



**CABINET FOR HEALTH AND FAMILY SERVICES
DEPARTMENT FOR PUBLIC HEALTH**

**Andy Beshear
Governor**

275 East Main Street, HS1GWA
Frankfort, KY 40621
502-564-3970
Fax: 502-564-9377
www.chfs.ky.gov/dph

**Eric C. Friedlander
Acting Secretary**

**Steven J. Stack, MD
Commissioner**

February 21, 2020

The Honorable Andy Beshear
Governor
700 Capitol Avenue, Suite 100
Frankfort, Kentucky 40601

Dear Governor Beshear:

Please accept the 2019 Department for Public Health Neonatal Abstinence Syndrome Registry Report, which is included in this transmittal pursuant to KRS 211.678. The Cabinet for Health and Family Services has prepared this report with narrative and sets of tables and graphs that outline the overall picture of neonatal abstinence syndrome in Kentucky. This report summarizes causes in Kentucky for children and stresses related prevention measures.

Should you have questions regarding the information, please feel free to contact Andrew Waters, Assistant Division Director, Maternal and Child Health, at Andrew.Waters@ky.gov or (502) 564-4830 ext. 4396.

Sincerely,

A handwritten signature in black ink, appearing to read "Eric C. Friedlander".

Eric C. Friedlander
Acting Secretary

Enclosure



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The Honorable John D. Minton Jr.
Chief Justice
Supreme Court of Kentucky
700 Capitol Avenue, Room 231
Frankfort, Kentucky 40601

Dear Chief Justice Minton:

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February 21, 2020

Jay D. Hartz, Executive Director
Legislative Research Commission
Room 300, Capitol
Frankfort, Kentucky 40601

Dear Mr. Hartz:

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ANNUAL REPORT 2018

Public Health Neonatal Abstinence Syndrome Reporting Registry



Kentucky Department for Public Health
Division of Maternal and Child Health

December 2019



Neonatal Abstinence Syndrome Reporting Registry – Annual Report 2018

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The Neonatal Abstinence Syndrome in Kentucky Annual Report is prepared by the Division of Maternal and Child Health, within the Kentucky Department for Public Health, under Commissioner Dr. Angela Dearing. This report was made possible by the many individuals who contributed their time and efforts toward the prevention of NAS.

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Questions concerning this report should be directed to:
Public Health Neonatal Abstinence Syndrome Reporting Registry
Kentucky Department for Public Health
275 East Main Street, HS2WA
Frankfort, KY 40621
neonatalabstinence@ky.gov

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Executive Summary

The Kentucky Public Health Neonatal Abstinence Syndrome (NAS) Reporting Registry shows a slight decline in the number of Neonatal Abstinence Syndrome (NAS) cases since 2015, although the rate is still higher than most of the nation. In 2018, there were 907 cases of babies with signs and symptoms of NAS; this accounts for 16.5 of every 1,000 live births among Kentucky residents. Rates are highest in Appalachian areas of the state, in some areas reaching over 40 cases per 1,000 live births. Mothers of infants with NAS tend to have less education, be unmarried, and have more children, which may suggest lower socioeconomic status, a lack of social support, or reduced access to services.

The most frequent opioids reported were buprenorphine (62%), heroin (20%), and methadone (9%). Other commonly used substances are amphetamines, including methamphetamine (31%) and cannabinoids (28%). All other substances were used by less than 20% of women in the registry. Heroin use declined from 2016 to 2018, while methamphetamine use increased. Approximately 64% of cases were exposed to more than one type of substance during pregnancy. Women with polysubstance use used three substances on average.

Prenatal care is critical for these women to address substance abuse and other co-occurring problems, such as hepatitis C, which was reported in about 35% of this population. Compared to women whose infants do not have NAS, mothers of infants with NAS are more likely to utilize Women, Infants, and Children (WIC) services during pregnancy, but much less likely to obtain adequate prenatal care. Inadequate health insurance may explain part of this disparity, although 92% of the delivery hospitalizations were billed to insurance, including Medicaid. Enrollment in and compliance with medication assisted treatment (MAT) is one factor associated with adequate prenatal care. About 55% of the women in the registry were estimated to be enrolled in MAT. Of these, 55% were also using other drugs or not compliant with their treatment.

Infants with NAS are twice as likely to have a low birth weight and three times as likely to be admitted to a neonatal intensive care unit. Tobacco and alcohol use co-occur with substance use at high rates, which could further affect the health and development of these infants. Infants with NAS had longer delivery hospitalizations: 12.8 days as compared to 3.8 days for infants without NAS. Infants who received pharmacological treatment (53%) had average stays of 20.0 days. Among this group, the most common treatment was morphine (77%), followed by clonidine (36%), and buprenorphine (19%); about 38% received multiple medications.

More than 85% of infants with NAS were referred to the Department for Community Based Services, and more than 80% of those cases were accepted for investigation. Data from other Kentucky programs indicates that NAS is a risk factor for fatal or near-fatal child abuse including abusive head trauma and Sudden Unexpected Infant Death.

In addressing NAS and the issues of families affected by substance use, the Kentucky Department for Public Health recommends: continuing to promote prenatal care; promoting enrollment in MAT programs; implementing a plan of safe care including educating parents and medical/child care providers on safe sleep, abusive head trauma, child abuse and neglect; enrollment in services such as WIC and home visiting; and improving access to long-acting reversible contraception.

Background

The Opioid Epidemic

Across the United States (U.S.), the problem of opioid abuse is widespread and severe; in recent years, it has been the focus of prevention efforts across the nation. The 2018 Life in Rural America survey found that 41% of rural Appalachians believe that drug addiction and abuse is the biggest problem facing their local community, and the vast majority believe that the opioid epidemic has gotten worse in recent years (NPR, RWJF, Harvard, 2018). County-level opioid prescribing patterns also pinpoint Appalachia at the center of the epidemic (CDC, “U.S. County Prescribing Rates,” 2017).

2 out of 5
rural Appalachians believe that drug addiction and abuse is the biggest problem facing their community.



Opioids are a class of narcotic substances that bind to receptors in the brain to produce pain relief, anesthesia, or euphoria (Hughes et al., 2016). Prolonged use causes tolerance, or the need for increasing doses to produce an effect, which can lead to fatal or non-fatal drug overdoses (ACOG, “Opioid,” 2017). Opioids were originally derived from the opium poppy, but semi-synthetic and synthetic forms were developed with the intent of increasing potency but with an incorrect assumption of decreasing potential for abuse (Hudak & Tan, 2012). Because no abuse-proof formulations exist, opioids are classified as controlled substances in the U.S. (Hughes et al., 2016).

