

Improving Care For Newborns With Substance Exposure And Neonatal Abstinence Syndrome



Goal

To provide effective and sustainable training for WV pre-hospital field providers and acute care facility personnel in the care and recognition of infants exposed to substances during pregnancy who require management for Neonatal Abstinence Syndrome (NAS) after hospital discharge.



Why Neonatal Abstinence Became A Project

In 2017, funding was received from the Hospital Preparedness Program grant to develop a neonatal abstinence syndrome training to address the rising number of infants requiring treatment for Neonatal Abstinence Syndrome.

Committee members consist of:

- Pediatricians/Neonatologists
- Registered Nurses
- Paramedics
- Emergency Medical Technicians
- WV Office of Emergency Medical Services Personnel
- WV Hospital Association
- WV Perinatal Partnership
- Appalachian High Intensity Drug Trafficking Area

Substance Use In Pregnancy

- Serious problem for both mother and baby
- Drug withdrawal and illnesses from high risk behavior (Mom)
- Poor prenatal care
- Withdrawal in the baby or effects such as low birthweight, congenital malformations, prematurity, long-term cognitive problems/learning disabilities or adverse effects on growth



Source of Exposure

- Currently in WV, the drug associated with NAS is not tracked. However, Tennessee NAS surveillance documents the drug used during gestation.
- The most recent data available from Tennessee is week 50 from 2017, which is cumulative for calendar year.
- Source of Exposure*:
 - Medication assisted treatment (MAT) - 69%
 - Legal prescription of an opioid pain reliever - 6%
 - Legal prescription of a non-opioid - 9%
 - Prescription opioid obtained without a prescription - 29%
 - Non-opioid prescription substance obtained without a prescription - 16%
 - Heroin - 5%
 - Other non-prescription substance - 20%
 - No known exposure - <1%
 - Other - 3%

* It is possible that more than one source of exposure occurred.

Objectives

- History of substance use in pregnancy in WV
- Most common substances used in pregnancy
- Effects on the newborn
- Recognizing Neonatal Abstinence Syndrome (NAS)
- Treatment options

Brief History Of Substance Use In Pregnancy

- Perinatal partnership established in 2006 with the mission to identify reasons for poor health outcomes in maternal and child population.
- 50% of WV perinatal providers identified drug and alcohol use as a major factor in poor birth outcomes.
- Committee on substance use in pregnancy was formed with its goal being the determination of prevalence rates, costs associated with treatment, methods to improve identification of pregnancies at risk and subsequent treatment/care of affected infants, and long term goal of reduction of substance use in pregnancy and improvement of birth outcomes through education of providers and their patients.

Substance Use In Pregnancy

Prevalence

What do we know about the extent of the problem of maternal substance use and its effect on infants?

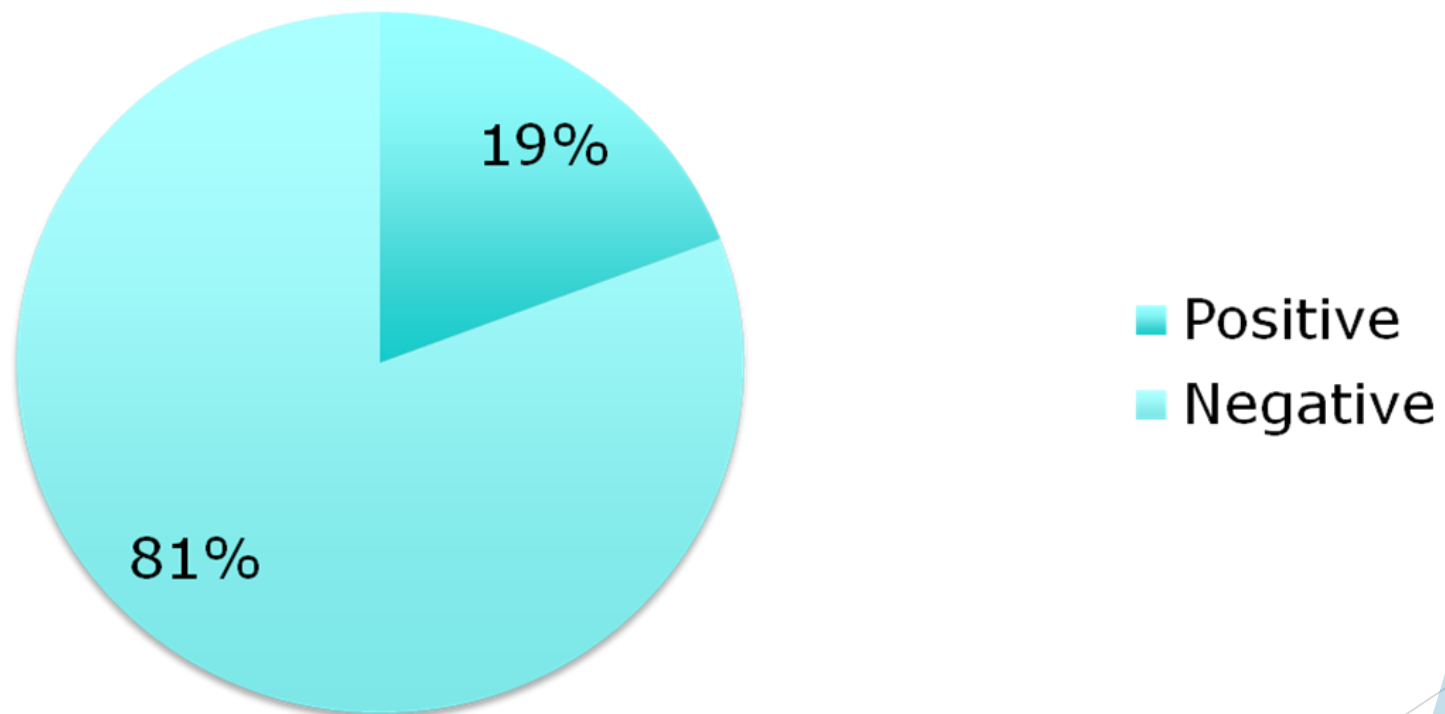


Umbilical Cord Tissue Study September 2009

- Collection of 759 discarded de-identified umbilical cord tissue segments from 8 WV hospitals across the state. Segments tested by lab for substances of use/abuse.
- Goal was to determine the rate and type of substances used during pregnancy in babies delivered at WV hospitals

Prevalence Of Substance Use In Pregnancy (WV)

759 Total Cords

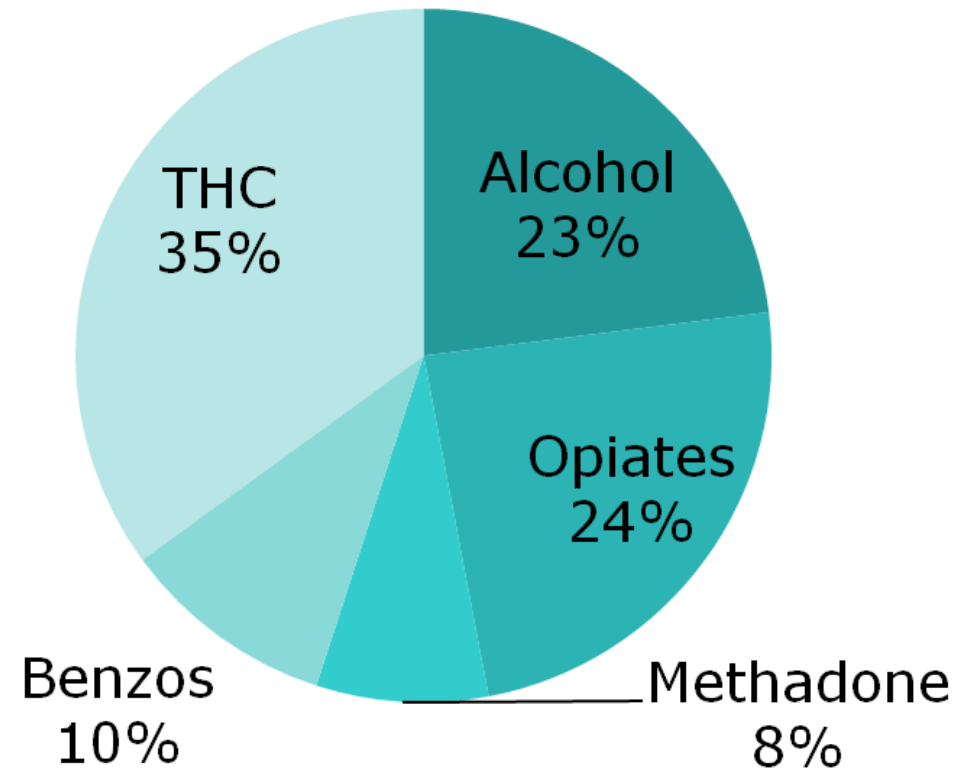


Source: Stitley, Michael, MD, et.al. "Prevalence of Drug Use in Pregnant West Virginia Patients," *West Virginia Medical Journal*, Vol. 106, No. 4, 2010.

