Neonatal Abstinence Syndrome

2017 Surveillance Report

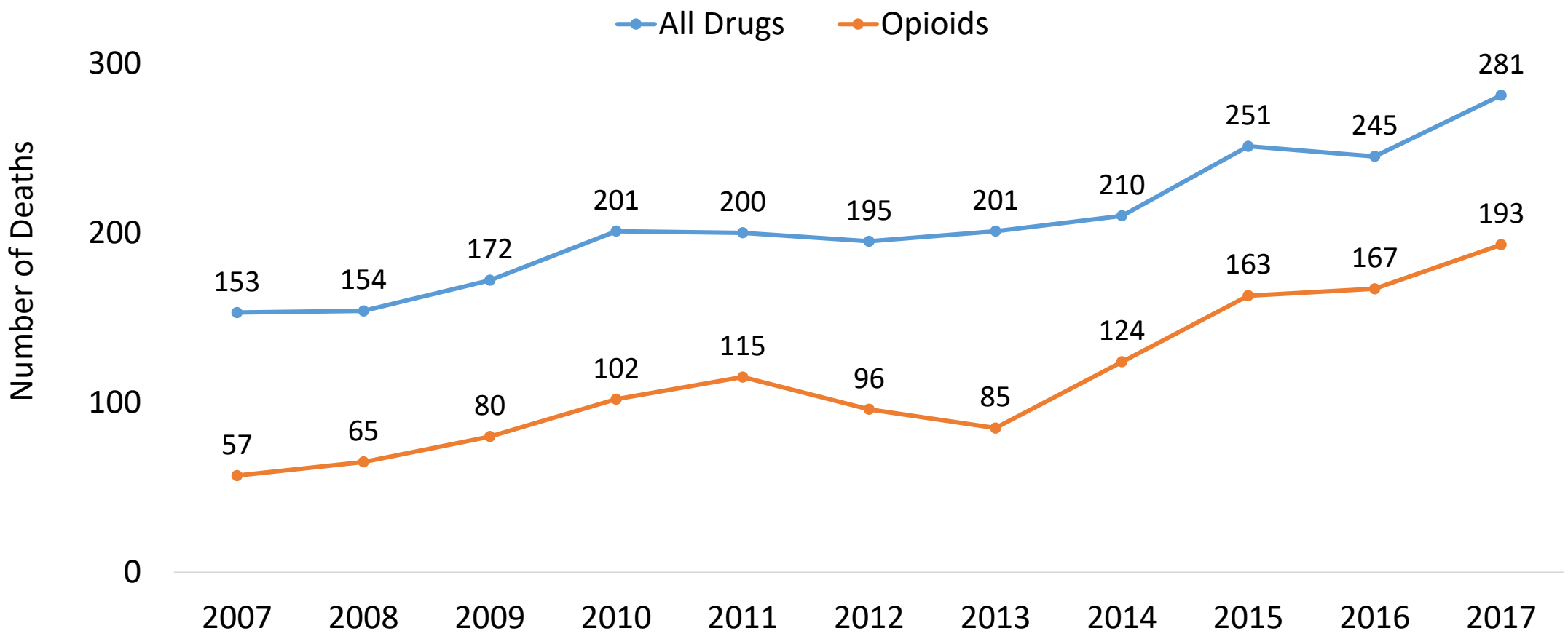
Georgia Perinatal Quality Collaborative / J. Michael Bryan, MPH, PhD / April 26, 2019

Outline

- Background
- Hospital Discharge Data: charges and length of stay
- Surveillance System Data
- Key Findings and Recommendations
- Upcoming Changes to NAS Case Definition

Background

All Drug and Opioid Overdose Deaths, Females, 15-44 Years of Age, Georgia, 2007-2017

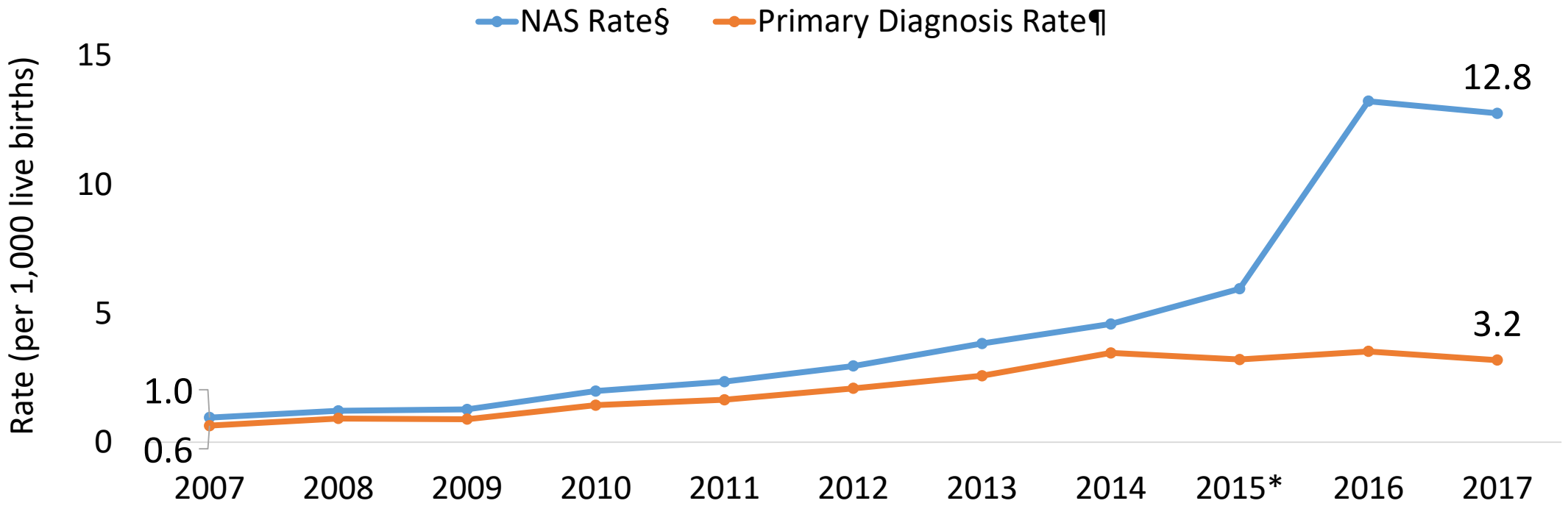


DATA SOURCE: Georgia Death Certificates (2007–2017). Georgia Department of Public Health, Office of Health Indicators for Planning and Office of Vital Records. Data pulled October 18, 2018.