In the U.S. between 1999 and 2015, the number of opioid overdose deaths increased from 8,050 to 33,091 (O’Donnell, Gladden, & Seth, 2017), and by 2016, about two-thirds of drug overdose deaths in the U.S. were due to opioids (Vivolo-Kantor et al., 2017). At first, this increase was blamed on prescription opioid abuse, as the amount of opioids prescribed more than quadrupled between 1999 and 2010 (Guy et al., 2017). Since then, opioid prescriptions have declined slightly, and overdose deaths due to synthetic opioids, such as heroin and fentanyl, have increased more than fivefold (O’Donnell, Halpin, Mattson, Goldberger, & Gladden, 2017; O’Donnell, Gladden, & Seth, 2017). Mirroring this trend, surveys by Foundation for a Healthy Kentucky found that more people knew someone who used heroin in 2017 than in 2013 (“Heroin,” 2018), but fewer people self-reported having a prescription for painkillers between 2011 and 2017 (“Use and Misuse,” 2018).



3x as many opioids were prescribed per capita in 2015 than in 1999.



4x as many opioid overdose deaths occurred in 2015 as in 1999.



5x as many synthetic opioid overdose deaths occurred in 2016 as in 2013.

Overdose fatalities, which may be prevented by increased use of naloxone (Cash et al., 2018), only capture a small fraction of opioid-related morbidity. Non-fatal overdoses can result in kidney failure, heart problems, nerve damage, and anoxic brain injuries (Clark, 2014), none of which are prevented by naloxone (Clark, 2014).

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Impact on Maternal and Child Health

Women of childbearing age and their families are not immune to the effects of the opioid epidemic. In a pooled sample of 28 states, including Kentucky, the rate of opioid use disorder (OUD) per 1,000 deliveries quadrupled between 1999 and 2014; in Kentucky, the change is even more dramatic: a 48-fold increase to 19 cases per every 1,000 deliveries (Haight, Ko, Tong, Bohm, & Callaghan, 2018). Although research on maternal overdose rates is limited, women with OUD may be at greater risk of overdosing in the postpartum period (Schiff et al., 2018).



When a woman uses opioids during pregnancy, the effects extend far beyond herself. NAS refers to the signs and symptoms due to the discontinuation of prenatal substance exposure (PSE) (Kocherlakota, 2014). Opioids are most commonly associated with NAS, but it can also be caused by many over the counter or prescription medications (Hudak & Tan, 2012). Many of these substances may be used legally, so NAS does not inherently indicate illicit activity by the mother.

NAS presents similarly to withdrawal in adults, including restlessness, tremors, seizure, vomiting, fever, sweating, and apnea (Hudak & Tan, 2012). Not all babies with substance exposure will experience withdrawal, and the severity and duration of specific symptoms may vary. The dose, timing, and combinations of specific substances may all play a role. Because symptoms are non-specific, toxicology screenings for mother and infant, in addition to maternal history, are important in establishing in utero exposure. NAS is treated by non-pharmacological measures such as swaddling, rocking, and reducing environmental stimuli (Kocherlakota, 2014), but when severe may need pharmacological intervention. Treatment for NAS may take place in a Neonatal Intensive Care Unit (NICU) or in other units with close monitoring of the infant's manifestations.

As OUD among women of childbearing age has risen, so has NAS. From 1999 to 2013, in a sample of 28 states, the overall NAS incidence quadrupled from 1.5 to 6.0 cases per 1,000 births (Ko et al., 2016). Kentucky had one of the highest rates, estimated at 15.0 cases per 1,000 live births in 2013 (Ko et al., 2016). Data from the Kentucky Injury Prevention Research Center (KIPRC) shows the number of annual cases in Kentucky increased from 19 cases in 2000 to 1,060 cases in 2014 (KIPRC, 2018).

Data from the Kentucky Pregnancy Risk Assessment Monitoring Surveillance (PRAMS) survey provides insight into attitudes toward substance use during pregnancy. Some mothers described their path to recovery, and others described needing additional resources for treatment. For them, as for many mothers, pregnancy is a catalyst for changing health behaviors, when the desire to change meets the availability of services (Schiff et al., 2018). Overall, mothers reflected concern with their children's health and development and hoped that substance exposure had not permanently harmed their children.

"A mother cannot just 'stop' taking a medication she has become dependent [on] or addicted to."

PRAMS mother

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Methodology and Limitations

In 2013, the Kentucky General Assembly enacted Kentucky Revised Statute (KRS) 211.676, establishing NAS as a reportable disease. Mandatory statewide reporting to the Public Health NAS Reporting Registry (from here on, “the NAS Registry”) began on July 15, 2014. The NAS Registry collects information from Kentucky hospitals on Kentucky resident children with NAS and a history of prenatal substance exposure. Case reporting is not tied to any specific International Classification of Disease (ICD-9 or ICD-10) code.

KRS 211.678 outlines the confidentiality requirements of the NAS Registry and calls for an annual report including aggregated statistical data analyses. This annual report includes calendar year 2018 births. Cases were linked to the Certificate of Live Birth to obtain prenatal and perinatal information, and in order to provide a comparison group of births without NAS. Cases were excluded if they were not Kentucky residents, were not born in 2018, were reported as not having signs and symptoms consistent with NAS, or were duplicate cases.

Results are presented as number of cases or rates of NAS per 1,000 live births, calculated as follows:

$$\frac{\text{Number of cases} \times 1,000}{\text{Total number of live births}}$$

Any category with less than five (<5) cases is suppressed, and categories with 5-19 cases should be interpreted with caution as rare outcomes may lead to unstable estimates.

Unless otherwise stated, all figures and tables show unduplicated case counts of Kentucky residents for birth year 2018. Data are from the NAS Registry and the Office of Vital Statistics, and numbers are preliminary.

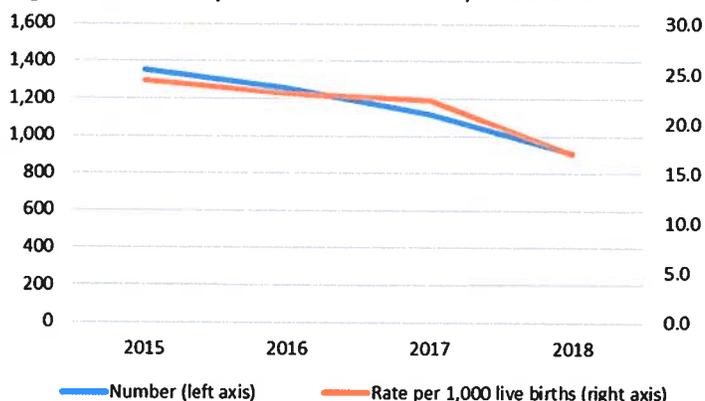
The NAS Registry is a passive surveillance system, and as such is limited by the reporting practices of different hospitals or individual hospital employees. Delayed reporting is a concern for its negative effect on data quality. For 2018 cases, 65% were reported more than 30 days after birth, and the average time to submission was 88 days. The data system does not have a mechanism to differentiate details of timing and intent of substance use, which primarily affects data on polysubstance use and medication assisted treatment (MAT). Finally, Kentucky resident births that occur at facilities outside of Kentucky and are not transferred to a Kentucky hospital are not reported to the NAS Registry, which could result in underreporting near state borders.