This work was supported by the HRSA MCH Title V Block grant to the WV OMCFH

Results Of Umbilical Cord Tissue Study, 2009

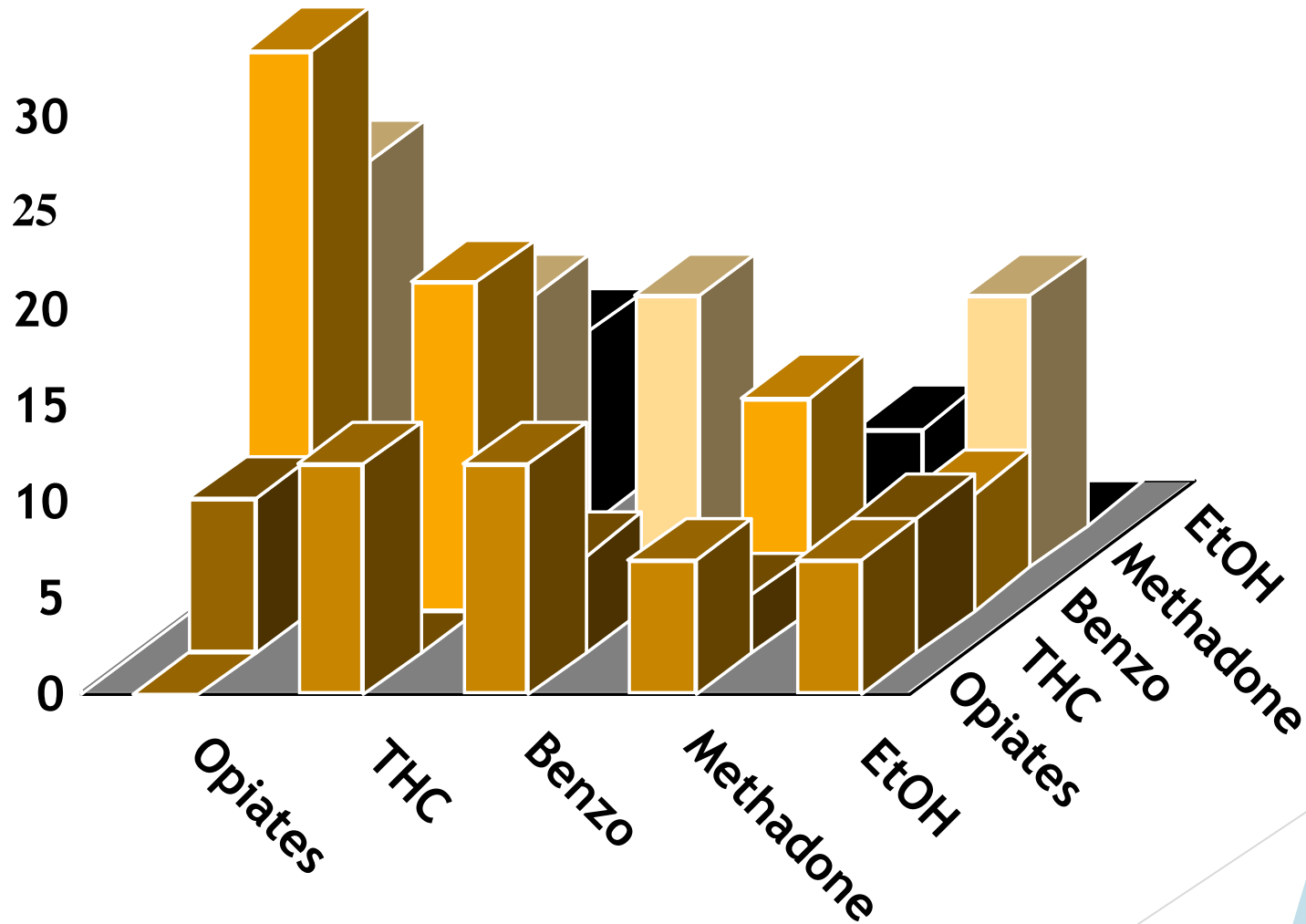
Drugs



Source: Stitley, Michael, MD, et.al. "Prevalence of Drug Use in Pregnant West Virginia Patients," West Virginia Medical Journal, Vol. 106, No. 4, 2010.

This work was supported by the HRSA MCH Title V Block grant to the WV OMCFH

Polysubstance Abuse



Source: Stitley, Michael, MD, et.al. "Prevalence of Drug Use in Pregnant West Virginia Patients," West Virginia Medical Journal, Vol. 106, No. 4, 2010. This work was supported by the HRSA MCH Title V Block grant to the WV OMCFH

Common Substances Used In Pregnancy

- Nicotine and Marijuana
- Alcohol
- Cocaine and Methamphetamines
- Opiates
- “Polysubstance” use is very common

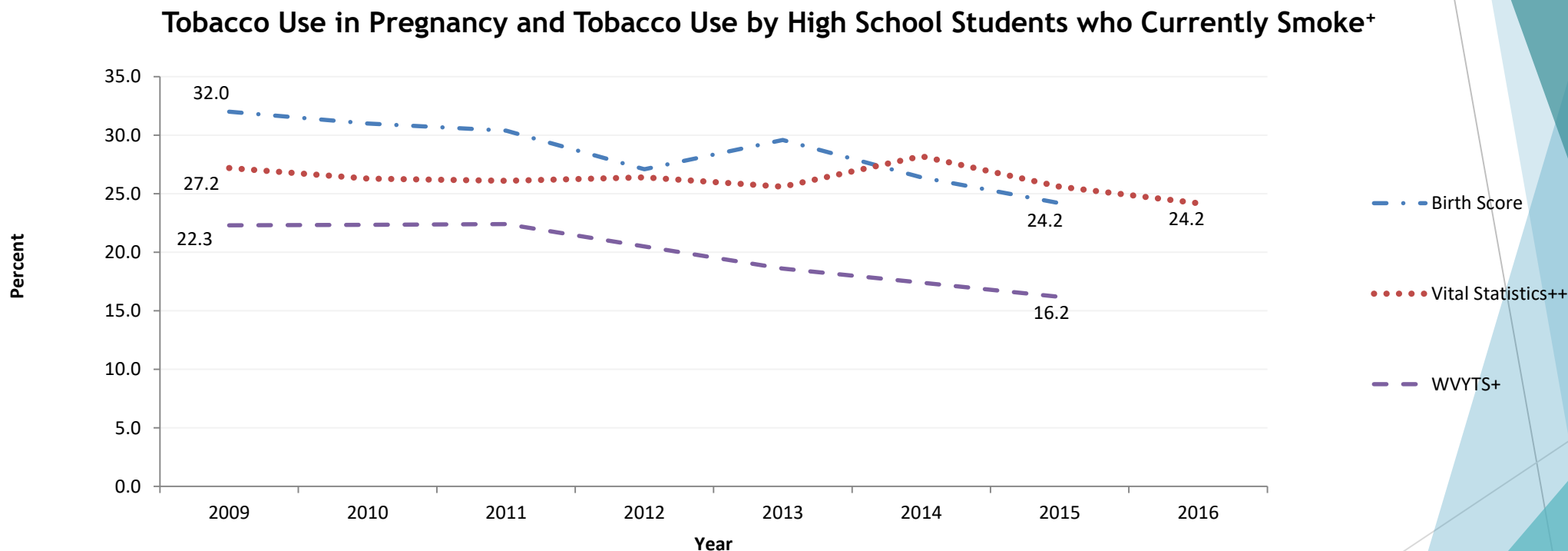


Tobacco: Effect On The Newborn

- Toxic chemicals in tobacco include nicotine, carbon monoxide and hydrogen cyanide.
Results in: poor placental blood flow (38% decrease), fetal hypoxemia, and malnutrition
- Nicotine causes loss of nerve cells and damages neurons causes brain damage even if not low birthweight
- Nicotine causes low birthweight, preterm birth, increased infant mortality and maybe a factor in SUIDS (Sudden Unexplained Infant Death Syndrome)
- Nicotine may cause behavioral and cognitive effects in later childhood

Tobacco Use During Pregnancy

- West Virginia has a high rate of tobacco use during pregnancy.
- However, progress is being made to decrease rates.



⁺On at least 1 day during the 30 days before the survey as indicated in the West Virginia Youth Tobacco Survey (WVYTS).

⁺⁺Vital Statistics data is derived from birth certificate reporting. Data for 2016 is cumulative as of 12/14/2016.