Background

- **Neonatal abstinence syndrome (NAS):** Set of clinical withdrawal signs and symptoms in a newborn exposed to illegal or prescription drugs during pregnancy
- Georgia DPH added NAS to Notifiable Diseases/Conditions list January 1, 2016
- Two data sources in this surveillance report
  - Administrative: Hospital discharge data (HDD)
  - Provider-based: Case reporting through the State Electronic Notifiable Disease Surveillance System (SendSS)

Rate of NAS Cases per 1,000 Live Hospital Births by Year, Georgia, 2007–2017

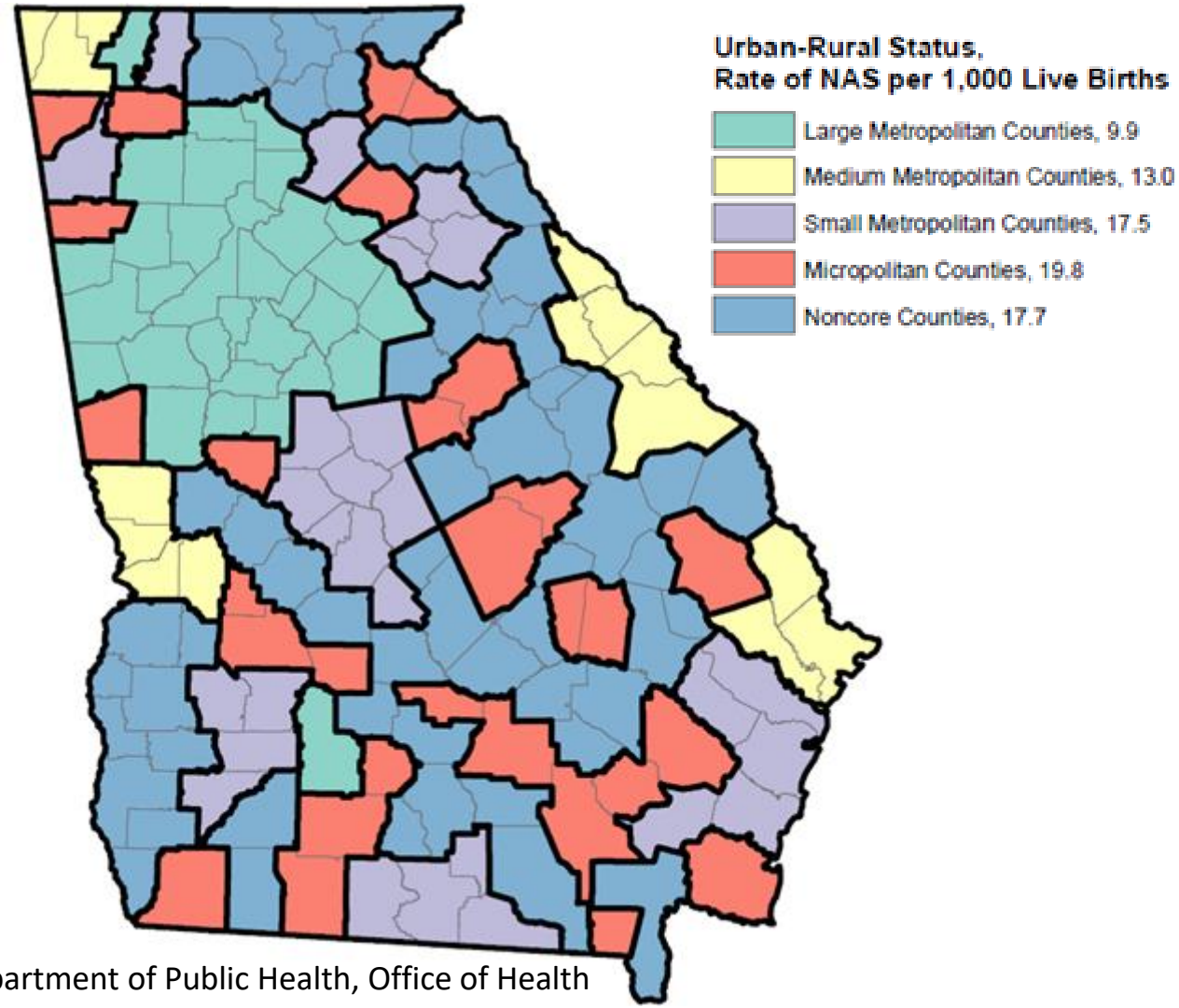


*By October 1, 2015, all hospitals in the U.S. were required to switch from ICD-9-CM to ICD-10-CM codes.
§NAS Rate includes all NAS cases identified using at least one of four ICD codes.
¶Primary Diagnosis Rate only includes NAS cases identified using one of two ICD codes indicating infants exhibited physical signs/symptoms of withdrawal.
DATA SOURCE: Georgia Hospital Discharge Data (2007–2017). Georgia Department of Public Health, Office of Health Indicators for Planning. Data pulled October 25, 2018.