Data and Results

Kentucky Incidence

Although Kentucky’s NAS rate still remains far above the national average, it is possible that the trend of growth is slowing or even reversing. Data from the NAS registry shows that there were 907 unduplicated cases in 2018, which is a decrease from previous years (Figure 1). It is too soon to tell if the decrease truly indicates a downward trend in incidence of NAS.

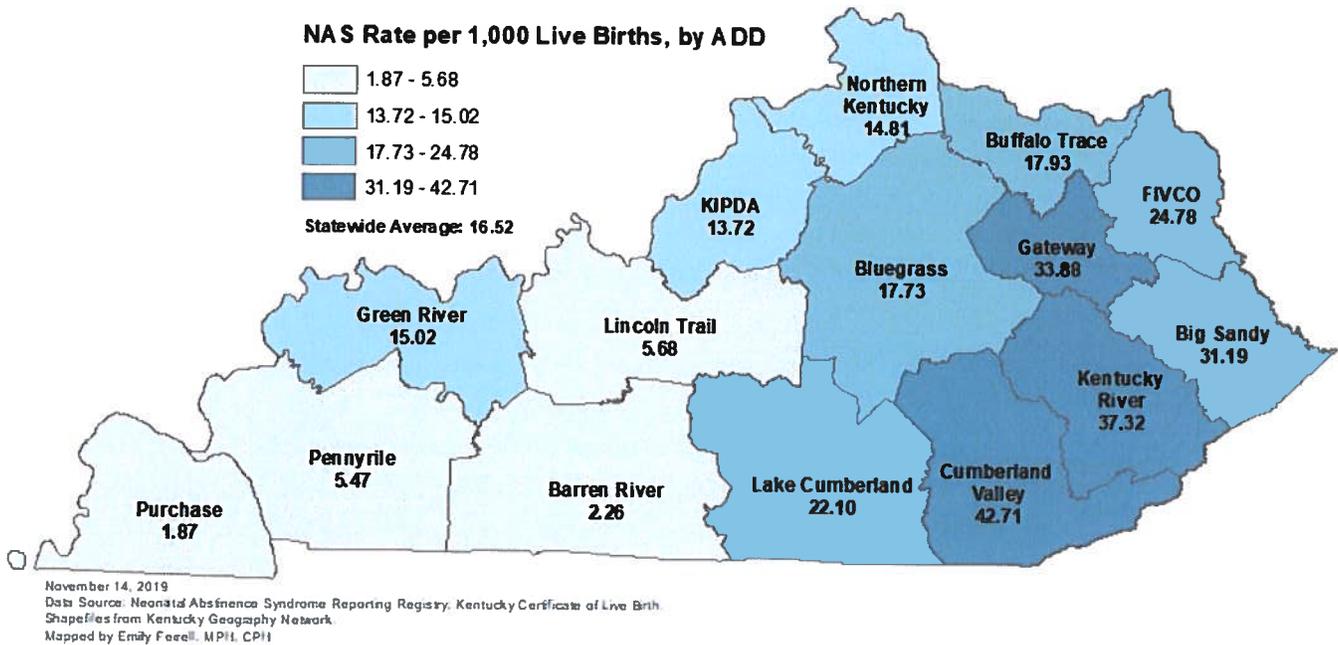
Figure 1. Kentucky Resident NAS Cases, 2015-2018



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Although the overall statewide rate has decreased, there are large discrepancies within Area Development Districts (ADDs) across Kentucky with rates ranging from 1.9 to 42.7 cases per 1,000 live births (Figure 2).

Figure 2. NAS Rate Among Kentucky Residents by ADD, 2018



NAS disproportionately affects rural areas, and in Kentucky, the rate of NAS in rural counties is nearly twice as high as the rate in urban counties. The Appalachian region in particular has high NAS rates. However, several Appalachian districts (Big Sandy, Kentucky River, and FIVCO) had rates that decreased by at least a third from last year, which could reflect community-level interventions that were implemented to address the opioid epidemic.

Mothers of NAS cases (compared to mothers of infants without NAS) were significantly more likely to be Non-Hispanic White and tended to have less education, be unmarried, and have more children (Figure 3). Those factors may indicate lower socioeconomic status, less social support, lack of access to family planning services, or limited health literacy.

Identifying demographic patterns and addressing social determinants of health are important steps in developing interventions to reach high-risk populations.

Out of every 10 mothers of NAS cases...

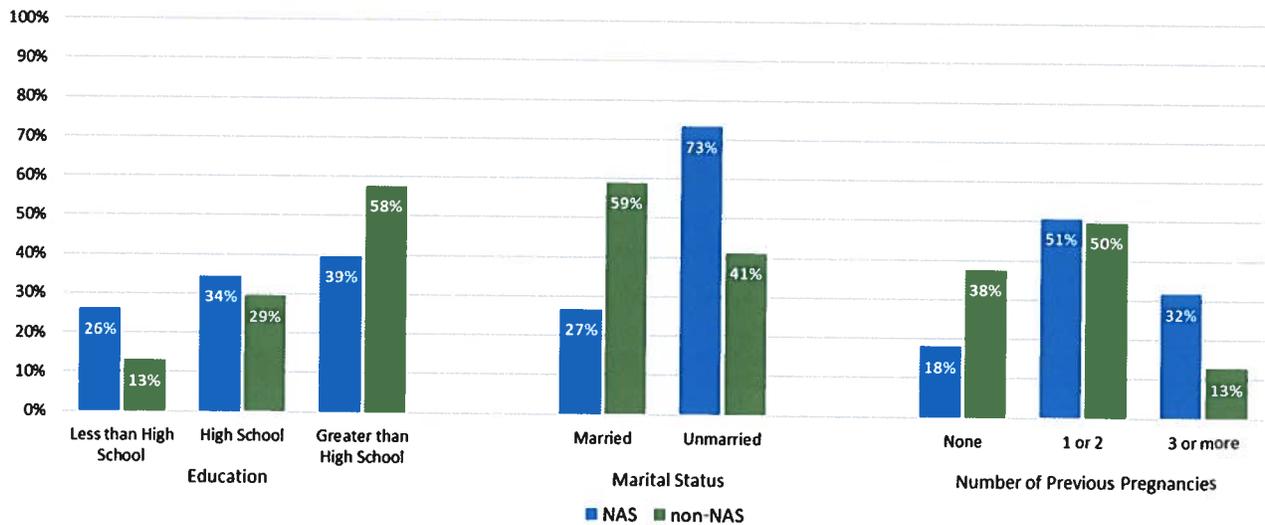
 **4** Had education beyond high school

 **3** Were married

 **2** Were first time moms

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Figure 3. Education, Marital Status, and Pregnancies of Mothers by NAS Status of Child, 2018



