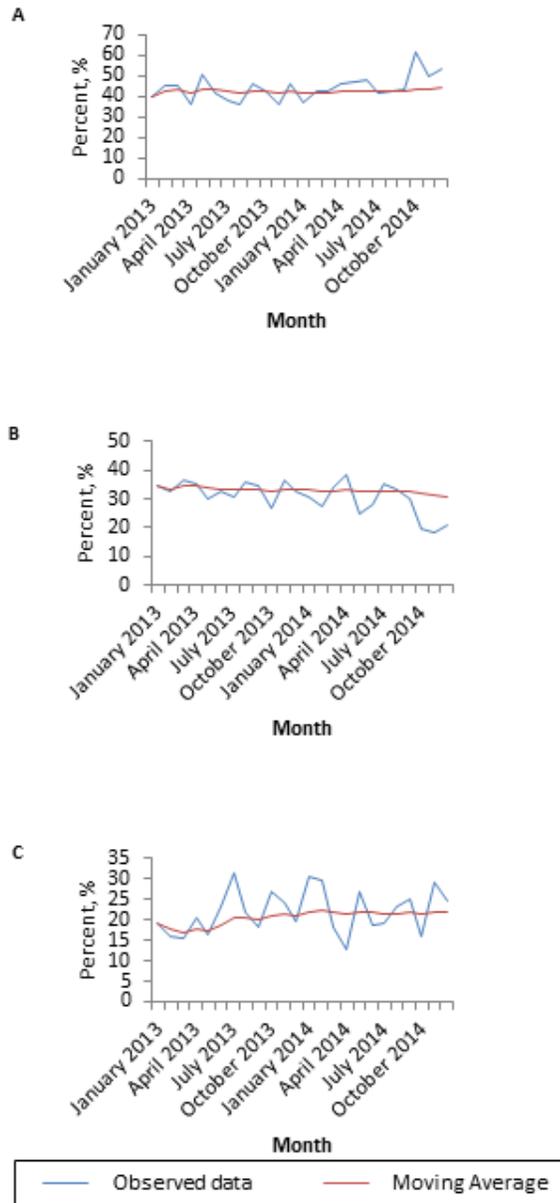


Figure 5: Trends in Mutually Exclusive Sources of Exposure Over Time, 2013-2014. A: Prescription Drugs Only ( $p=0.02$ ); B: Illicit/Diverted Drugs Only ( $p=0.0037$ ); C: Illicit and Prescription Drugs ( $p=0.29$ )

## 5 Regional Data

### Highlights: Regional NAS Data

- Statewide rate of 12.7 NAS cases per 1,000 live births
  - Highest rates in Sullivan County (49.1 per 1,000 live births), Northeast Region (42.7 per 1,000), and East Region (39.8 per 1,000)
  - Sullivan County and Upper Cumberland Region saw decreased rates in 2014 compared to 2013
- Exposure source varied by region
  - “Prescription Drugs Only” most common source in most regions
  - “Illicit/Diverted Drugs only” more common in Davidson and Knox Counties, Southeast Region
  - “Prescription Drugs Only” and “Illicit/Diverted Drugs Only” tied for leading exposure source in East Region
  - “Illicit/Diverted Drugs Only” and “Prescription and Illicit Drugs” tied for leading exposure source in Knox County
- 10 counties represent nearly half of all NAS cases

### 5.1 NAS Incidence by Region

Annual incidences by region for 2013 and 2014 are shown in Figure 6. For each of the two years since NAS reporting began, Sullivan County, North East, East, and Upper Cumberland Regions have had the highest rates of NAS. In 2014, ten counties represented nearly half of all NAS cases (Table 4). Six of East Region’s 15 counties are ranked in the top ten counties with the highest rates of NAS statewide (Table 5).