NAS Rate across Georgia

Rates of NAS per 1,000 Live Births, by Urban-Rural Status, Hospital Discharge Data, Georgia, 2017

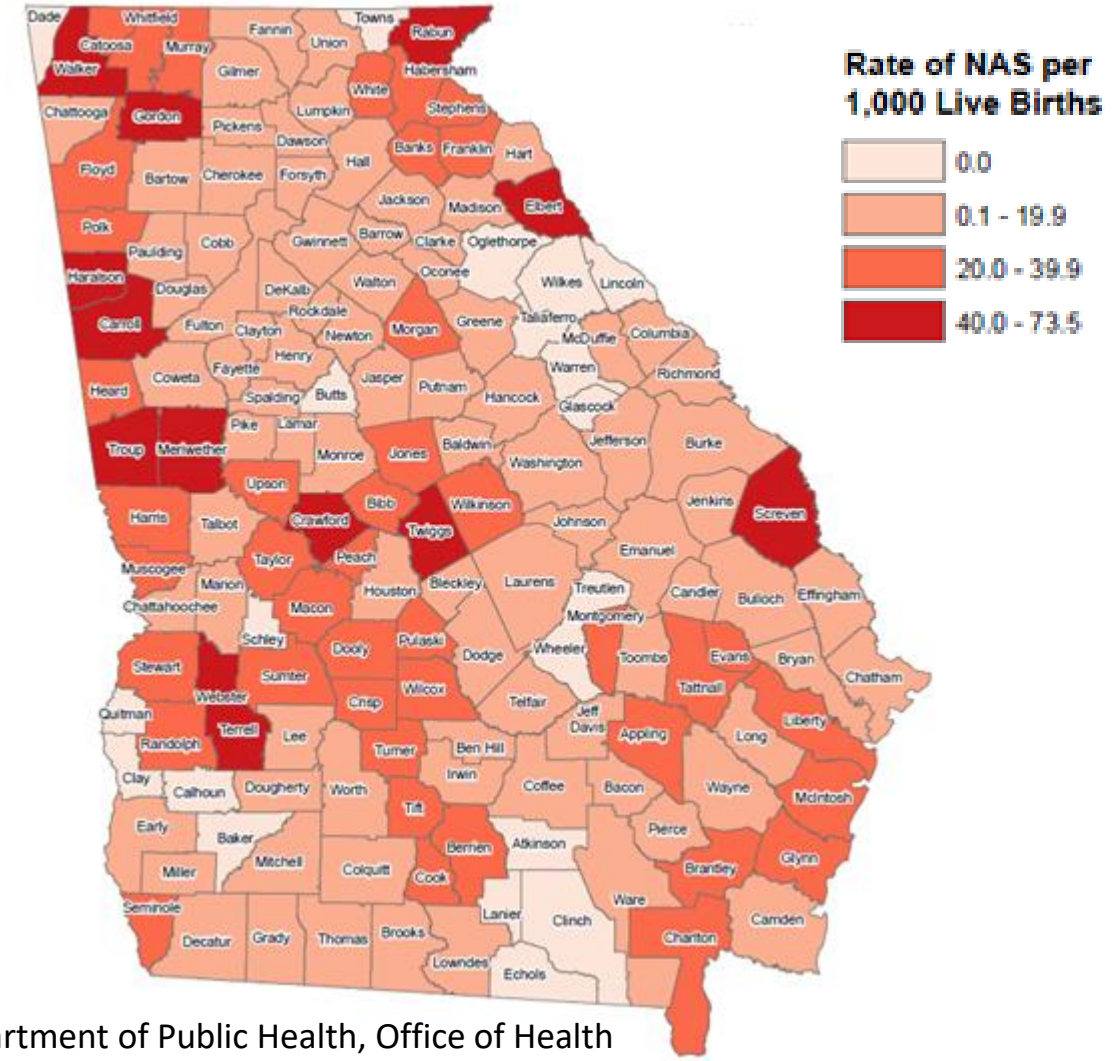
- **Non-metropolitan** counties had higher rates of NAS than larger metropolitan counties
- NAS rates among small metropolitan, noncore, and micropolitan counties ranged from **17.5** to **19.8** per 1,000 live births
- Rate of NAS in **micropolitan counties** was double that of large metropolitan counties (19.8 vs 9.9 per 1,000 live births)



DATA SOURCE: Georgia Hospital Discharge Data (2017). Georgia Department of Public Health, Office of Health Indicators for Planning. Data pulled October 25, 2018.

County-Specific Rates of NAS per 1,000 Live Births, Hospital Discharge Data, Georgia, 2017

- NAS rates by county ranged from **0 to 73.5** cases per 1,000 live births
- 20 counties had no identified cases of NAS (each had <250 live births in 2017)
- 13 counties had **≥40** cases per 1,000 live births



DATA SOURCE: Georgia Hospital Discharge Data (2017). Georgia Department of Public Health, Office of Health Indicators for Planning. Data pulled October 25, 2018.

Hospital Charges and Length of Stay

Total Charges (USD) among Nursery Infants by NAS Status or ICD-10-CM Code, Hospital Discharge Data, Georgia, 2017

NAS Infants[1]	Non-NAS Infants
Mean Charges (95% CI)	Mean Charges (95% CI)
$7,236 ($6,639, $7,833)	$3,763 ($3,737, $3,789)

Infants Experiencing Withdrawal[2]	Infants Exposed[3]
Mean Charges (95% CI)	Mean Charges (95% CI)
$16,225 ($13,522, $18,927)	$5,269 ($4,973, $5,565)

1. NAS infants are either of the two ICD-10-CM codes (P96.1 or P04.4).
2. Infants experiencing withdrawal were identified with ICD-10-CM code P96.1.
3. Infants exposed were identified with ICD-10-CM code P04.4.

Hospital Charges

- Infants **exhibiting substance withdrawal symptoms** (P96.1) had hospital charges **$12,500 more** than infants with no indication of effects of addictive substances ($16,224 vs $3,762, respectively)
- Infants **affected by maternal use of substances of addiction** (history of exposure, P04.4 only) had hospital charges **$1,500 more** than infants with no indication of effects of addictive substances

Length of Stay (Days) among Nursery Infants by NAS Status or ICD-10-CM Code, Hospital Discharge Data, Georgia, 2017

NAS Infants[1]	Non-NAS Infants
Mean Days (95% CI)	Mean Days (95% CI)
4.5 (4.1, 4.9)	2.6 (2.5, 2.6)

Infants Experiencing Withdrawal[2]	Infants Exposed[3]
Mean Days (95% CI)	Mean Days (95% CI)
11.2 (9.3, 13.0)	3.0 (2.9, 3.2)

1. NAS infants are either of the two ICD-10-CM codes (P96.1 or P04.4).
2. Infants experiencing withdrawal were identified with ICD-10-CM code P96.1.
3. Infants exposed were identified with ICD-10-CM code P04.4.