Frequent Substances Used

Table 1 includes all substances included in the NAS Registry (excluding tobacco and alcohol) by category, ranked from most to least commonly reported. Variation in hospital testing policies, type of sample (cord blood, urine, or meconium), ability of the substance to pass through the placenta, and half-life of the substance were adjusted for by considering a case a positive if there is any indication of substance use (maternal history, maternal toxicology screen positive, and/or infant toxicology screen positive). From year to year, there have been no major changes in the rankings of substances.

Table 1. Frequency of All Substance Groups in the Public Health NAS Reporting Registry, 2018

Frequency of Substances in the Public Health NAS Reporting Registry		Frequency of All Other Opioids in the Public Health NAS Reporting Registry	
Buprenorphine	61.74%	Unspecified Opioids	32.08%
All Other Opioids	41.23%	Oxycodone	9.04%
(Meth)Amphetamines	31.09%	Hydrocodone	5.07%
Cannabinoid	27.56%	Fentanyl	3.86%
Heroin	19.63%	Tramadol	0.66%
Benzodiazepines	13.78%		
Metadone	9.48%		
Cocaine	8.38%		
Gabapentin	5.07%		
SSRIs	2.43%		
Barbiturates	1.65%		
Tricyclics	1.10%		

Note: Numbers will not add to 100% as more than one substance can be reported per case and not all substances are shown in the table above. The category (Meth)Amphetamines includes any indication of use of methamphetamine and/or amphetamines. The category All Other Opioids includes any indication of use of codeine, fentanyl, hydrocodone, meperidine, morphine, oxycodone, tramadol, and/or other unspecified opioids.

The most common substance in the NAS Registry is buprenorphine, a partial opioid agonist which is used to reduce withdrawal and cravings and has low potential for misuse (SAMHSA, 2016). While it can be associated with NAS, its use as part of supervised MAT is preferable to untreated OUD during pregnancy. Increased access to MAT may explain why buprenorphine has been one of the most common substances in the NAS Registry every year since its inception.

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The second most common reported substance was “all other opioids”, which were reported for more than two out of every five cases. Non-specific toxicology reports or maternal histories of opioid use make up the majority of this category.

The reported frequency of amphetamine use, including methamphetamine, has been increasing in recent years; in 2017, it was reported in only 23.07% of cases, compared to 31.09% in 2018.

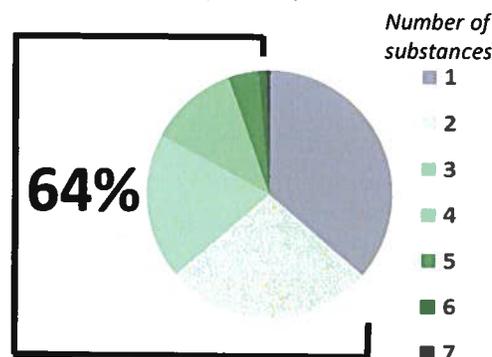
More than one quarter of the cases in the NAS Registry were exposed to cannabinoids. Cannabis is the most commonly used illicit drug in the U.S., with about 7% of pregnant women self-reporting use in the past month (McCance-Katz, 2018), which likely represents only about half of all users (Garg et al., 2016). One factor in the frequency of cannabis use is a perception of safety, which was reflected by the Kentucky PRAMS participants who described smoking marijuana while pregnant. All mothers said that they felt it was safe and/or beneficial for anxiety, depression, and morning sickness. One participant wrote:

“ I have done research and they prescribe it in a lot of other countries. I use it because I suffer from manic depression and don't like the way the prescriptions make me feel. ”

The American College of Obstetricians and Gynecologists (ACOG) discourages marijuana use during pregnancy due a lack of studies on its safety (ACOG, “Marijuana,” 2017). Although cannabis is not known to cause NAS, it is associated with pregnant women using other substances, including tobacco, alcohol, and opioids (Passey, Sanson-Fisher, D’Este, & Stirling, 2014).

Approximately 64% of cases had polysubstance use, which in this report means use of substances from more than one type or category (see Table 1), excluding tobacco and alcohol. About 27% of women used two types of substances, and about 37% used three or more types of substances; the overall average number of substances used among women with polysubstance use was three. Polysubstance use may contribute to more severe or prolonged NAS symptoms. Substances such as cocaine, benzodiazepines (Hudak & Tan, 2012), and antidepressants (Kaltenbach et al., 2012) can be associated with worsened NAS symptoms when combined with opiates.

Figure 4. Frequency of Polysubstance Use



Over half (54.9%) of the women had a prescription for medications to treat addiction, indicating enrollment in MAT. About 7% of women had prescriptions for pain treatments, which may mean that much of the use reported to the NAS Registry is illicit. About 7% of women had prescriptions for psychiatric treatment, which aligns with the low reported frequencies of benzodiazepines, SSRIs, and tricyclics.

Prenatal Care

Infants with NAS have particular patterns in healthcare utilization, from the time of conception onward. The prenatal period presents a unique window of opportunity for women to make many changes in their health and lifestyle, including management of OUD (ACOG, “Opioid,” 2017). Barely half of the mothers in the NAS Registry received at least adequate prenatal care (Kotelchuck index), compared to four out of five mothers who did not have infants with NAS.