<http://dhhr.wv.gov/News/2016/Pages/Rates-of-Smoking-during-Pregnancy-Show-Strong-Signs-of-Decline.aspx>

Marijuana: Effects On The Newborn

- Most commonly used illicit drug
- Studies suggest infants born low birth weight
- Older children may have learning deficits and poor memory and reduced “executive functioning”
- Interacts with two receptors in brain (CB1 and CB2)
- Cannabis has over 480 chemicals
- 66 unique cannabinoids e.g.
 - delta-9-THC (psychoactive)
 - cannabidiol (antiemetic)
 - cannabitol (anticonvulsant)



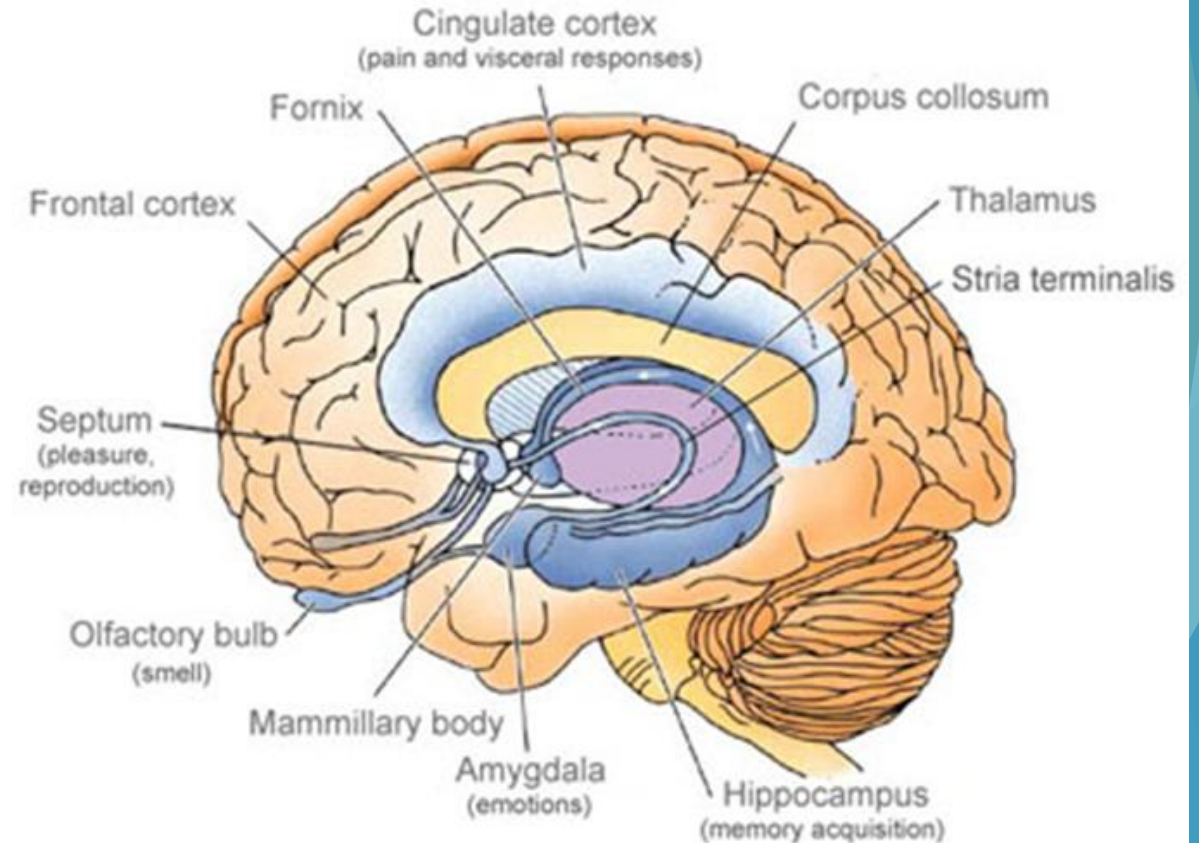
Marijuana: Effects On The Newborn (Cont'd.)

- Studies so far have yielded conflicting results
- Legalizing marijuana has implications for more severe effects
- Concentrations of cannabinoids may be much higher in plants grown selectively for specific effects
- Marijuana use 1-4 weeks after conception may affect structural development of the brain (neural plate)
- Marijuana use in 2nd trimester may cause disruption of differentiation of the brain and neurodevelopmental deficits in cognition and memory



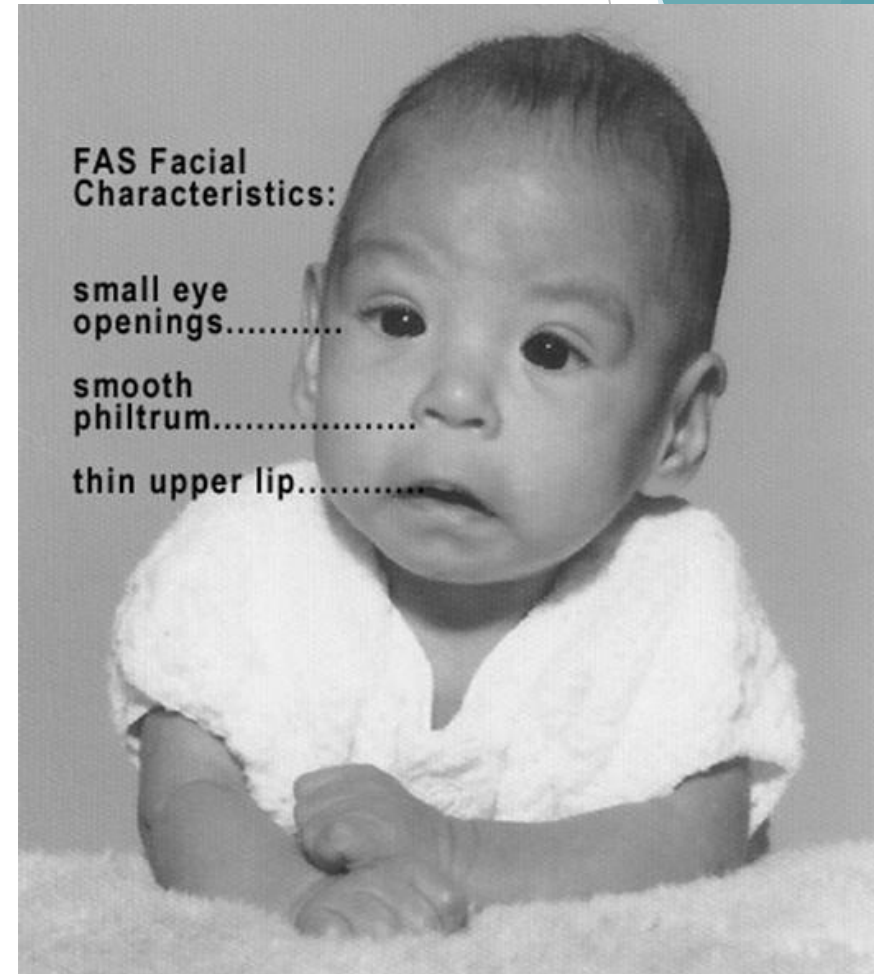
Alcohol: Effects On Newborn

- Alcohol freely crosses the placenta : is a TERATOGEN
- Causes damage to many parts of brain : cerebellum hippocampus, basal ganglia, and corpus callosum “Limbic system”
- Supports different functions...
 - Emotion, behavior, memory
 - Motivation, smell, learning
- Corpus Callosum connects left and right sides of brain



Alcohol: Effects On The Newborn (Cont'd.)

- Use in early pregnancy may cause Fetal Alcohol Syndrome
 - Babies are growth restricted
 - Average IQ 63 in childhood
 - Have motor deficits
 - Tremulous, irritable, hyperactive
- Microcephalic, short palpebral fissures, long philtrum, thin upper lip, VSD/ASD joint anomalies, small 5th fingernail



Alcohol Effects On The Newborn (Cont'd.)

FETAL ALCOHOL SPECTRUM DISORDER

- May result from later exposure
- Much more prevalent
- Does not have gross structural damage
- Kills nerve cells, inhibits synapses
- Inhibits myelin formation and biochemical processes

ALCOHOL USE IN PREGNANCY IS:

“The most common non-genetic cause of mental retardation”

Cocaine/Amphetamines: Effects On Babies

- Effects are pharmacologically similar (different mechanism)
- Both are very potent sympathomimetics (vasoconstriction)
- Increase noradrenaline, dopamine and serotonin
- Poor placental blood flow: babies are growth restricted

COCAINE



METHAMPHETAMINE



Cocaine and Amphetamines

Babies:

- May be small for age, born prematurely
- May have placental abruption, born outside hospital
- May have microcephaly, anomalies of cardiac, renal or gastro-intestinal tract

Long term follow up of “cocaine babies” has not shown much:

- Small deficits in intelligence
- Some language deficits and less abstract thinking
- Poor academic skills

THESE DRUGS DO NOT CAUSE WITHDRAWAL IN BABIES

Neonatal Abstinence Syndrome (NAS)

- Refers to a syndrome in babies that results from exposure to certain substances in utero, which occurs after the umbilical cord is cut, and the exposure is removed abruptly. These babies have symptoms of withdrawal which may or may not require (or have required) pharmacologic therapy.
- The class of drugs most commonly associated with this syndrome are Opioids (morphine, codeine, hydrocodone oxycodone, methadone, buprenorphine, heroin).
- NAS is NOT caused by alcohol, nicotine, marijuana, cocaine, or methamphetamine, but MAY make the syndrome worse.

Neonatal Abstinence Syndrome (Cont'd.)