Length of Stay

- Infants with **substance withdrawal symptoms** (P96.1) hospitalized **~9 more days** than infants with no indication of effects of addictive substances (11.2 vs 2.6 days, respectively)
- Infants **affected by maternal use of substances of addiction** (P04.4 only) had average length of stay **half a day longer** than infants with no indication of effects of addictive substances (3.0 vs 2.6 days, respectively)

Confirmed Case Summary

Case Definition

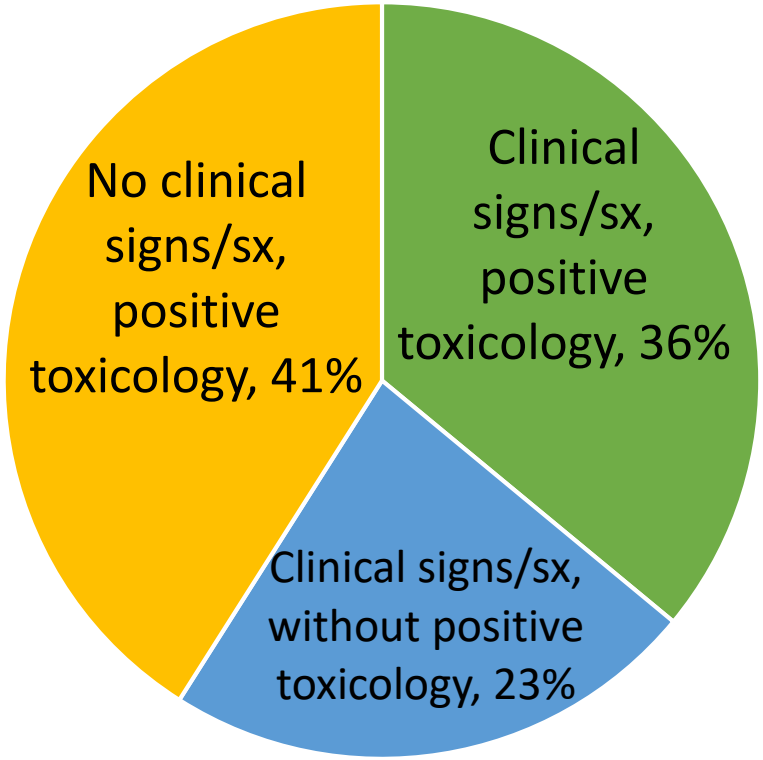
Confirmed case: ***Infant*** reported with

- Positive toxicology screen OR
- Clinical signs/symptoms compatible with NAS

Class Categories of Substances Collected in SendSS			
Cannabinoids	**Depressants**	**Opioids**	**Stimulants**
Marijuana or THC	Alcohol	Buprenorphine	Amphetamines
	Barbiturates	Heroine	Cocaine
	Benzodiazepines	Oxycodone	Methamphetamine
	Gabapentin	Tramadol	Tobacco
	Phencyclidine (PCP)	Other opioids	
	SSRI[3]		

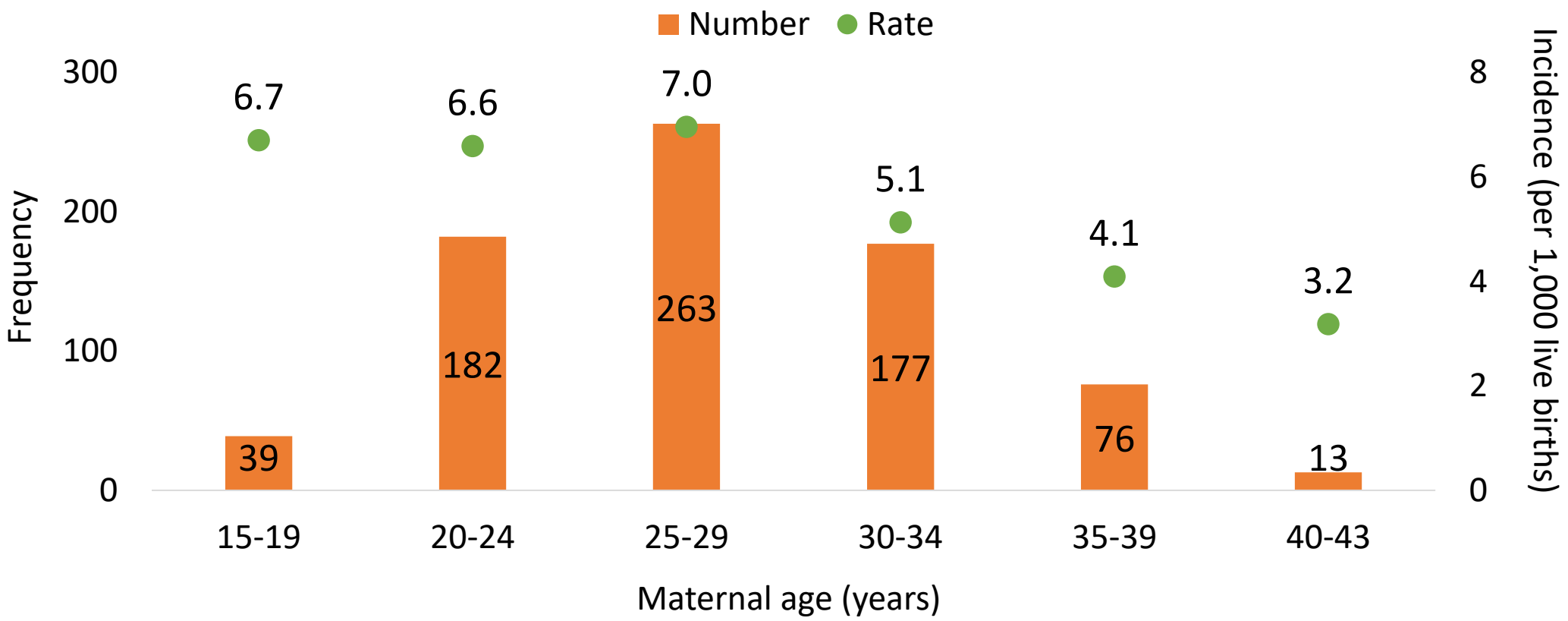
Clinical Signs/Symptoms in SendSS	
Blotchy skin coloring	Other
Diarrhea	Poor/inability to feed
Excessive crying	Seizures
Excessive sucking	Sweating
Fever/temperature instability	Tremors
Hyperactive reflexes	Vomiting
Hyperirritability	