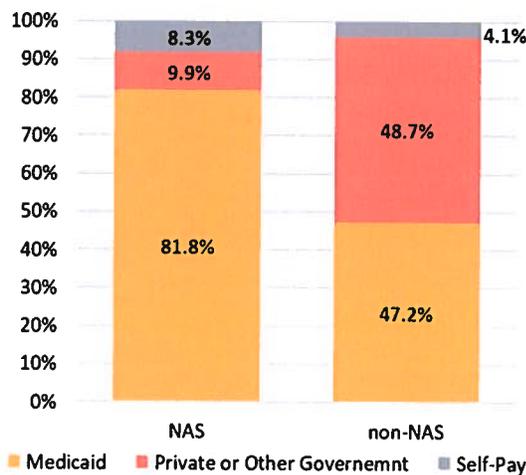
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As part of prenatal care, ACOG recommends women with OUD are screened for a variety of infections, including hepatitis C (ACOG, “Opioid,” 2017). Among Kentucky women whose children did not have NAS, 1.9% were diagnosed with hepatitis C; among mothers of NAS cases, this rose to 35.0%. Among women with polysubstance use, it is 38.7%. These concerns led to the passage of Senate Bill 250 in April 2018, which added universal screening of pregnant women for hepatitis C to KRS 214.160.

Hepatitis C is 18x more common in mothers of NAS cases.

Over half of the mothers whose infants had NAS received services through the Women, Infants, and Children program (WIC) during pregnancy. Enrollment in WIC can ensure proper nutrition for an infant who is at risk of feeding difficulties, provide assistance with breastfeeding, and serve as a point of contact where women and their children can be referred to additional services.

Figure 5. Insurance Type at Time of Delivery, by NAS Status, Kentucky Residents, 2018

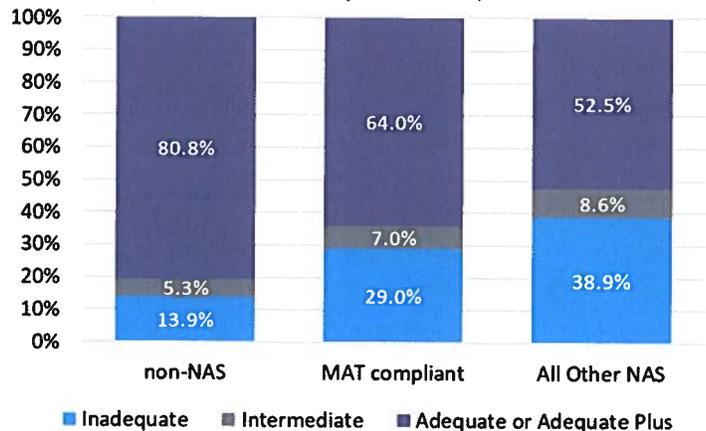


Disparities in insurance coverage, shown in Figure 5, give one possible explanation for disparities in prenatal care utilization. Twice as many deliveries of infants with NAS were paid out of pocket as opposed to deliveries of infants without NAS (8.3% versus 4.1%), and these mothers may lack insurance to cover prenatal care.

With more than four out of every five babies with NAS having Medicaid, as opposed to about half of the non-NAS population, Medicaid organizations have the ability to reach this population and work with them to promote prenatal, postpartum, and pediatric care. By ensuring appropriate preventive services, it may be possible to avoid costly outcomes in the future.

Another factor in prenatal care utilization is enrollment in and compliance with MAT (Figure 6). This data indicates that encouraging enrollment in both prenatal care and MAT may provide additional benefits to mothers. MAT uses counseling and mental health therapy approaches in addition to medications such as buprenorphine, methadone, or naltrexone. In this report, MAT is defined as having a valid prescription for replacement therapy. Non-compliance is defined as concurrent use of meth/amphetamines, barbiturates, cannabinoids, cocaine, heroin, or any other opioid. These are proxy measures, as the NAS Registry does not collect compliance with MAT. In the 2018 cohort, over half of the mothers were in MAT and over two-fifths of those were compliant (Figure 7).

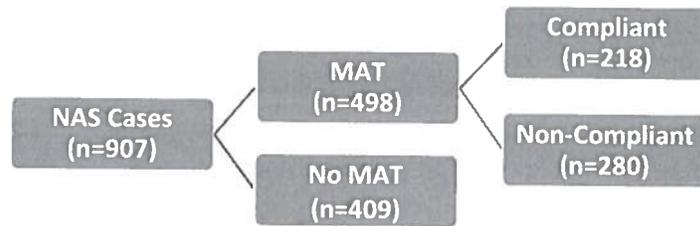
Figure 6. Adequacy of Prenatal Care, by NAS and MAT Compliance, Kentucky Residents, 2018



Note: Adequacy of prenatal care calculated using Kotelchuk index.

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Figure 7. Number of Cases in NAS Registry, by MAT Participation and Compliance



The low rate of compliance among mothers in MAT parallels the high frequency of polysubstance use among the entire sample of cases in the NAS Registry. It is worth noting that mothers with polysubstance use were less likely to be enrolled in MAT than those who only used one substance (61.9% and 50.9%, respectively).

Newborn Outcomes

In the wake of the opioid epidemic, alcohol and tobacco are often overlooked although both forms of prenatal substance exposure can have negative effects such as developmental delays and preterm birth (Bishop et al., 2017) and can cause withdrawal-like symptoms in infants (Hudak & Tan, 2012). Kentucky Office of Vital Statistics data show that 15.8% of women whose babies did not have NAS reported smoking during pregnancy, which increases to 71.8% for women whose babies have NAS. Data collected in the NAS Registry is even higher with 79.8% of women reporting tobacco use.

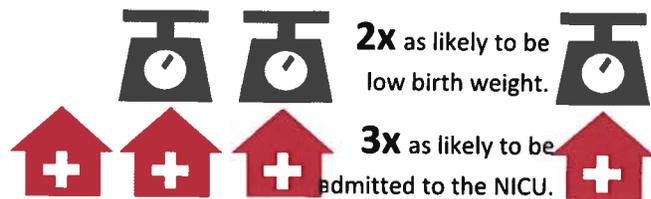


4 out of 5 babies with NAS had mothers who smoked during pregnancy.

The prevalence of alcohol use during pregnancy is not well known, as it is vastly under-reported but is estimated to be approximately 10% (CDC, 2015). Alcohol use is reported on the birth certificates of 0.7% of NAS cases, although the NAS Registry found that 3.1% of NAS cases had a history of alcohol use during pregnancy. Although under-reporting is still a concern, the NAS Registry might be a more accurate source of information on this topic.

Compared to infants without NAS, infants with NAS are nearly twice as likely to be low birth weight (LBW) defined as less than 2,500 grams. Underlying social, behavioral, and biomedical factors (Schempf & Strobino, 2008) may be partly responsible for this finding. Infants with NAS can have difficulties feeding and gaining weight (Hudak & Tan, 2012), which further increases the health risks and challenges associated with preterm and low birth weight.

Babies with NAS are



Compared to babies who do not have NAS.

These conditions are associated with medical complications that result in longer duration of hospitalization. In 2018, about one in ten newborns without NAS had NICU stays, compared to one in three newborns with NAS, and there is a national trend of NICUs dedicating increasing resources to NAS (Tolia et al., 2015).