Signs and Symptoms

- Hyper-irritability, high-pitched crying, abrupt state changes, gaze aversion, tremors, seizures
- Gastro-intestinal dysfunction with frantic sucking, rooting vomiting, diarrhea
- Respiratory distress and tachycardia
- Vague autonomic symptoms:
 - Yawning
 - Sneezing
 - Fever
 - Mottling of skin



Opioid Use In Pregnancy

- Opioids are Natural, Synthetic compounds (Opiates) used for relief of pain. They all have morphine-like actions
- Common opioids: Morphine, Codeine, Hydrocodone, Hydromorphone, Oxycodone, Zohydro Subutex/Suboxone (buprenorphine), Methadone



- Heroin (diacetylmorphine) is synthetic with a short $\frac{1}{2}$ life. Heroin is converted to 6-monoacetyl morphine (6-MAM). 6-MAM has 6X potency of Morphine!!

Opioids

- “Designer” opioids are synthetic derivatives of opioids. These are created in makeshift laboratories such as:
 - 3-methylfentanyl (Moscow theater hostage crisis 2002)
 - alpha-fentanyl (China white)
 - desomorphine (“krokodil”)
- These agents change frequently in labs in an attempt to evade law-enforcement. They have up to 1000X potency of heroin and are responsible for overdose deaths.

Opioids (cont'd.)

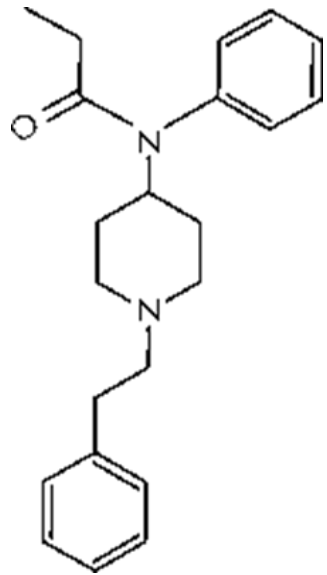
- Fentanyl is an opiate with 100 times the potency of morphine. It can be injected, smoked or snorted. Analogs include:
 - Mexican brown
 - Persian white
 - China white(α -methylyfentanyl)
 - 3-methylyfentanyl is 16X potency of fentanyl
- Carfentanil is a veterinary anesthetic, and is also now in samples of heroin in the USA and Canada
- MPPP (1-methyl-4-phenyl-4-propionooxypiperidine) is called “the new designer heroin” (impurities can cause Parkinsonism)
- These are dangerous drugs produced in labs with no controls of purity or potency

Fentanyl and Analogues

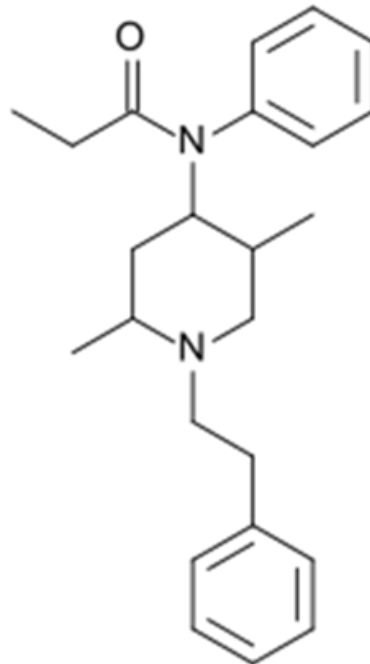
Derivatives of Piperidine

Chemical Structure:

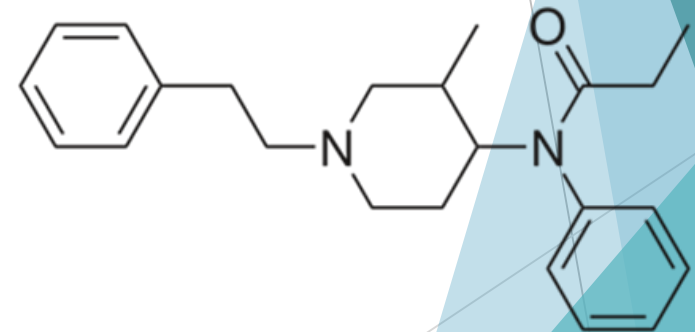
C₂₂H₂₈N₂O



2,5 dimethyl

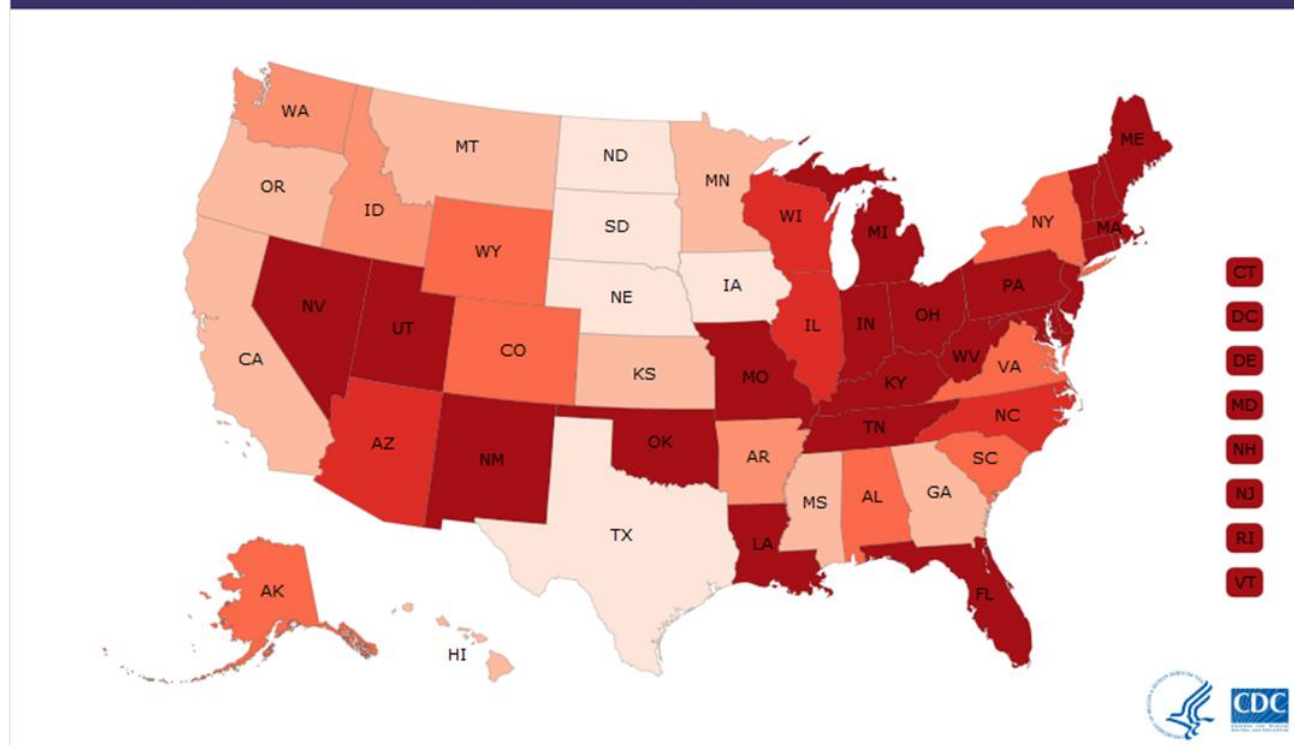


3-methyl fentanyl



2016 Drug Overdose Death Rates per 100,000 Population

Number and age-adjusted rates of drug overdose deaths by state, US 2016



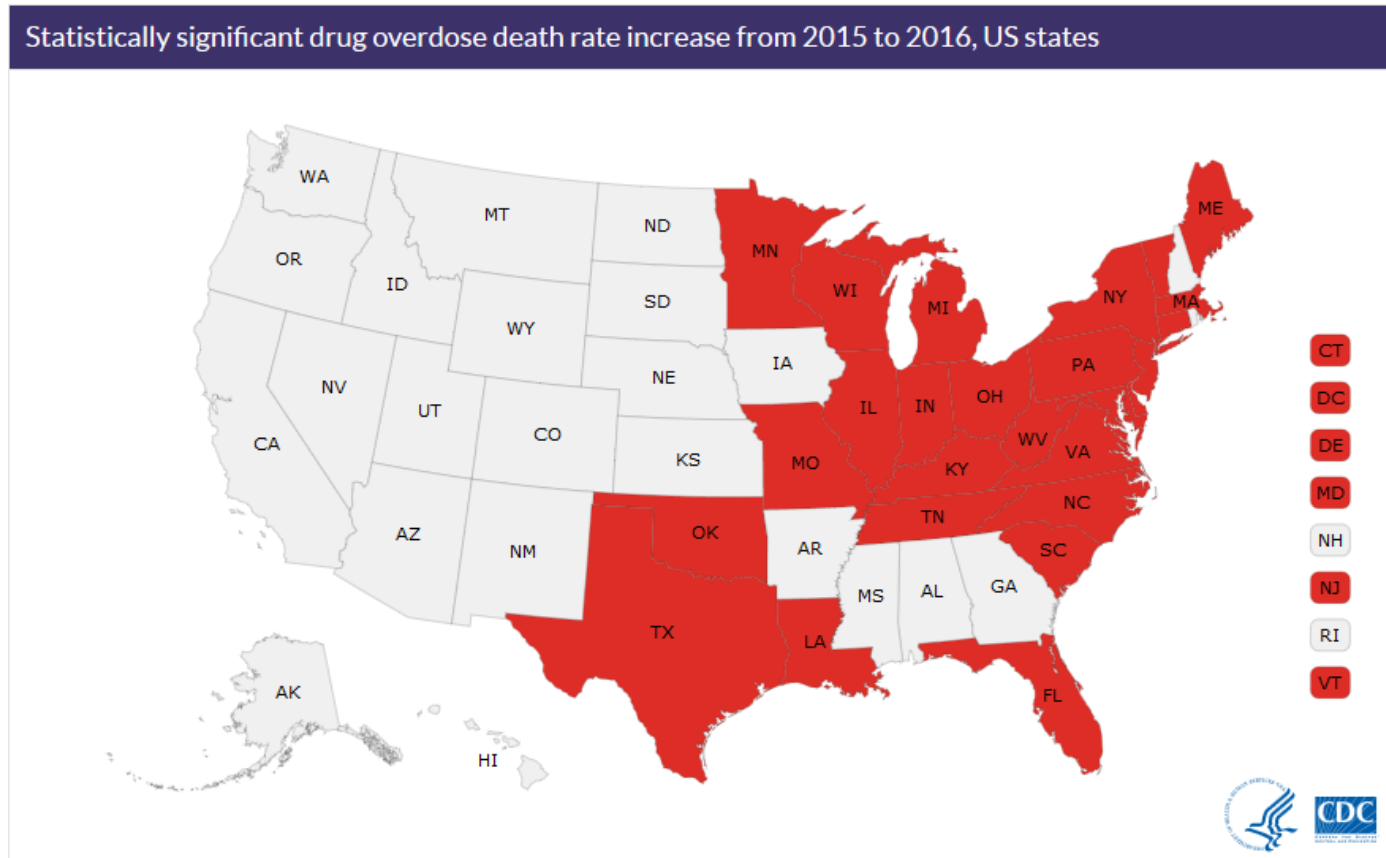
Legend

- 6.9 to 11.0
- 11.1 to 13.5
- 13.6 to 16.0
- 16.1 to 18.5
- 18.6 to 21.0
- 21.1 to 52.0

WV: 52.0
US: 19.8

Source: <https://www.cdc.gov/drugoverdose/data/statedeaths.html#tabs-2-3>

Overdoses Increased from 2015 to 2016



Statistically significant increase

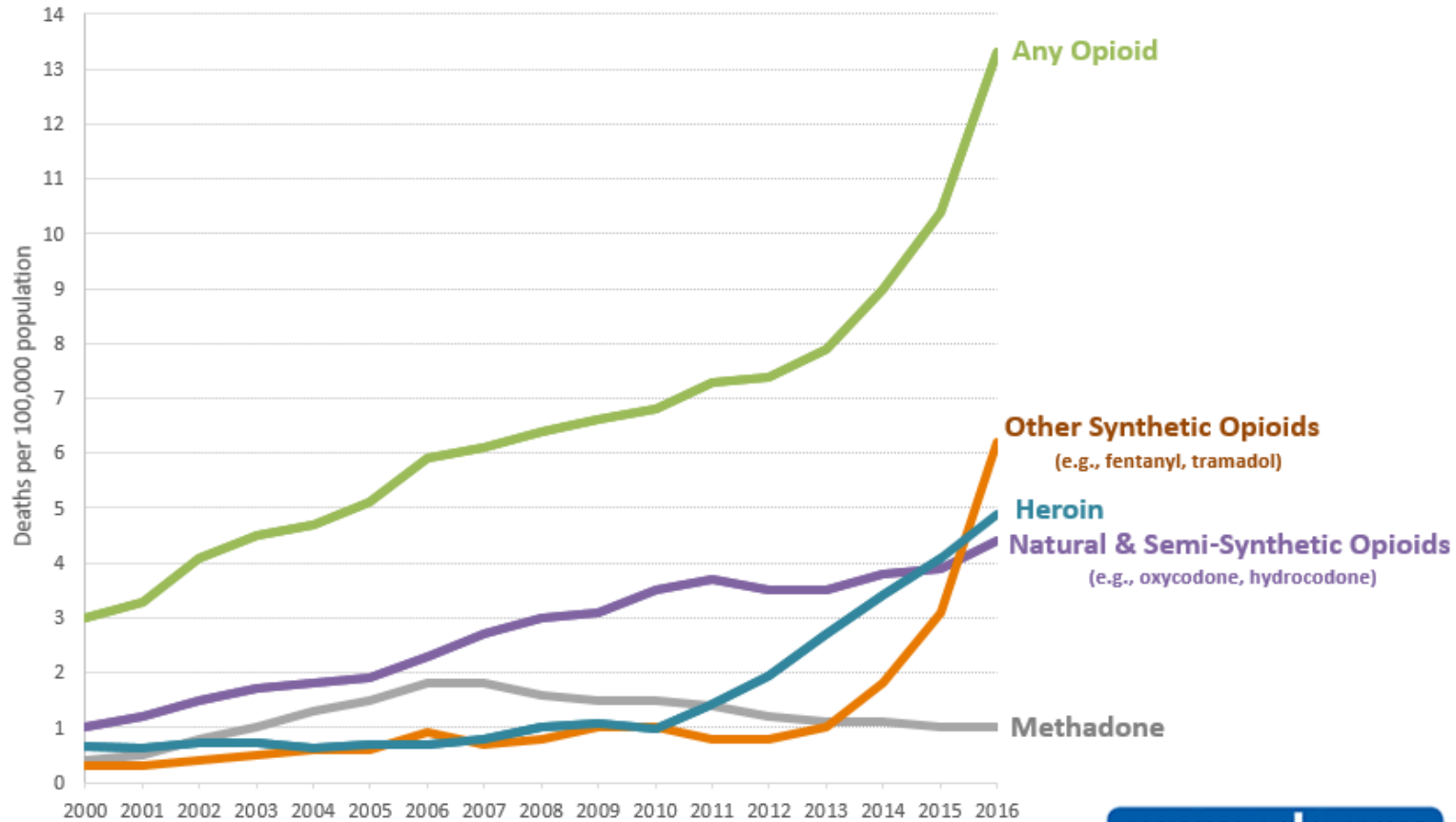
Statistically significant increase from 2015 to 2016

- No
- Yes

Source: <https://www.cdc.gov/drugoverdose/data/statedeaths.html#tabs-2-3>

Drugs Contributing to Overdose Death

Overdose Deaths Involving Opioids, by Type of Opioid, United States, 2000-2016



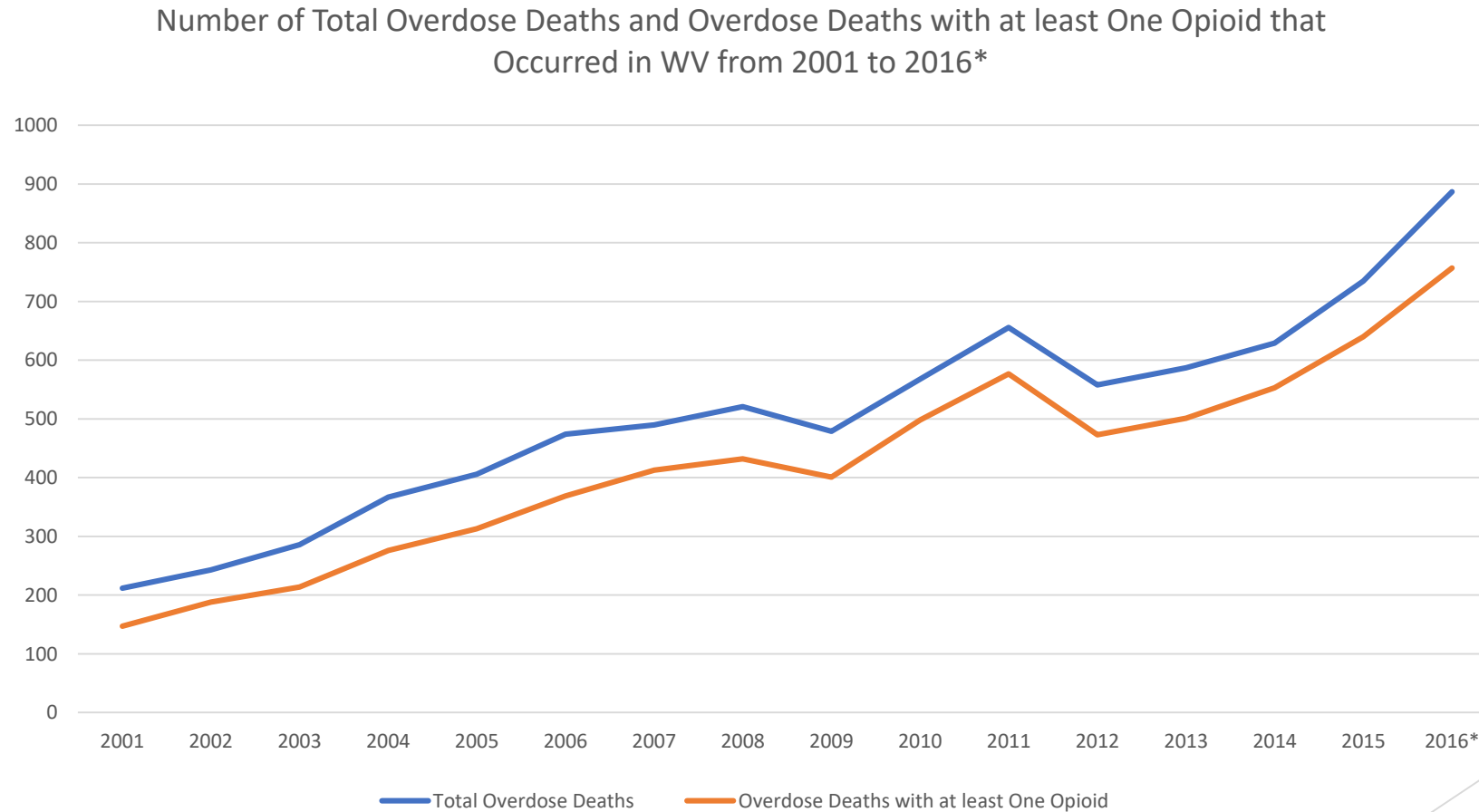
SOURCE: CDC/NCHS, National Vital Statistics System, Mortality. CDC WONDER, Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://wonder.cdc.gov/>.