Confirmed NAS Cases by Confirmation Method, Georgia, 2017 (N=762)



DATA SOURCE: State Electronic Notifiable Disease Surveillance System NAS reporting form (2017). Georgia Department of Public Health. Data pulled September 5, 2018.

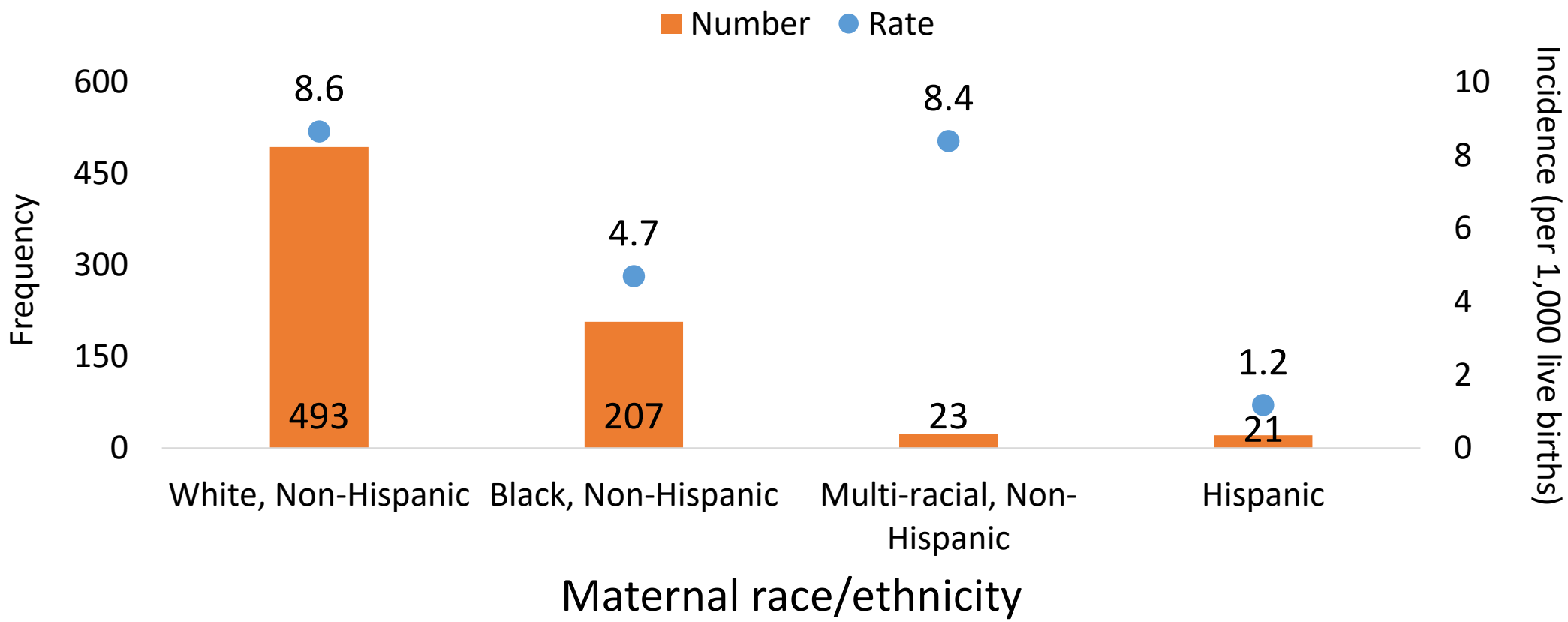
Confirmed NAS Cases and Incidence by Maternal Age, Georgia, 2017 (N=750*)



*Maternal age was not available for all confirmed cases.

DATA SOURCE: State Electronic Notifiable Disease Surveillance System NAS reporting form (2017). Georgia Department of Public Health. Data pulled September 5, 2018.

Confirmed NAS Cases and Incidence by Maternal Race/Ethnicity, Georgia, 2017 (N=744*)



*Maternal race/ethnicity was not available for all confirmed cases.

DATA SOURCE: State Electronic Notifiable Disease Surveillance System NAS reporting form (2017). Georgia Department of Public Health. Data pulled September 5, 2018.