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NAS cases also have a much longer length of stay (LOS): 12.7 days versus 3.8 days. As symptoms do not develop immediately (Kocherlakota, 2014), the American Academy of Pediatrics (AAP) (Hudak & Tan, 2012), and the World Health Organization (2014) both recommend observing infants with NAS in the hospital for four to seven days post-delivery. The 2018 NAS Registry data show that the average age at onset of symptoms is 31.3 hours; 11% of cases in the registry did not develop symptoms until 48-72 hours after birth, and 7% were asymptomatic until 72 hours after birth.



One factor contributing to the length of stay is pharmacological treatment for NAS; infants receiving medication for NAS tend to have a much longer LOS than those who receive comfort care only (20.0 days compared to 6.3 days). Overall, 48% of infants with NAS received one or more medications to treat NAS. Among infants whose mothers were compliant with MAT, only 41% received pharmacotherapy for NAS, compared to 52% of those who were non-compliant with MAT and 49% of those who did not receive MAT. This data indicates that compliance with MAT may be associated with less severe symptoms that do not require pharmacological treatment.

Three out of every four treated infants received morphine, which is consistent with research on prescribing practices (Hudak & Tan, 2012). Clonidine was used in 35.6% of treated cases, although there are few studies evaluating its use to alleviate NAS symptoms in infants (Hudak & Tan, 2012). All other medications (methadone, phenobarbital, and buprenorphine) were administered to <20% of infants who received medication. Nearly 40% of infants who received treatment were prescribed more than one medication.

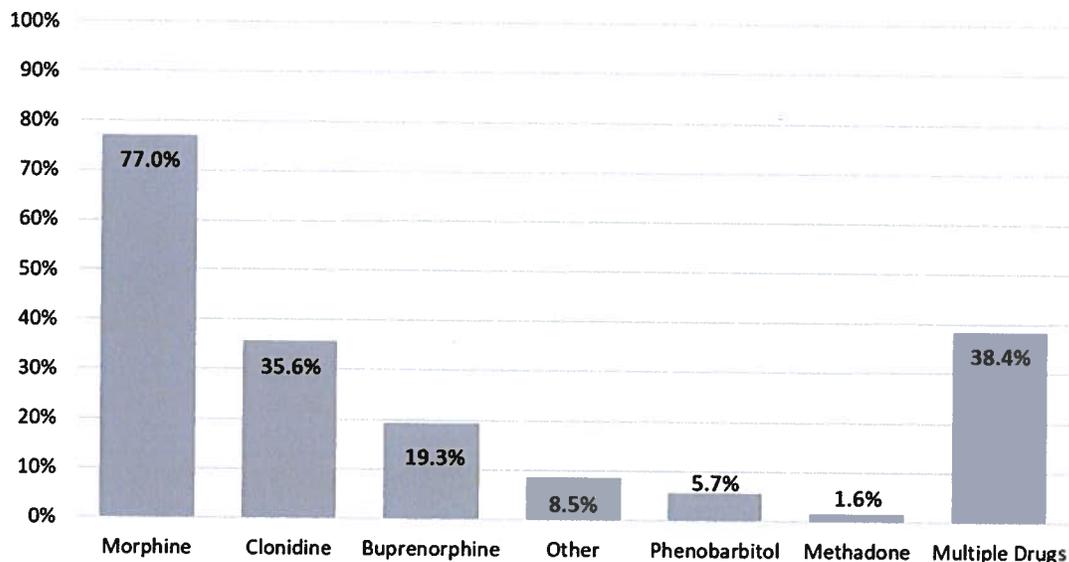


Figure 8. Frequency of Medications Administered to Treat NAS, Kentucky Residents, 2018

When considering pharmacological treatments for NAS, the first concern is that treatment should be both safe and effective for infants. NAS may cause distress or discomfort but it is ultimately self-limiting, and unnecessary medication may prolong or exacerbate the withdrawal process (Hudak & Tan, 2012). Some interventions that help reduce the severity of NAS can be provided instead of or in addition to pharmacological treatment.

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Babies whose mothers were compliant with MAT were nearly 20% less likely to need treatment and had average LOS that was 3.3 days shorter, compared to others in the NAS Registry. Breastfeeding may also reduce the severity of NAS symptoms (Hudak & Tan 2012; ACOG, “Opioid,” 2017). From birth certificate data, mothers of infants with NAS are half as likely to plan to breastfeed as mothers of infants without NAS; according to the NAS Registry, only about 25% actually initiate breastfeeding.



ACOG recommends breastfeeding, unless contraindicated.

Outcomes Beyond Discharge

In addition to lack of insurance, women with OUD might have less interaction with the healthcare system because they fear civil or criminal charges or reporting to child welfare agencies. These fears are not baseless, as many states consider substance use during pregnancy to be child abuse (Guttmacher Institute, 2019). As part of the Child Abuse Prevention and Treatment Act (CAPTA), states must have policies to notify child welfare agencies about infants with prenatal substance exposure. Nationwide, in fiscal year 2018, over 94,000 children entering foster care had parental drug abuse as a circumstance of removal from the home (Children’s Bureau, 2019).

As stated in the Kentucky Cabinet for Health and Family Services (CHFS) standard of practice manual, cases may be accepted for investigation if caregivers are rendered incapable of caring for the immediate and ongoing needs of the child (2018). Examples include exposure to a non-prescribed substance, substance abuse by a caregiver, or impaired caregiving due to substance use. In Kentucky, prenatal substance exposure is not always classified as child abuse or neglect, but there are criminal statutes associated with exposing children to illegal drug activity (Children’s Bureau, 2015). In Kentucky, reports of abuse or neglect cannot be filed on behalf of unborn children, but providers are expected to document the exposure in the medical record and file a report after delivery. Of all infants in the NAS Registry, 85% were referred to DCBS; 81% of those were accepted. Among infants whose mothers were estimated to be compliant with MAT, 74% were referred to DCBS and 59% of those were accepted for investigation.

The Child Fatality and Near Fatality External Review Panel (“the Panel”) conducts comprehensive, multidisciplinary reviews to discover risk factors and systems issues and recommend prevention measures (2019). Of 136 FY 2018 cases reviewed, 56% had substance abuse by a caregiver as a risk factor, which rose to 73% among abusive head trauma cases.

56% of the cases reviewed by the panel had caregiver substance abuse.

Data from Kentucky’s Sudden Unexpected Infant Death (SUID) Case Registry shows that in 2016-2017, 15% of SUID cases had a NAS diagnosis and 25% of cases had a family or caregiver with substance use history. This data could indicate that NAS is a risk factor for SUID, but there is not a known biological mechanism for that relationship. Caregiving or co-sleeping while impaired could also endanger infants.

Concluding Statement

NAS is just one facet of the opioid epidemic and cannot be addressed in isolation from larger systemic issues. Although the problem is daunting, prevention is possible. The following recommendations help address the underlying determinants of health to promote better outcomes for families and children.

Recommendations for Prevention

Promote optimal periconceptual health and prenatal care. Optimal periconceptual status promotes healthy pregnancy. Prenatal care ensures monitoring for any medical or fetal complication and screening for substance use disorder and co-morbidities so that referral can be made for treatment and counseling.

Encourage MAT programs. MAT programs, especially those that incorporate comprehensive services to address the complex needs of the mother and family, can be very successful in addressing OUD. In the PRAMS survey, one mother said, “With suboxone, things could [have] been so much better,” in her recovery, and another credited MAT with preventing relapses. This popularity is reflected in the NAS Registry, where reported MAT enrollment increased seven percentage points from 2017 to 2018. To support recovery, MAT should be more accessible for both pregnant and postpartum women. Furthermore, all MAT providers need training in family oriented protocols for counseling and behavioral therapy, which are crucial to the success of the treatment program.

Implement a plan of safe care. Every infant, including those prenatally exposed to drugs or alcohol, should leave the hospital with an appropriate plan of safe care. A plan of safe care should address and coordinate the services needed for the impacted child, caregivers, and parent(s). The Kentucky Department for Public Health has the community outreach structure in place to help bridge the widening gap between the need for and availability of services or resources.

Encourage education for parents on abusive head trauma and safe sleep. Due to the heightened risk of maltreatment and death among NAS cases, parents need to receive additional training on child abuse prevention. Birthing hospitals provide in-person, evidence-informed education regarding safe sleep and abusive head trauma prevention to parents, both antepartum and postpartum. Making this a universal practice will ensure that all parents of infants with NAS or prenatal substance exposure are reached. To that end, the Kentucky Hospital Association supports this practice.

Implement the practice of modeling safe sleep among healthcare and childcare providers. NAS cases have an increased risk of SUID, which may be reduced through safe sleep practices. Healthcare and childcare providers are uniquely positioned to encourage these practices through modeling, and should do so universally.

Increase enrollment in services such as WIC and home visiting. Programs that serve mothers and families prenatally and throughout early childhood have unique opportunities for engagement. These programs should incorporate substance abuse education into curricula on healthy pregnancies, in addition to making referrals to counseling or treatment.

Improve access to long-acting reversible contraception (LARC). More than four out five NAS cases were not the first live birth to that mother, compared to about three out of five non-NAS cases. This demographic trend has been consistent across the past few years, with the additional context that nearly 90% of pregnancies among this population are unintended (Heil et al., 2010). This trend could indicate a need for more effective pre-conception counseling, including improved access to family planning among women of reproductive age who use opioids for any purpose. Women who are not utilizing reproductive health may be limited by socioeconomic factors, and the cost of child rearing would be an increase in financial burden. LARCs should be available to all mothers during the intrapartum period.

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References

- American College of Obstetricians and Gynecologists (ACOG). (2017). Marijuana use during pregnancy and lactation. Committee Opinion No. 722. *Obstetrics & Gynecology*, 130. doi: 10.1097/AOG.0000000000002354
- American College of Obstetricians and Gynecologists (ACOG). (2017). Opioid Use and Opioid Use Disorder In Pregnancy: Committee Opinion No. 711. *Obstetrics & Gynecology*, 130. doi: 10.1097/AOG.0000000000002235
- Bishop, D., Borkowski, L., Couillard, M., Allina, A., Baruch, S., & Wood, S. (2017). Pregnant Women and Substance Abuse: Overview of Research & Policy in the United States. George Washington University
- Cash R.E., Kinsman J., Crowe R.P., Rivard M.K., Faul M., & Panchal A.R. (2018). Naloxone Administration Frequency During Emergency Medical Service Events — United States, 2012–2016. *Morbidity and Mortality Weekly Report*, 67(31). doi: 10.15585/mmwr.mm6731a2
- Centers for Disease Control and Prevention (CDC). (2015). One in 10 Pregnant Women in the United States Reports Drinking Alcohol. Retrieved November 25, 2018 from <https://www.cdc.gov/media/releases/2015/p0924-pregnant-alcohol.html>
- Centers for Disease Control and Prevention (CDC). (2017). U.S. County Prescribing Rates, 2017. Retrieved November 16, 2018 from <https://www.cdc.gov/drugoverdose/maps/rxcounty2017.html>
- Children’s Bureau. (2015). Parental Drug Use as Child Abuse. Retrieved December 5, 2018 from <https://www.childwelfare.gov/pubPDFs/drugexposed.pdf>
- Children’s Bureau. (2019). AFCARS Report: Preliminary FY 2018 Estimates as of August 22, 2019. Retrieved November 15, 2019 from <https://www.acf.hhs.gov/sites/default/files/cb/afcarsreport26.pdf>
- Clark H.W. (2014). Even non-fatal overdoses can lead to severe consequences. Retrieved December 5, 2018 from <https://blog.samhsa.gov/2014/09/02/even-non-fatal-overdoses-can-lead-to-severe-consequences>
- Foundation for a Healthy Kentucky. (2018). Heroin and methamphetamine use among adults in Kentucky. Retrieved November 16, 2018 from <https://www.healthy-ky.org/res/images/resources/KHIP-heroin-and-meth-FINAL.pdf>
- Foundation for a Healthy Kentucky. (2018). Use and misuse of prescription pain relievers among Kentucky adults. Retrieved November 16, 2018 from <https://www.healthy-ky.org/res/images/resources/KHIP5-Rx-Drug-Misuse.pdf>
- Garg M., Garrison L., Leeman L., Hamidovic A., Borrego M., Rayburn W.F., & Bakhireva L. (2016). Validity of Self-Reported Drug Use Among Pregnant Women. *Maternal Child Health Journal*, 20. doi: 10.1007/s10995-015-1799-6
- Guttmacher Institute (2019). Substance Use During Pregnancy. Retrieved November 15, 2019 from <https://www.guttmacher.org/state-policy/explore/substance-use-during-pregnancy>
- Guy G.P., Zhang K., Bohm M.K., Losby, J., Lewis, B., Young, R., ... Dowell, D. (2017). Vital Signs: Changes in Opioid Prescribing in the United States, 2006–2015. *Morbidity and Mortality Weekly Report*, 66(26). doi: 10.15585/mmwr.mm6626a4
- Haight S.C., Ko J.Y., Tong V.T., Bohm M.K., & Callaghan W.M. (2018). Opioid Use Disorder Documented at Delivery Hospitalization — United States, 1999–2014. *Morbidity and Mortality Weekly Report*, 67(31). doi: 10.15585/mmwr.mm6731a1
- Heil, S.H., Jones, H.E., Arria, A., Kaltenbach, K., Coyle, M., Fischer, G., ... Martin, P.R. (2010). Unintended pregnancy in opioid-abusing women. *Journal of substance abuse treatment*, 40(2). doi: 10.1016/j.jsat.2010.08.011
- Hudak, M.L. & Tan, R.C. (2012). Neonatal Drug Withdrawal. *Pediatrics*, 129(2). doi: 10.1542/peds.2011-3212
- Hughes, A., Williams, M.R., Liparia, R.N., Bose, J., Copello, E.A.P., & Kroutill, L. (2016). Prescription Drug Use and Misuse in the United States: Results from the 2015 National Survey on Drug Use and Health. *NSDUH Data Review*
- Kaltenbach, K., Holbrook, A., Coyle, M.G., Heil, S.H., Salisbury, A., Stine, S., ... Jones, H. (2012). Predicting Treatment for Neonatal Abstinence Syndrome in Infants Born to Women Maintained on Opioid Agonist Medication. *Addiction*, 107(01). Doi: 10.1111/j.1360-0443.2012.04038.x

Neonatal Abstinence Syndrome Reporting Registry – Annual Report 2018

- Kentucky Cabinet for Health and Family Services (CHFS). (2017). Public Health Child Fatality Review Program 2017 Annual Report
- Kentucky Cabinet for Health and Family Services (CHFS). (2018). Neonatal Abstinence Syndrome in Kentucky: Annual Report on 2016 Births
- Kentucky Cabinet for Health and Family Services (CHFS). (2018) Standard of Practice Manual 2.3 - Acceptance Criteria and Reports That Do Not Meet. Retrieved December 18, 2018 from <http://manuals.sp.chfs.ky.gov/chapter2/02/Pages/23AcceptanceCriteria.aspx>
- Kentucky Injury Prevention and Research Center (KIPRC). (2018). County profiles for drug-related inpatient hospitalizations and emergency department visits. Retrieved on November 25, 2018 from <http://www.mc.uky.edu/kiprc/pubs/overdose/county-profiles.html>
- Ko, J.Y., Patrick, S.W., Tong, V.T., Patel, R., Lind, J.N., & Barfield, W.D. (2016). Incidence of Neonatal Abstinence Syndrome — 28 States, 1999–2013. *Morbidity and Mortality Weekly Report*, 65(31). doi: <http://dx.doi.org/10.15585/mmwr.mm6531a2>
- Kocherlakota, P. (2014). Neonatal abstinence syndrome. *Pediatrics*, 134(2). doi 10.1542/peds.2013-3524
- McCance-Katz, E.F. (2018). The National Survey on Drug Use and Health: 2017. Retrieved December 5, 2018 from <https://www.samhsa.gov/data/sites/default/files/nsduh-ppt-09-2018.pdf>
- National Public Radio (NPR), Robert Wood Johnson Foundation (RWJF), & Harvard T.H. Chan School of Public Health (Harvard). (2018). Life in Rural America. Retrieved on November 25, 2018 from https://www.rwjf.org/content/dam/farm/reports/surveys_and_polls/2018/rwjf449263
- O'Donnell, J.K., Gladden, R.M., & Seth, P. (2017) Trends in Deaths Involving Heroin and Synthetic Opioids Excluding Methadone, and Law Enforcement Drug Product Reports, by Census Region — United States, 2006–2015. *Morbidity and Mortality Weekly Report*, 66(34). doi: 10.15585/mmwr.mm6634a2
- O'Donnell, J.K., Halpin, J., Mattson, C.L., Goldberger, B.A., & Gladden, R.M. (2017) Deaths Involving Fentanyl, Fentanyl Analogs, and U-47700 — 10 States, July–December 2016. *Morbidity and Mortality Weekly Report*, 66(34). doi: 10.15585/mmwr.mm6643e1
- Passey, M.E., Sanson-Fisher, R.W., D'Este, C.A., & Stirling, J.M. (2014). Tobacco, alcohol and cannabis use during pregnancy: Clustering of risks. *Drug and Alcohol Dependence*, 134. doi:10.1016/j.drugalcdep.2013.09.008
- Quast T. (2018). State-Level Variation in the Relationship Between Child Removals and Opioid Prescriptions. *Child Abuse and Neglect*, 86. doi: 10.1016/j.chiabu.2018.10.001
- Schempf, A.H. & Strobino, D.M. (2008). Illicit Drug Use and Adverse Birth Outcomes: Is it Drugs or Context? *Journal of Urban Health*, 85(6). doi: 10.1007/s11524-008-9315-6
- Schiff, D.M., Nielsen, T., Terplan, M., Hood, M., Bernson, D., Diop, H., ... Land T. (2018) Fatal and Nonfatal Overdose Among Pregnant and Postpartum Women in Massachusetts. *Obstetrics and Gynecology*, 132(2). doi: 10.1097/AOG.0000000000002734
- Substance Abuse and Mental Health Services Administration (SAMHSA). (2016). Buprenorphine. Retrieved November 20, 2018 from <https://www.samhsa.gov/medication-assisted-treatment/treatment/buprenorphine>
- Tolia, V.N., Patrick, S.W., Bennett, M.M., Murthy, K., Sousa, J., Smith, P.B., ... Spitzer, A.R. (2015). Increasing incidence of the neonatal abstinence syndrome in U.S. neonatal ICUs. *New England Journal of Medicine*, 372(22). doi: 10.1056/NEJMs1500439
- Vivolo-Kantor, A.M., Seth, P., Gladden, R.M., Mattson, C.L., Baldwin, G.T., Kite-Powell, A., Coletta, M.A. (2018). Vital Signs: Trends in Emergency Department Visits for Suspected Opioid Overdoses — United States, July 2016–September 2017. *Morbidity and Mortality Weekly Report*, 67(9). doi: 10.15585/mmwr.mm6709e1
- World Health Organization. (2014). Guidelines for the identification and management of substance use and substance use disorders in pregnancy. Retrieved December 19, 2018 from http://www.who.int/substance_abuse/publications/pregnancy_guidelines/en/
- Slavova, S. (2015). Heroin Overdoses in Kentucky. Retrieved on November 25, 2018 from <http://www.mc.uky.edu/kiprc/PDF/opiod-misuse-2016.pdf>