<https://www.cdc.gov/drugoverdose/data/analysis.html>

Overdose Deaths in WV

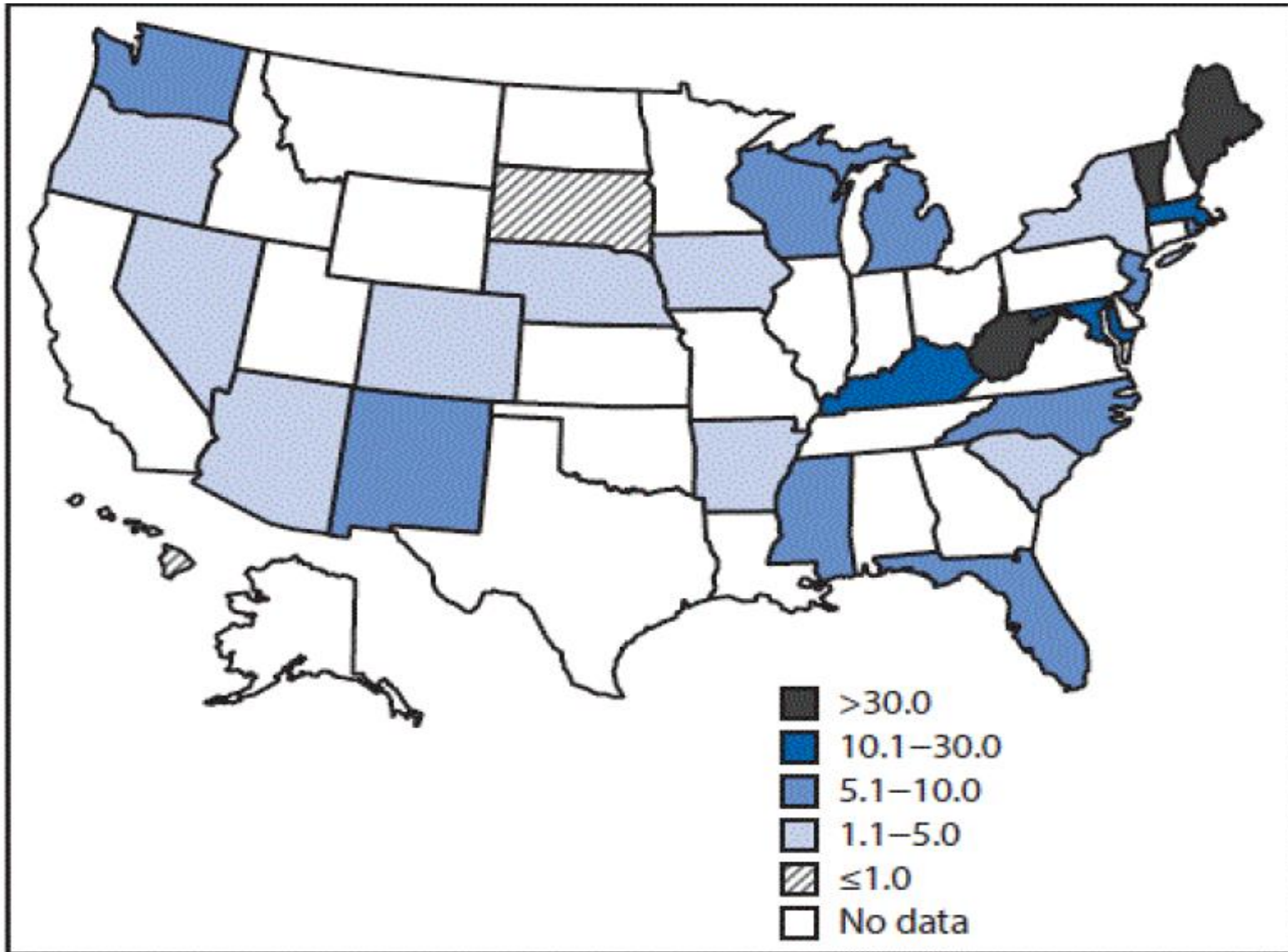
- The number of overdose deaths that occur in WV is increasing.



*Data is preliminary.

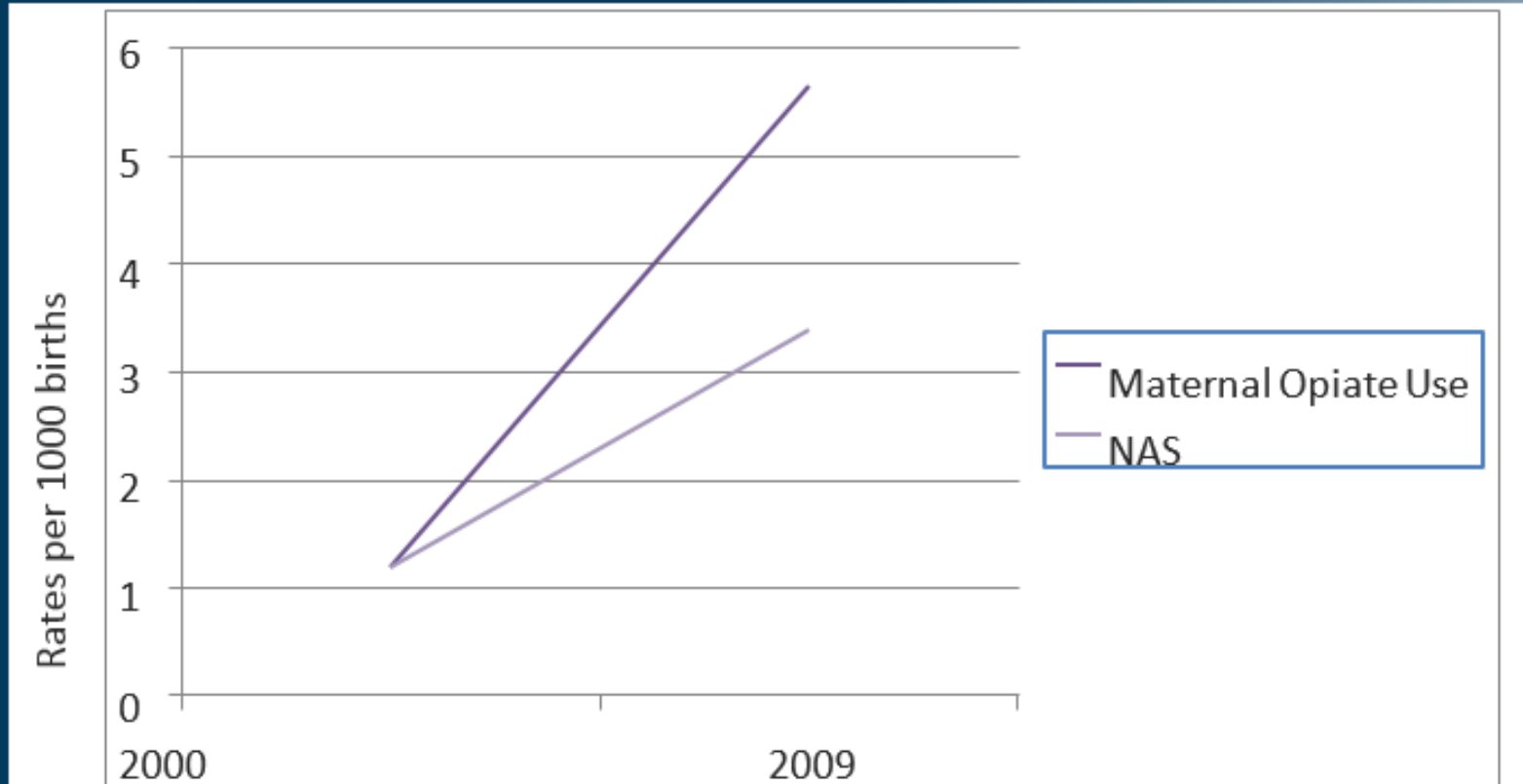
Data Source: West Virginia Health Statistics Center, Vital Statistics System, Drug Overdose Database, January 31, 2018.