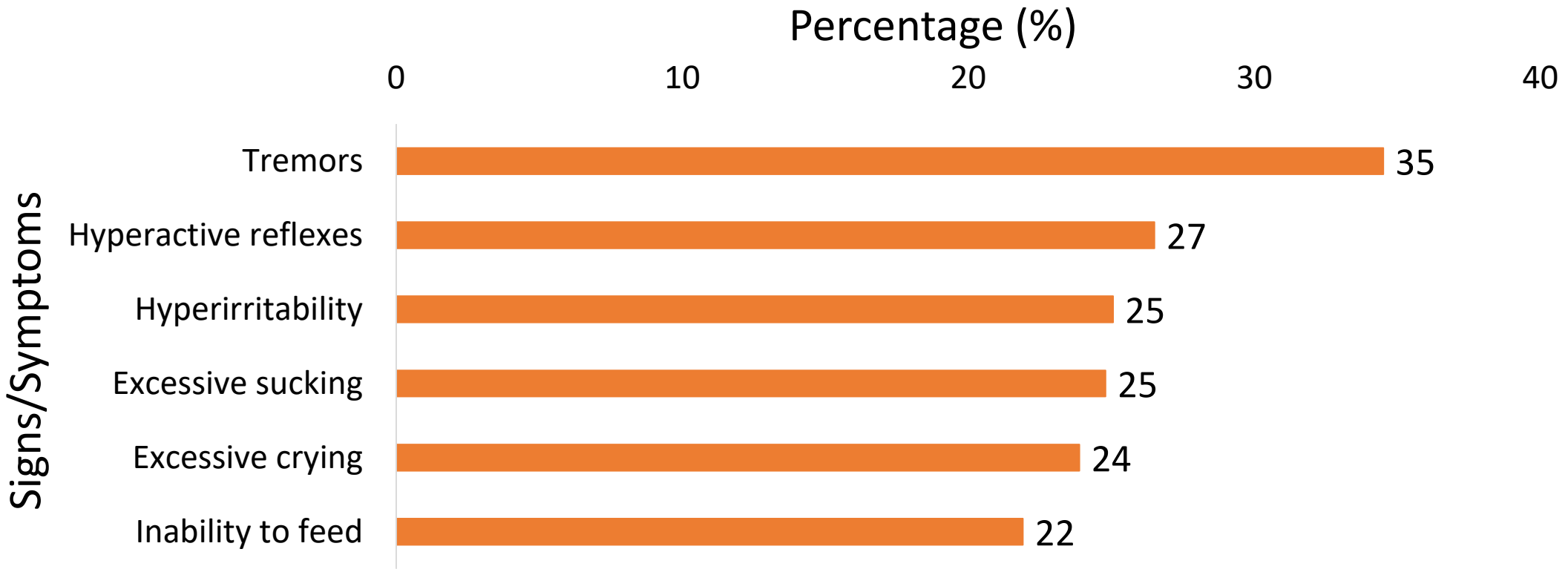
Confirmed Case Summary

- Maternal age
  - Incidence was highest among infants born to mothers 15-29 years of age (6.6-7.0 cases per 1,000 live births)
  - **>1/3** infants with NAS were born to mothers **25–29 years of age**
- Maternal race/ethnicity
  - **~2/3** confirmed NAS cases had **White, non-Hispanic** mothers (493 infants among 744* confirmed cases)
  - Infants with **White, non-Hispanic** mothers had nearly **twice** the incidence of NAS as infants with Black, non-Hispanic mothers (8.6 vs 4.7 cases per 1,000 live births)
- Infant sex
  - 52% of confirmed cases were male and 48% were female
  - Incidence rate was **~6.0** cases per 1,000 live births for each sex

*Maternal race/ethnicity was not available for all confirmed cases.

Reported Withdrawal Signs/Symptoms

Distribution of NAS Signs/Symptoms*, Georgia, 2017 (N=762)



*Only signs/symptoms reported in >20% of confirmed cases are displayed. Cases may be included in more than one category, as multiple signs/symptoms could be reported per case.

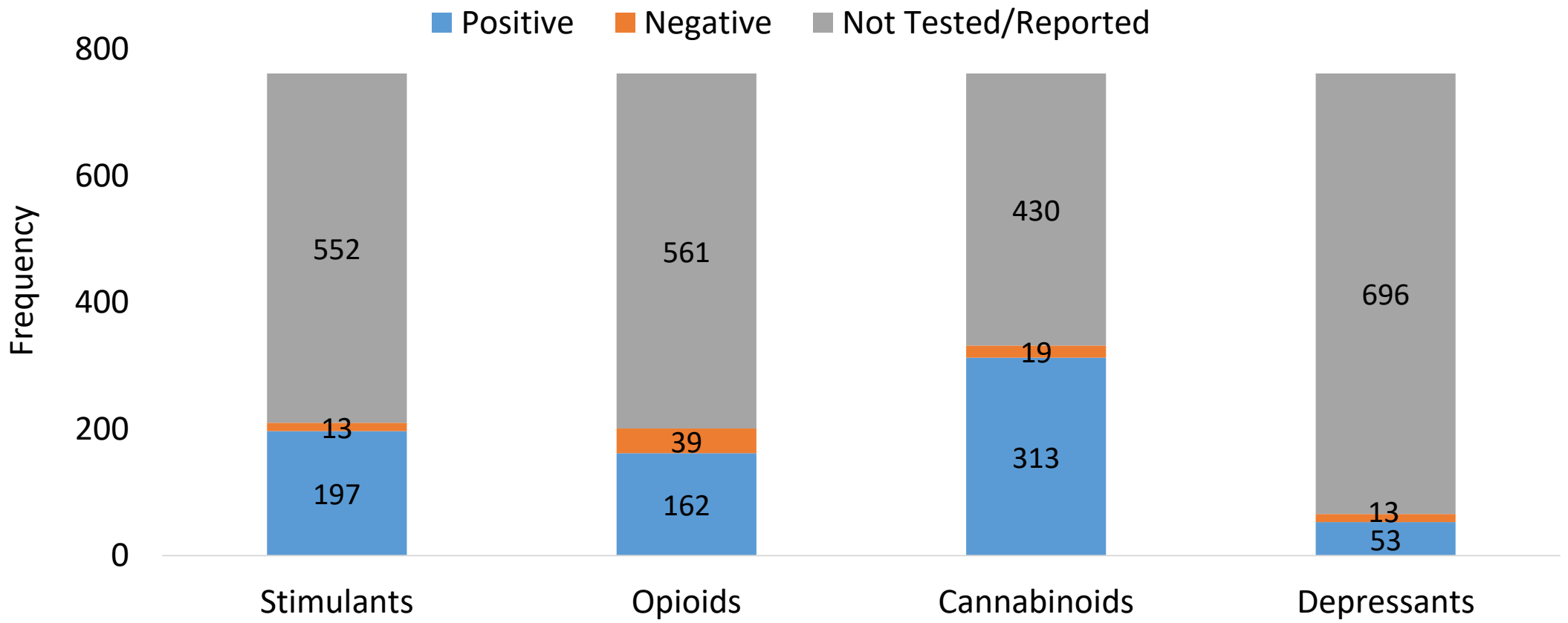
DATA SOURCE: State Electronic Notifiable Disease Surveillance System NAS reporting form (2017). Georgia Department of Public Health. Data pulled September 5, 2018.