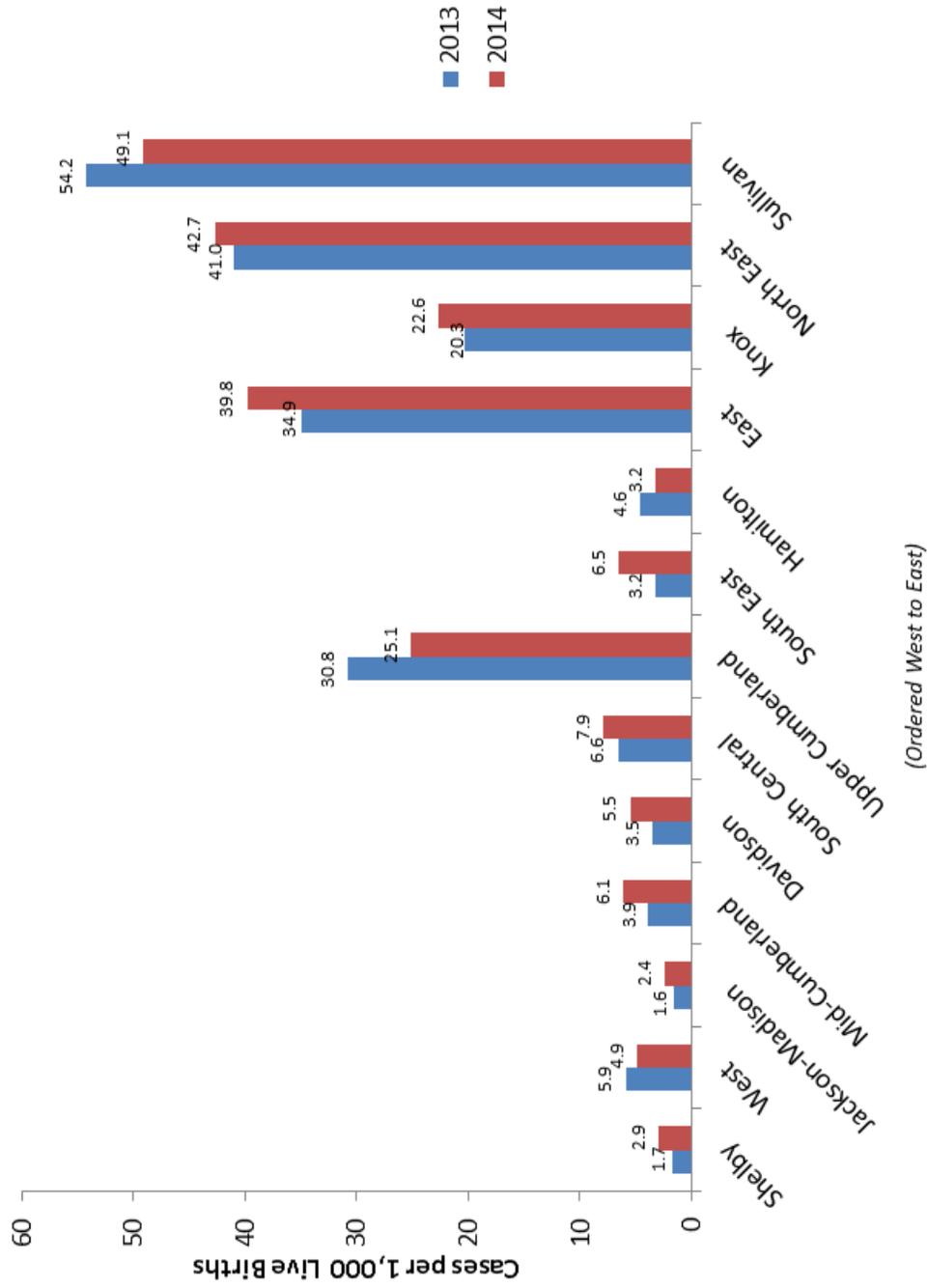


Figure 6: Annual NAS Case Rate by Region, 2013-2014

| County     | Region           | % of Cases |
|------------|------------------|------------|
| Knox       | Knox             | 11.0       |
| Sullivan   | Sullivan         | 7.6        |
| Davidson   | Davidson         | 5.5        |
| Sevier     | East             | 4.4        |
| Washington | North East       | 4.3        |
| Shelby     | Shelby           | 3.8        |
| Greene     | North East       | 3.1        |
| Putnam     | Upper Cumberland | 3.1        |
| Anderson   | East             | 3.0        |
| Campbell   | East             | 3.0        |
| TOTAL      |                  | 48.8       |