NAS* Incidence Rates 2012-2013



Neonatal Abstinence Syndrome

Nationally



Source: Patrick, S., et. Al, "Neonatal Abstinence Syndrome and Associated Health Care Expenditures, U.S. 2000-2009." JAMA, May 9, 2012

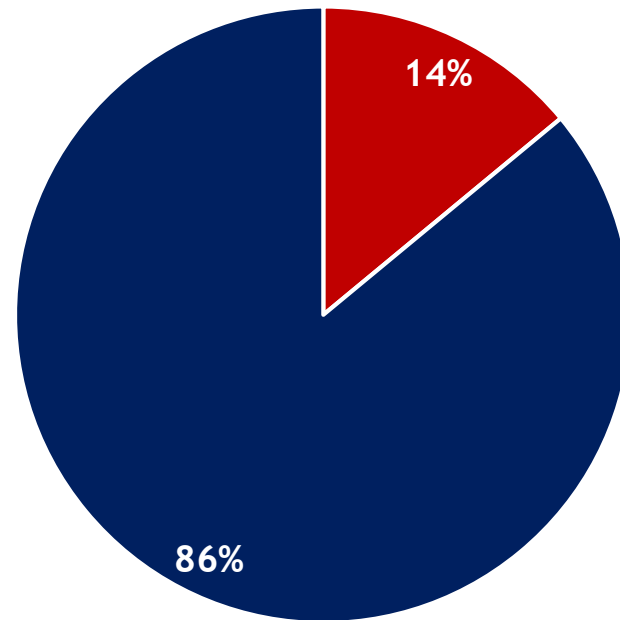
NAS Data in WV

- The national data source for NAS surveillance is the hospital uniform billing data from the State Inpatient Databases, Healthcare Cost and Utilization Project.
 - This source has a long data lag. NAS is also likely under reported in this dataset.
 - The WV Bureau of Public Health has implemented two NAS surveillance data sets since 2014, to improve the ability of the state to track NAS rates in a more timely manner.
 - In 2014, the WV Health Statistics Center added NAS diagnosis to the Birth Certificate.
 - In October 2016, intrauterine substance exposure and NAS diagnosis was added to the Birth Score through the OMCFH's collaboration and support of Project Watch at WVU.
 - Birth Score is a developmental and risk screening tool completed on infants born at WV birth facilities.

Intrauterine Substance Exposure

- From January 1, 2017 to December 31, 2017:
 - 14.2% of all infants born at West Virginia birthing facilities were exposed to drugs prenatally.
 - 14.4% of West Virginia infants born at in-state birthing facilities were exposed to drugs prenatally.

Percent of Infants Exposed to Drugs Prenatally Born at WV Birthing Facilities in 2017.



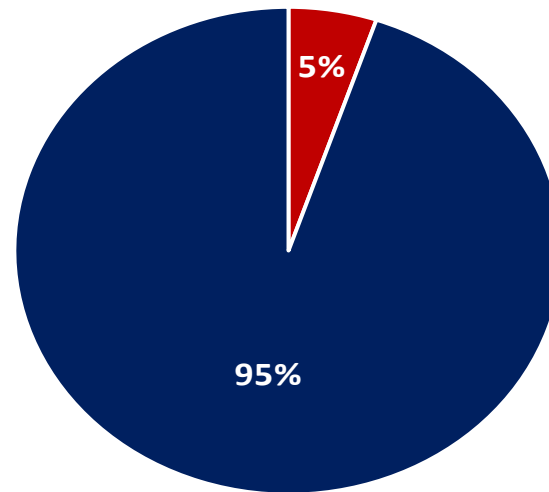
■ Drug Exposed ■ Non-Drug Exposed

Source: WV Birth Score

Neonatal Abstinence Syndrome

- From January 1, 2017 to December 31, 2017:
 - 5.2% of all infants born at West Virginia birthing facilities were exposed to drugs prenatally.
 - 5.1% of West Virginia infants born at in-state birthing facilities were exposed to drugs prenatally.

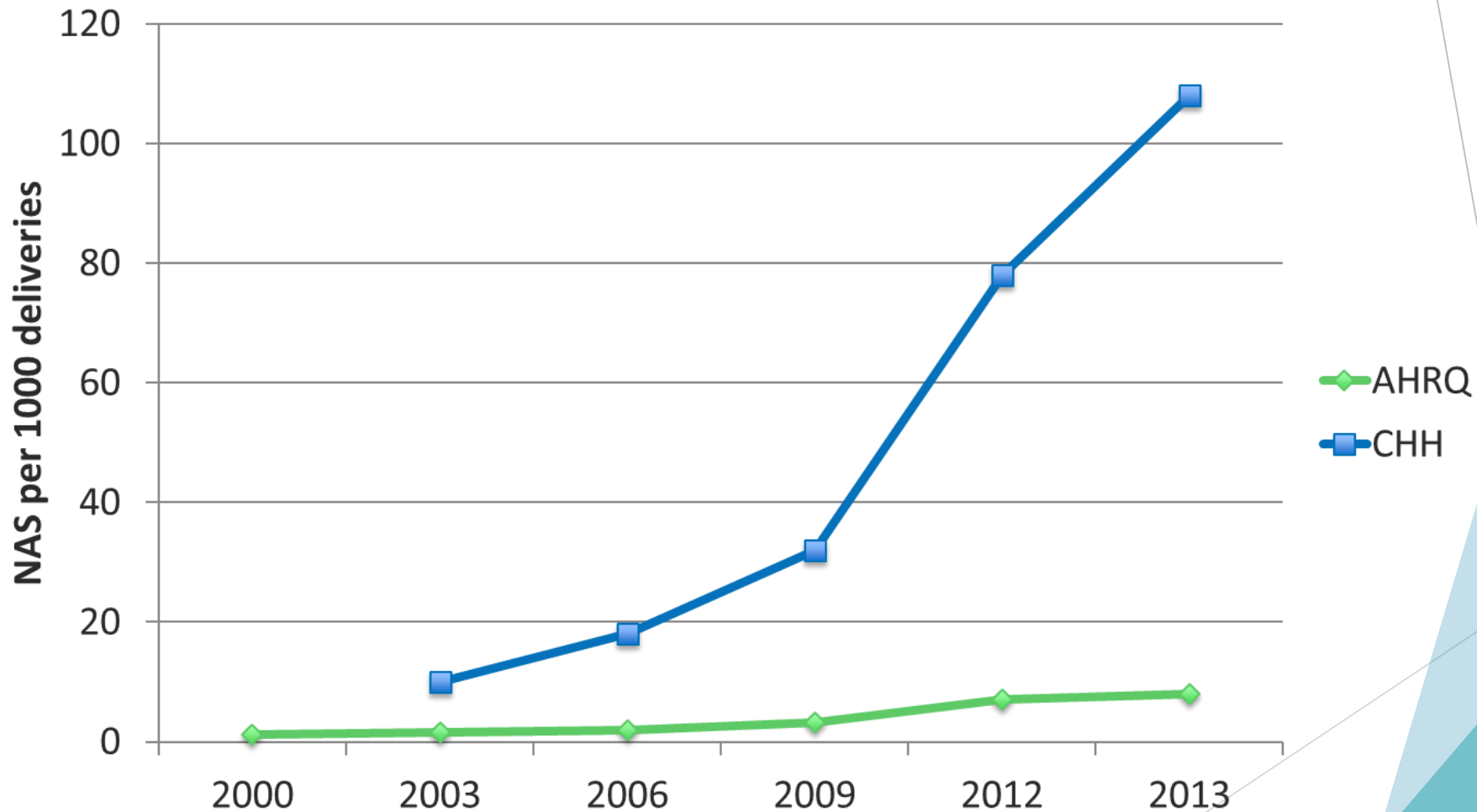
Percent of Infants Diagnosed with NAS at WV Birthing Facilities in 2017.



■ NAS Diagnosis ■ No NAS Diagnosis

Cabell Huntington Hospital (2009-2012)

National data shows that the rate of NAS tripled from 2000 to 2009 At Cabell Huntington hospital the rate was 10X national rate



Source: Chaffin, David. Joan C. Edwards School of Medicine, Marshall University, 2014.

Neonatal Abstinence Syndrome

Identifying Intrauterine Exposure and Neonatal Withdrawal



Recommendations of American Academy of Pediatrics

- Screening for NAS should begin with a careful maternal history and physical examination
- Toxicological testing, as needed
- Multiple risk factors include maternal report or documentation of substance use, late entry into care or no prenatal care, previous unexplained late fetal demise, precipitous labor, and placental abruption
- Infants at risk for intrauterine exposure and neonatal withdrawal should be observed for 4-7 days after birth

Source: Mark L. Hudak, MD, Rosemarie C. Tan, MD,, PhD, THE COMMITTEE ON DRUGS, and THE COMMITTEE ON FETUS AND NEWBORN, American Academy of Pediatrics, doi:10.1542/peds.2011-3212.

Toxicological Tests

- *Urine
 - **Meconium
 - Umbilical Cord
- * Maternal or neonatal urinary screening only picks up drug exposure in the hours immediately before urine collection. So may have false negatives.
- ** Newborn meconium screening may yield false-negative results, through the likelihood is lower than with urinary screening.

Source: [2012 AAP Clinical Report: Neonatal Drug Withdrawal](#)

NAS - More Common and More Complex Today

- Years ago, NAS secondary to heroin or morphine
- Today, NAS may be secondary to:
 - ✓ morphine
 - ✓ heroin
 - ✓ methadone
 - ✓ buprenorphine
 - ✓ prescription opioid analgesics
 - ✓ antidepressants*
 - ✓ anxiolytics*
 - ✓ and use of multiple licit and illicit substances

*Women with mental health disorders are at increased risk of substance abuse.

Source: Kocherlakota, Prabhakar. "Neonatal Abstinence Syndrome." *Pediatrics*, 2014; 134; e547. doi: 10.1542/peds.2013-3524

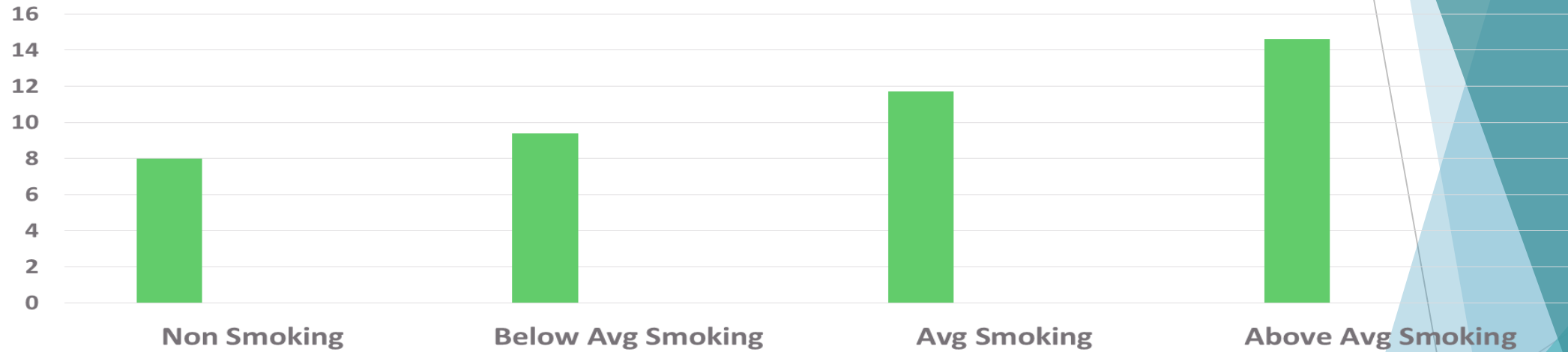
Other Drugs Related to Neonatal Withdrawal

- **Nicotine**
- **Selective Serotonin Reuptake Inhibitors (SSRIs):**
 - ✓ paroxetine HCl (Paxil)
 - ✓ fluoxetine (Prozac)
 - ✓ citalopram HBr (Celexa)
 - ✓ sertraline HCl (Zoloft)
 - ✓ venlafaxine HCl (Effexor)

Source: Mark L. Hudak, MD, Rosemarie C. Tan, MD,, PhD, THE COMMITTEE ON DRUGS, and THE COMMITTEE ON FETUS AND NEWBORN, American Academy of Pediatrics, doi:10.1542/peds.2011-3212

Smoking and NAS

Length of Stay



Jones, et al. "Cigarette Smoking in opioid-dependent pregnant women: maternal and neonatal outcomes." *Drug and Alcohol Depend.* 2013.

Neonatal Withdrawal

- Onset, duration, and severity affected by many factors, including:
 - ✓ Drugs used by mother (half-lives, amount, pharmacological properties, etc.)
 - ✓ Duration of exposure
 - ✓ Total accumulation
 - ✓ Maternal Smoking
 - ✓ Multiplicity of substances used

Neonatal Withdrawal (Cont'd)

- Short and intense initial phase
 - ✓ Onset varies, but usually symptoms appear 24-72 hours after birth, but can be delayed 5-7 days.
 - ✓ Lasts 4 weeks or more
 - ✓ Total accumulation
 - ✓ Long chronic and relapsing phase
 - ✓ 4-6 months after discharge

Source: Kocherlakota, Prabhakar. "Neonatal Abstinence Syndrome." *Pediatrics*, 2014; 134; e547.
DOI:10.1542/peds.2013-3524.

Neonatal Abstinence Syndrome (NAS)

- Multi-system disorder involving:
 - ✓ Central nervous system
 - ✓ Autonomic nervous system
 - ✓ Gastrointestinal tract
 - ✓ Respiratory system



NAS - Signs and Symptoms

- **Central Nervous System:**
 - ✓ Persistent high-pitched crying
 - ✓ Hypertonia
 - ✓ Irritability
 - ✓ Tremulousness
 - ✓ Sleep Disturbances
 - ✓ Skin excoriation
 - ✓ Exaggerated reflexes
 - ✓ Seizures

Neonatal Abstinence Syndrome - Signs and Symptoms

- **Autonomic nervous system:**
 - ✓ Mottling
 - ✓ Yawning
 - ✓ Sweating
 - ✓ Fever

NAS - Signs and Symptoms

- **Gastrointestinal and Respiratory Symptoms:**
 - ✓ Poor feeding/hyperphagia/excessive rooting
 - ✓ Non-nutritive sucking
 - ✓ Vomiting
 - ✓ Loose bowels
 - ✓ Tachypnea
 - ✓ Nasal stuffiness

Neonatal Abstinence Syndrome



Long-Term Prognosis

Difficult to evaluate long term effects of opioid exposure
Confounding variables such as:

- Polysubstance exposure
- Prematurity
- Low birthweight
- Intrauterine growth restriction
- Continued maternal drug use
- Exposure to violence
- Socioeconomic factors
- Educational level of parents and exposure to schooling

Long- Term Prognosis (cont'd.)

There are ongoing observational studies to evaluate:

- developmental issues
- behavioral problems
- maltreatment, trauma, mental disorders

Children who have had a diagnosis of NAS may have:

- poor/deteriorating school performance
- poorer mean national test scores than matched controls
- probably no significant neurobehavioral differences

Australian study (New South Wales 2000-2011)

Current Integrated OB & Behavioral Health Programs in our State

- ✓ Perinatal Partnership Drug Free Mom and Babies pilot projects*
- ✓ Shenandoah Valley Medical Systems
- ✓ Thomas Memorial Hospital
- ✓ Greenbrier Valley Physicians
- ✓ WVU
- ✓ CAMC's Drug Affected Moms and Babies
- ✓ Cabell Huntington Hospital's Maternal Addiction Recovery Center (MARC)
- ✓ Family Care Health Center, Kanawha Valley
- ✓ Turning Points Residential Facility, Beckley

*New sites will be added in October 2018 through state funding.

Lily's Place

- Non-hospital residential setting for infants needing treatment for withdrawal
- Located in Huntington, WV
- In addition to weaning, includes therapeutic handling, parent education, and referrals to social and health support, including recovery programs for parents.



Lily's Place



Signs Of Child Abuse And Neglect



Signs of Abuse and Neglect (Cont'd.)



Signs of Abuse and Neglect (Cont'd.)



Resources For The At-Risk Family

- **Child Abuse and Neglect Hotline: 1-800-352-6513**
- **SafeSoundBabies.com**
 - Resources for keeping babies safe, including safe sleep and shaken baby syndrome prevention
- **Help Me Grow West Virginia**
 - FREE Referral Service that connects families with critical developmental resources for their children birth through five years.



Resources For The At-Risk Family (Cont'd.)

- **Help4WV**

- Offers a 24/7 call, chat, and text line that provides immediate help for any West Virginian struggling with an addiction or mental health issue.

1-844-HELP4WV
SUBSTANCE ABUSE AND BEHAVIORAL HEALTH HELPLINE

- **West Virginia Tobacco Quit Line**

West Virginia
TOBACCO
QUITLINE
1-800-QUIT-NOW 1-877-966-8784

Summary

- Maternal substance use and NAS are escalating exponentially
- Substances used include nicotine, marijuana, alcohol, cocaine methamphetamines and Opioids
- Effects on the newborns of these drugs were outlined and discussed
- Opioid use in pregnancy is the main cause of NAS, although other drugs such as benzodiazepines and antidepressants also cause or increase severity of NAS
- Features of Neonatal Abstinence Syndrome (NAS) were outlined
- Recognition of infants in the home who are “at risk” was emphasized, using high index of suspicion
- “At risk” infants should be taken to an emergency room for evaluation

Questions and Answers