Reported Withdrawal Signs/Symptoms

- Among confirmed cases, 451 infants (59%) reported to have clinical signs/symptoms consistent with substance withdrawal
  - **Tremors** (35%) most frequently reported
  - **~1/4** reported to have **hyperactive reflexes** (27%), **hyperirritability** (25.1%), and/or **excessive sucking** (25%)
- Among confirmed NAS cases reported with any signs/symptoms, **>80%** reported **multiple** signs/symptoms

Reported Substance Exposure

Toxicology Screening Results by Substance Class among Confirmed Cases, Georgia, 2017 (N=762)



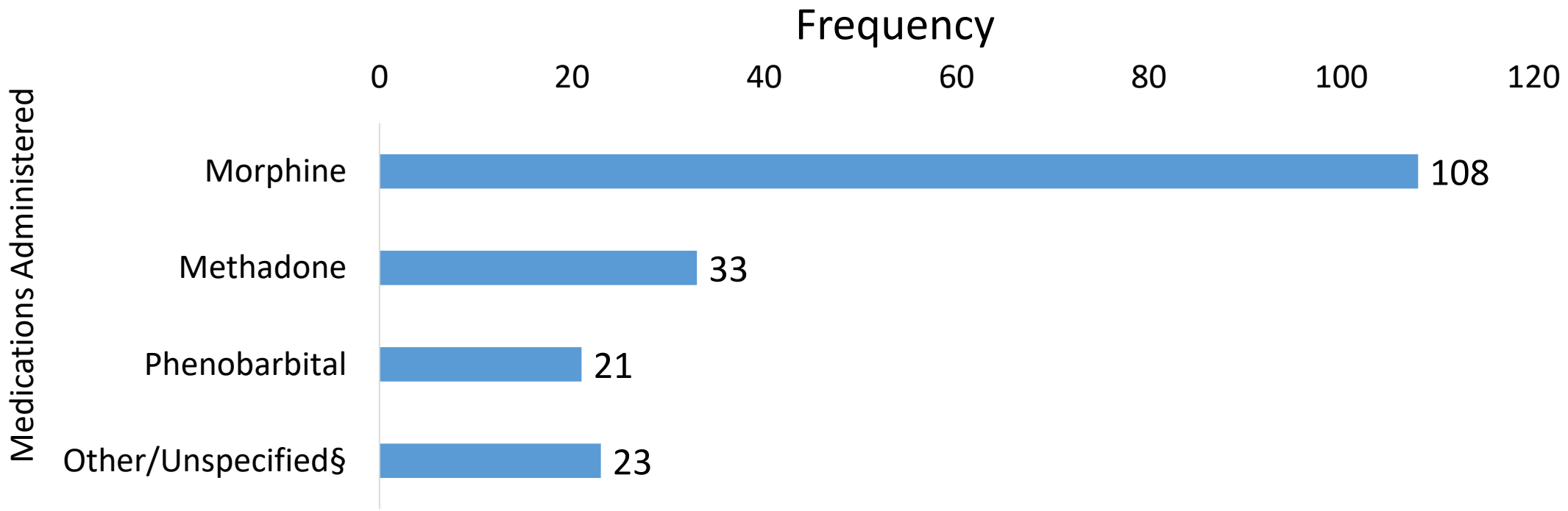
*Classes are not mutually exclusive, as an infant could have a positive toxicology screen for more than one substance/class.
DATA SOURCE: State Electronic Notifiable Disease Surveillance System NAS reporting form (2017). Georgia Department of Public Health. Data pulled September 5, 2018.

Reported Substance Exposure

- **3/4** confirmed NAS cases reported positive toxicology screens for **≥1 substance**
- Infants were most frequently reported positive for cannabinoids
- **>1/5** confirmed NAS cases had positive toxicology screens for **stimulants** (~26%) or **opioids** (~21%)
- Infant toxicology results not available for majority of confirmed cases….

Reported Medications Used to Treat Infants

Medications Used to Treat Infants with Clinical Signs/Symptoms of Drug Withdrawal* among Infants with NAS Signs/Symptoms, Georgia, 2017 (N=451)



*Categories are not mutually exclusive, as some infants were treated with more than one medication.
§Other includes benzodiazepines, caffeine, clonidine, fentanyl, Sudafed, and Versed. Other and Unspecified categories were combined due to few reported cases.
DATA SOURCE: State Electronic Notifiable Disease Surveillance System NAS reporting form (2017). Georgia Department of Public Health. Data pulled September 5, 2018.

Reported Medications Used to Treat Infants

- **Morphine** was the most frequently reported pharmacological intervention used
- **~1/5** confirmed NAS cases reported to have received pharmacological intervention (n=161)
- Among infants reported with signs/symptoms (N=451), **~1/3** received medication to treat withdrawal (n=159)

Key Findings and Recommendations

Key Findings

- Reporting expanded to **52** birthing facilities
- 1,053 suspected cases reported - **762** determined to meet case definition
  - **59%** reported with **signs/symptoms** consistent with NAS (± positive toxicology), while **41%** reported with **positive toxicology only**
  - Infants born to mothers 15-29 years of age, **especially 25-29** (7.0 per 1,000 live births), and **non-Hispanic Whites** (8.6 per 1,000 live births) had highest NAS rates
- Rate of confirmed NAS was ~6.5 cases per 1,000 live births (vs 12.7/1,000 live births identified through HDD)

Key Findings (cont'd)

- **Small metropolitan**, **micropolitan**, and **non-core** counties had higher NAS rates than large and medium metropolitan counties (17.5–19.8 vs. 9.9–13.0 per 1,000 live births, respectively)
- Hospital **charges** and **length of stay increased** substantially for infants experiencing withdrawal compared to non-NAS infants **($12,500** and **9 days**, respectively)
- **Toxicology results** are **underreported**, which impacts ability to inform intervention and prevention efforts