Table 4: Top Ten Counties with Highest Percentage of NAS Cases, 2014

| County    | Region           | Rate of Cases (per 1,000 live births) |
|-----------|------------------|---------------------------------------|
| Grainger  | East             | 80.2                                  |
| Campbell  | East             | 78.5                                  |
| Unicoi    | East             | 63.8                                  |
| Roane     | East             | 63.0                                  |
| Morgan    | East             | 59.1                                  |
| Hawkins   | North East       | 50.9                                  |
| Claiborne | East             | 50.3                                  |
| Van Buren | Upper Cumberland | 50.0                                  |
| Greene    | North East       | 49.8                                  |
| Sullivan  | Sullivan         | 49.1                                  |

Table 5: Top Ten Counties with Highest Rate of NAS Cases, 2014

## 5.2 Exposure Source by Region

As seen in Figure 7, prescription drugs are a leading source of exposure in most regions of Tennessee. Illicit drug use is a leading source of exposure for NAS cases in Davidson County and South East Region. A comparison of the mutually exclusive sources of exposure for 2013 and 2014 is shown in Figure 8.

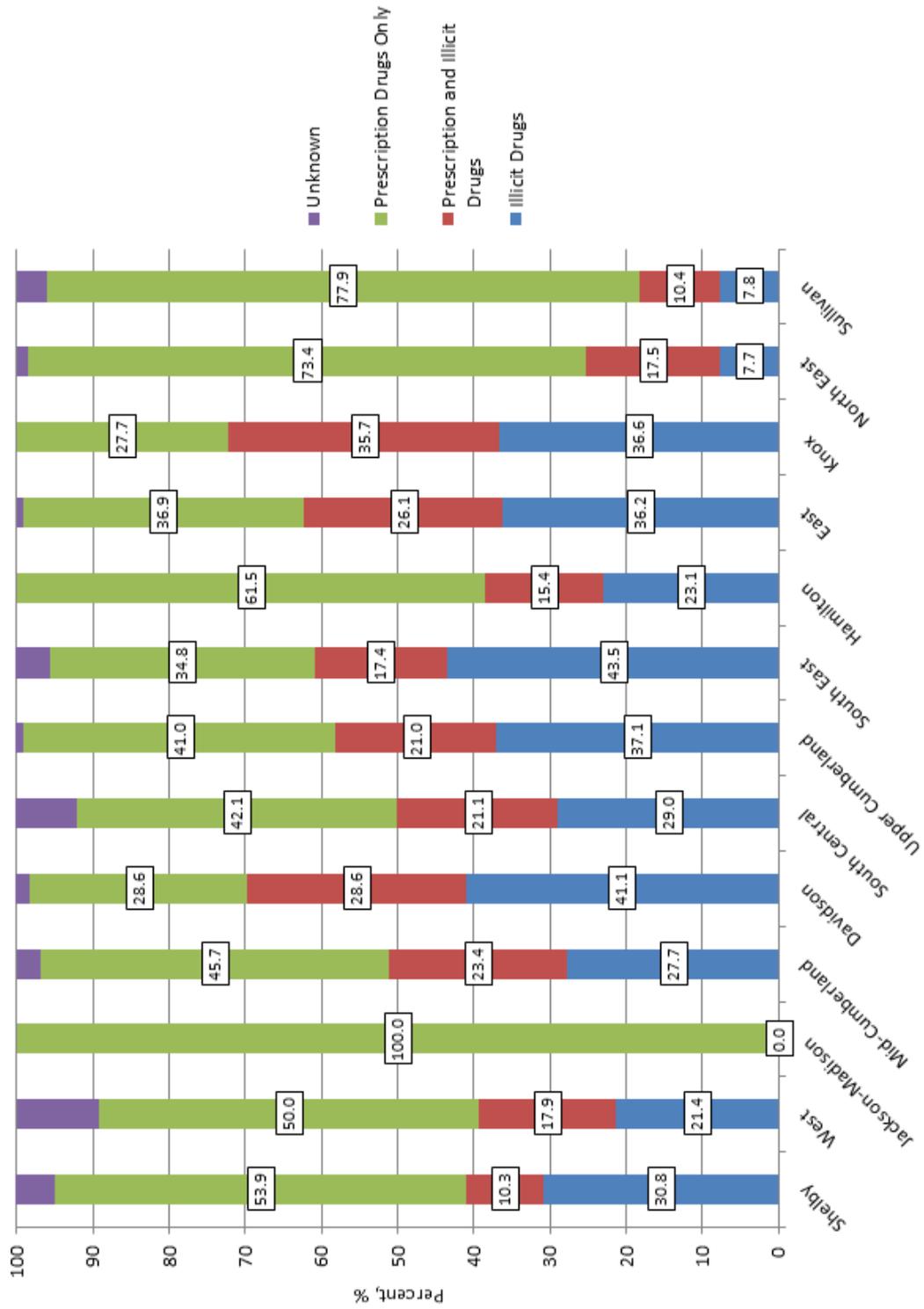


Figure 7: Mutually Exclusive Sources of Exposure by Region, 2014

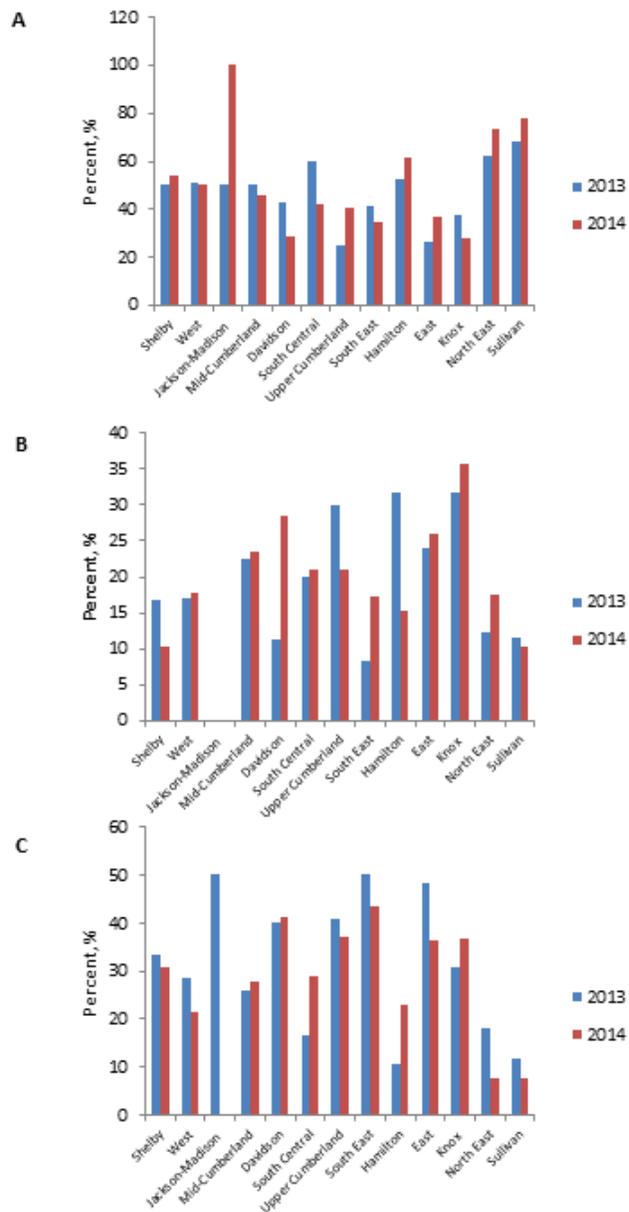


Figure 8: Mutually Exclusive Sources of Exposure by Region, 2013-2014. A: Prescription Drugs Only; B: Illicit and Prescription Drugs; C: Illicit/diverted Drugs Only.

## 6 Out of State Cases

### Highlights: Out of State Case Reporting

- Beginning July 1, 2014, hospitals began reporting NAS cases born to residents of border states
  - 57 cases reported
  - Of these, 23 (40.4%) born out of state and transferred to a TN hospital
  - 34 born in TN hospitals
- Most cases born to residents of Virginia (61.4%) and Kentucky (17.5%)

Effective July 1, 2014, reporting hospitals were asked to report cases born at Tennessee hospitals to residents of states that border Tennessee. These states include Alabama, Arkansas, Georgia, Kentucky, Mississippi, Missouri, North Carolina, and Virginia. Between July 1, 2014, and December 31, 2014, there were 57 out of state cases reported. The distribution of out of state cases, by maternal state of residence, is shown in Table 6.

Twenty-three (40.3%) of out of state cases reported were born in an out of state hospital then transferred to and reported by a Tennessee hospital.

|                | No. of Cases | Percent, % |
|----------------|--------------|------------|
| Arkansas       | 2            | 3.5        |
| Georgia        | 7            | 12.3       |
| Kentucky       | 10           | 17.5       |
| Mississippi    | 2            | 3.5        |
| North Carolina | 1            | 1.8        |
| Virginia       | 35           | 61.4       |
| TOTAL          | 57           | 100.0      |

Table 6: State of Residence for Out of State (Border States Only) NAS Cases Born in Tennessee, Since July 1, 2014

## 7 Conclusion

Between 2000 and 2010, the number of cases of Neonatal Abstinence Syndrome in Tennessee increased rapidly. Since implementation of mandatory reporting by hospitals of NAS in 2013, the occurrence of NAS cases has remained constant. The proportion of NAS cases exposed to illicit or diverted drugs has decreased, while the proportion of cases exposed only to prescription drugs has increased. Eighty percent of NAS mothers who were reported to have been using only prescription drugs were on medication assisted treatments for substance use disorders, under a health care provider's supervision. This may represent an early indication of victory in addressing the NAS epidemic, as pregnant women with substance abuse problems may be becoming more likely to seek treatment for their addictions in order to protect the health of their unborn infants. However, it is important to note that these treatments may still result in symptoms of neonatal withdrawal.

It is noteworthy that infants with NAS represent approximately 1% of all Tennessee infants born in 2014. In 2013, NAS infants accounted for 2.5% of all live births paid for by Medicaid (TennCare). The average costs associated with care during the first year of life for NAS infants on Medicaid was \$44,043 in 2013 (representing 14.2% of all Medicaid costs for infants during the first year of life). In comparison, the average Medicaid costs during the first year of life for a low birth weight baby were \$37,261.

## **8 Acknowledgments**

The Tennessee Department of Health would like to acknowledge the reporting hospitals and providers across the State of Tennessee, the NAS Sub-Cabinet Working Group and TDH Staff.

## 9 Technical Notes

1. At publication of the *2013 Neonatal Abstinence Syndrome Surveillance Annual Report*, 921 cases with a birth year of 2013 had been reported. After publication of the 2013 report, an additional 15 cases were reported and are included here.
2. For 2014 rate calculations, the denominator is the number of live births as recorded in the 2014 Provisional Birth Statistical System, Tennessee Department of Health; Division of Policy, Planning and Assessment.

## 10 References

O'Connor AB, O'Brien L, Alto WA. Are there gender related differences in neonatal abstinence syndrome following exposure to buprenorphine during pregnancy? *J Perinat Med* 2013; *Med* 41(5):621-3.

## 11 Suggested Citation

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