Key Recommendations

- Train hospital staff on **standardized protocol** for identification, assessment, and management of NAS
- Promote **primary prevention opportunities**, such as responsible prescribing practices, reproductive planning, and access to contraception
- Promote **existing services** and advocate for **increased support** for women with substance use disorder
- Improve **case identification** and **reporting** at facilities
  - Increase **awareness** of NAS
  - Encourage participation in **reporting suspected cases of NAS**
  - Leverage resources to **remove barriers to reporting**

Upcoming Changes to NAS Case Definition

Upcoming Case Definition Change

- Council of State and Territorial Epidemiologist's NAS Case Definition Workgroup
- Lack of standardized case definition currently
- Contributes to variability in reporting across jurisdictions

Recommendations from Workgroup

1. Utilize standard sources for case ascertainment: healthcare records, clinician & laboratory reporting
2. Utilize standardized criteria for case ascertainment
   - **Example**: A hospitalized neonate with any clinical signs consistent with NAS not explained by another etiology (e.g., sepsis, intracranial hemorrhage, hypocalcemia)
3. Utilize standardized criteria for case classification
   - Clinical **example**: A diagnosis of NAS OR a chief complaint that mentions NAS or a clinically compatible presentation
   - Laboratory **example**: *Confirmatory laboratory evidence - Neonate:*

Detection of opioids (any level) including natural (e.g., morphine, codeine), semi-synthetic (e.g., heroin), and synthetic (e.g., fentanyl, or fentanyl analogs), or opioid metabolites (e.g., 6-monoacetylmorphine), benzodiazepines (e.g., diazepam, alprazolam), or barbiturates (e.g., phenobarbital) in any clinical specimen from a screening or other laboratory test

THANK YOU FOR YOUR CONTRIBUTIONS TO THIS WORK! QUESTIONS?

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Supplemental Slides

NCHS Urban-Rural Statuses

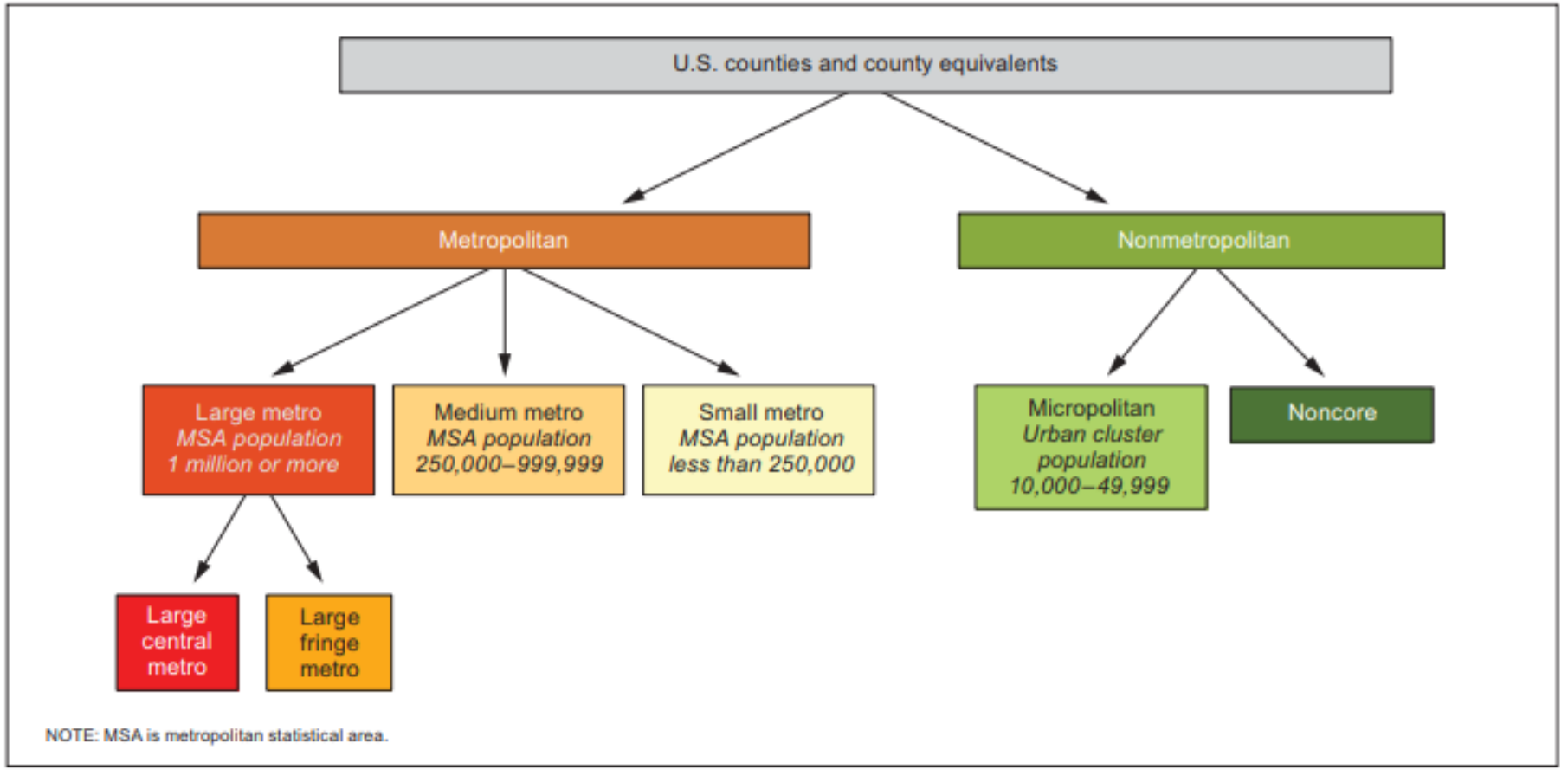

Figure 1. Structure of the 2013 NCHS Urban–Rural Classification Scheme for Counties

Ingram D. D., Franco S.J. 2013 NCHS Urban–Rural Classification Scheme for Counties. National Center for Health Statistics. [Internet]. Vital Health Statistics 2(166). 2014. [Cited 2018 Nov 9]. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf