

Neonatal Abstinence Syndrome and Drug Use Among Pregnant Women in Ohio

2004-2011



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Executive Summary

Approximately 5,100 hospitalizations resulted from Neonatal Abstinence Syndrome (NAS) in inpatient and outpatient settings between 2004 and 2011. In 2011 alone, there were 1,649 admissions to both settings, which equates to nearly five admissions per day. The rate of NAS grew six-fold from 14 per 10,000 live births in 2004 to 88 per 10,000 live births in 2011. The most common conditions associated with NAS were respiratory complications, low birth weight, feeding difficulties, and seizures. In 2011, Medicaid was the payer for approximately 84 percent of NAS inpatient hospitalizations; however, NAS claims represented less than 1.5 percent of total Medicaid claims.

NAS has taken a heavy toll on Ohio's healthcare system. Treating newborns with NAS was associated with over \$70 million in charges and nearly 19,000 days in Ohio's hospitals in 2011. Between 2004 and 2011, the average charge associated with NAS hospitalizations almost doubled while the average length of stay (LOS) fluctuated between 14 and 20 days. The average service charges and average LOS for NAS infants are much greater than for all Ohio infants. In 2011, the average inpatient charge was five times higher for NAS infants, and the average LOS was four times greater than for all Ohio infants.

Data on exposure to noxious substances through the placenta or breast milk suggests an increasing number of infants are exposed to opioids (i.e., heroin and prescription pain medication). Almost 1,400 infants were exposed to opioids between 2004 and 2011. The annual number of inpatient hospitalizations related to opioids increased 540 percent during this period, and opioids surpassed cocaine as the common drug of exposure in 2010 and remained the leading drug of exposure in 2011.

In addition to the rise in NAS, approximately 17,000 hospitalizations resulted from drug abuse or dependence among mothers at time of delivery between 2004 and 2011. Hospitalization rates doubled from 106 per 10,000 in 2004 to 210 per 10,000 in 2011. The most common drug abused at the time of delivery was marijuana. Opioids surpassed cocaine as the second most common drug abused in 2009 and continued to be second most common drug after 2010.

The number of women being treated for drug use during pregnancy almost doubled during the previous eight years with over 4,200 pregnant women admitted to treatment between 2004 and 2011. Similar to trends in drug use at time of delivery, a rapid rise in opioid use among pregnant women in treatment was found. Opioids surpassed marijuana and cocaine, and they were listed as the top primary drug of choice from 2010 onward.

Findings from this study have several important implications for drug abuse treatment and prevention programs. Healthcare providers need to be aware of the rapidly rising rates of NAS and drug use among pregnant women. Hospitalization and treatment data suggest drug use has shifted from cocaine to opioids. This shift has important implications for the implementation of screening and treatment protocols among high risk patients. In addition, more education and outreach efforts are needed on the adverse effect of drug use among women and their babies.



Background

The Ohio Departments of Mental Health and Addiction Services and Health have observed alarming trends in drug overdose over the last decade. From 1999 to 2011, Ohio's death rate due to unintentional drug overdoses increased 440 percent. The increase in deaths has been largely driven by abuse and misuse of prescription opioid pain medications.¹ A variety of societal and medical trends have led to the rise in prescription pain medication abuse and misuse. These trends include the direct marketing of pharmaceuticals to consumers and changes in clinical pain management which have led to a rise in opioid use in the population. Similar to the rapid increase in overdose deaths, there has been an increased number of Ohio residents receiving treatment for substance abuse. Data from the Multi-Agency Community Services Information System (MACSIS) indicate the number of people treated for substance abuse has increased from 92,462 in 2004 to 98,929 in 2011. While this increase is relatively modest, the number of people in treatment for opioid abuse or dependence has grown 163 percent from 9,275 in 2004 to 24,393 in 2011.

Coinciding with addiction rates in the general population, the number of pregnant women receiving treatment for drug use has increased 83 percent during the same period. Exposure to controlled substances and illicit drugs during pregnancy can have devastating consequences to the health and wellness of infants. An estimated 55-94 percent² of infants exposed to opioids in utero or smaller percentages exposed to other substances in utero have been diagnosed with Neonatal Abstinence Syndrome (NAS). Symptoms typically present themselves within 48-96 hours of birth, but may occur up to two weeks later. Manifestations of NAS vary depending on the specific drug(s) used by the mother, frequency of use, dosage and the infant's ability to metabolize and excrete the drug(s).³ NAS signs and symptoms vary widely between infants as well as within the same infant over time. Infants born with NAS are at risk for a variety of conditions, including pre-term birth, low birth weight, feeding difficulties, irritability, respiratory distress, seizures, and fever or unstable temperature.⁴

While the rise in drug overdose deaths has been well documented, all consequences of the epidemic have not been thoroughly studied. One of these consequences is the rise in the number of infants born with NAS. Studies from the United States and other countries have documented a rapid rise in NAS incidence rates over the last decade.^{5,6} However, to our knowledge, no work has been done to date to quantify the hospitalization rate of NAS and understand the unique issues of pregnant women in treatment for drug abuse and dependence in Ohio. The purpose of this report is to describe trends and patterns of infants hospitalized for NAS, describe the burden of NAS on Ohio's healthcare system, and characterize drug use among pregnant females at time of delivery and in addiction treatment.

¹Socie, E., Hirsch, A., & Beeghly, C. (2010). The Burden of Poisoning in Ohio, 1998-2008. Ohio Department of Health, Bureau of Health Promotion and Risk Reduction, Office of Healthy Ohio, Violence and Injury Prevention Program.

²Hudak, M. L. & Rosemarie, C. T. (2012). Neonatal Drug Withdrawal. *Pediatrics*, 129(2), e540-e560.

³Hamdan, A.H., MacGilvray, S.S., Windle, M.L., Carter, Wagner, C.L. & Rosenkrantz, T. (April, 2012). Neonatal Abstinence Syndrome. Retrieved from <http://emedicine.medscape.com/article/978763-overview#a0104>

⁴Substance Abuse and Mental Health Services Administration (2012). Glossary. Retrieved from <http://www.fasdcenter.samhsa.gov/educationTraining/courses/FASDTheCourse/misc/glossary.cfm#N>

⁵O'Donnell, M., Nassar, N., Leonard, H., Hagan, R., Mathews, R. Patterson, Y. & Stanley, F. (2009). Increasing prevalence of neonatal withdrawal syndrome: Population study of maternal factors and child protection involvement. *Pediatrics*, 123(4), e614-e621.

⁶Patrick, S.W., Schumacher, R.E., Benneyworth, B.D., Krans, E.E., McAllister, J.M., & Davis, M.M. (2012). Neonatal abstinence syndrome and associated healthcare expenditures: United States, 2000-2009. *Journal of the American Medical Association*, 307(18), 1934-1940.

Methods

Data for this study was obtained through several statewide data systems. The Ohio Hospital Association (OHA) provided discharge diagnosis data on infants who received services in Ohio. OHA data comes from its Statewide Clinical and Financial Database, which is submitted by 167 hospitals and 16 health systems. While membership to the organization is voluntary, the data are considered representative of the population because most healthcare systems (approx. 98 percent) submit data. OHA data was queried among all 16 hospital settings (e.g., inpatient and outpatient) to obtain data on all patient classes.

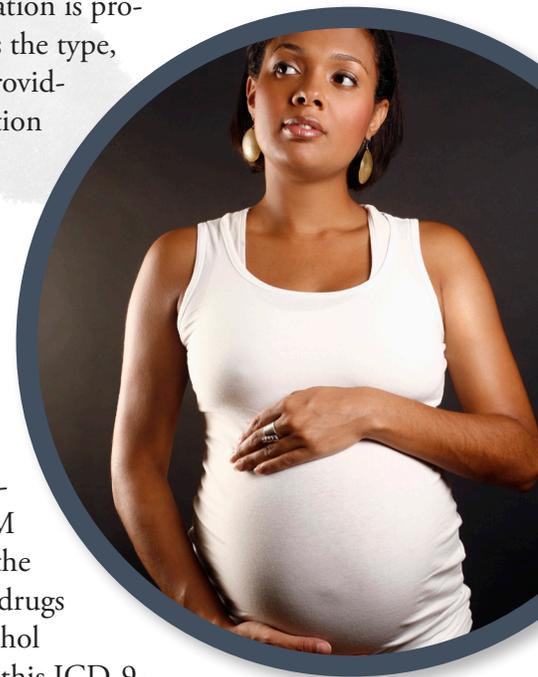
The MACSIS provided longitudinal data for pregnant women in treatment. MACSIS is a client information system operated by the Ohio Department of Mental Health and Addiction Services (OhioMHAS) for claims reimbursement and to meet state and federal reporting requirements. Information is provided by behavioral healthcare facilities across the state. Claims data identifies the type, number and duration of alcohol and other drug and mental health services provided, and the cost of that service for each client contact. The MACSIS information system collects information for clients whose services are paid in whole or in part by public dollars. Private pay clients are not included in the information system.

Neonatal Abstinence Syndrome

Hospitalizations for infants with NAS were identified using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). Records for infants (age < 1) with a diagnosis code of 779.5 (drug withdrawal syndrome in a newborn) were pulled if they had applicable ICD-9-CM codes anywhere in discharge fields related to the primary diagnosis or any of the 18 secondary diagnosis fields. The diagnosis of NAS may reflect one or more drugs in the infant's system, but this code does not include a diagnosis of Fetal Alcohol Spectrum Disorder (ICD-9-CM 760.71). Unlike NAS codes in the ICD-10, this ICD-9-CM code does not distinguish between NAS caused by drugs ingested by the mother versus NAS caused by drugs legitimately given by delivering physicians.

The study period for hospitalizations resulting from NAS was from 2004 to 2011 for inpatient settings while the study period for outpatient settings only included counts from 2010 and 2011. The study period was restricted to these years due to trends in reporting by member hospitals. The number of member hospitals reporting inpatient data was consistent between 2004 and 2011 while the number of member hospitals reporting outpatient data had increased and stabilized by 2010.

The annual hospitalization rates of NAS were calculated by dividing the number of infants hospitalized for NAS in Ohio's hospitals by the number of live births in Ohio. Birth records were only pulled for infants being born to women residing in Ohio who gave birth at an Ohio hospital. The number of live births was obtained from Ohio Public Health Information Warehouse (OPHIW), compiled and maintained by the Ohio Department of Health.



The burden of NAS on Ohio's healthcare system was estimated by quantifying charges and length of hospital stay (LOS) associated with NAS treatment. Average charges and LOS associated with NAS were compared to all Ohio infants born in Ohio's hospitals for diagnostic related groups 789-795. Charges were adjusted⁷ for inflation based on the consumer price index for all hospital services and reported in 2011 U.S. dollars.

Noxious Substances Affecting Infants and Breastfeeding Children

Neonatal abstinence syndrome cannot be broken down by individual drug; however, other ICD-9-CM codes may prove useful when examining drug-specific trends. ICD-9-CM diagnostic codes in the 760.7x series indicate specific noxious influences affecting fetuses or infants via placenta or breast milk (i.e., 760.72 – cocaine; 760.73 – opioids, including heroin and prescription opioids; and 760.75 – hallucinogens). Primary and all 18 secondary diagnostic codes for inpatients were queried independently of 779.5 for infants of any age. As with 779.5, these diagnostic codes are thought to be underutilized by physicians and other medical professionals.

Drug Abuse and Dependence at Time of Delivery

OHA data was used to examine drug-related diagnoses among mothers at time of delivery. Diagnostic related groups 370-375 were used to identify delivering mothers with drug abuse (305.xx) or drug dependence-related diagnoses (304.xx) for the five most commonly abused drugs including amphetamines, marijuana, cocaine, hallucinogens, opioids (i.e., heroin and prescription opioids) and sedative-hypnotics (i.e., benzodiazepines, barbiturates and muscle relaxants).

Treatment among Pregnant Women for Drug Abuse and Dependence

Finally, MACSIS admissions and discharge data were pulled for all women from 2004 to 2011. Records for pregnant women were compared to records for all women on several variables. Treatment admissions data was examined for women who indicated a primary drug of choice for the five most commonly abused drugs including amphetamines, marijuana, cocaine, hallucinogens, opioids and sedative-hypnotics. The stage of a woman's pregnancy, a new variable in 2010, was also incorporated to determine whether there were any trends for women seeking treatment. Discharge data for all women was also studied to determine the frequency of women's disposition at discharge. Every discharge status assigned to a client was based on a clinical evaluation when possible. Typically, a successful discharge meant that a client achieved all of their treatment goals; whereas, an unsuccessful discharge could have indicated a variety of conditions including partial attainment of goals, the client moved away from the service area or the client died.

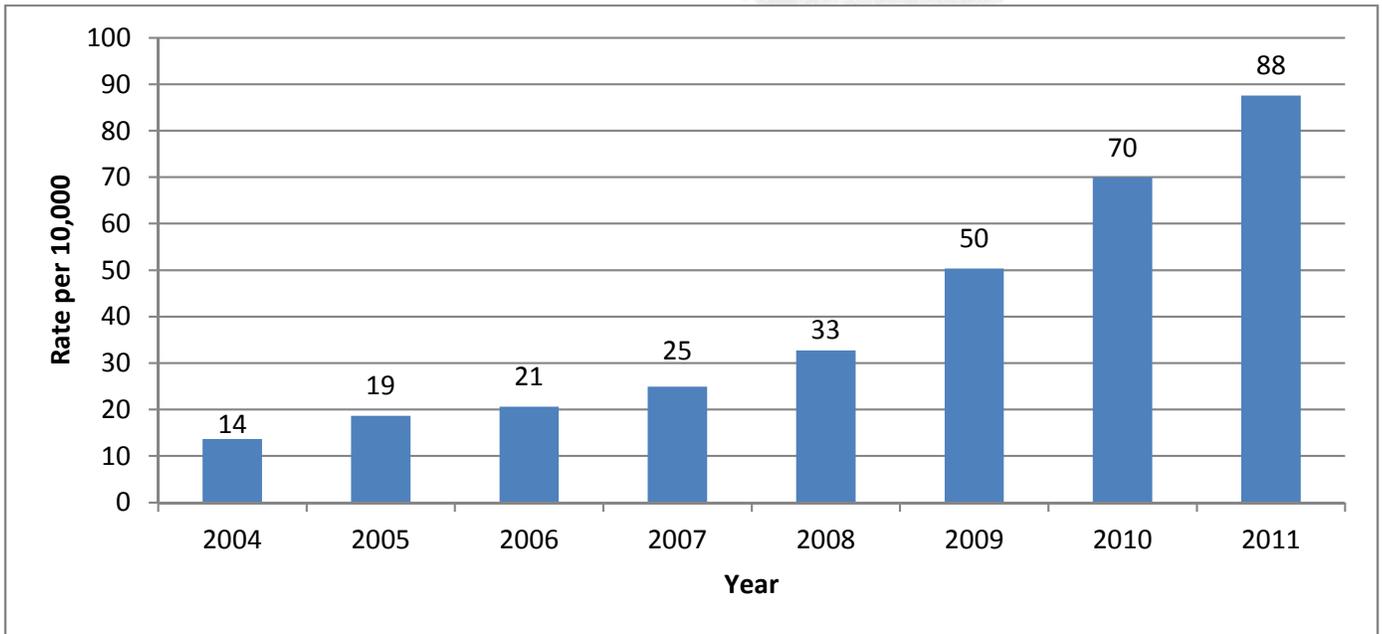
⁷US Department of Labor, Bureau of Labor and Statistics (2012). CPI Inflation Calculator. Retrieved from http://www.bls.gov/data/inflation_calculator.htm

Results

Hospitalizations

Approximately 5,100 hospitalizations resulted from NAS in inpatient and outpatient settings between 2004 and 2011. The annual inpatient NAS hospitalization rate among infants born in Ohio grew six-fold from 14 per 10,000 live births in 2004 to 88 per 10,000 live births in 2011 (Figure 1). In addition to the number of inpatient NAS hospitalizations, an increasing number of infants were treated in outpatient settings in recent years. In fact, the number of visits to outpatient settings grew from 170 in 2010 to 467 in 2011, representing a 174.70 percent increase. Anecdotal data from area hospitals suggests this increase is driven by triaging NAS infants that are having fewer complications to outpatient settings because inpatient settings do not have the capacity to deal with the large number of addicted infants.

Figure 1: NAS inpatient hospitalization rate per 10,000 live births, Ohio, 2004-2011

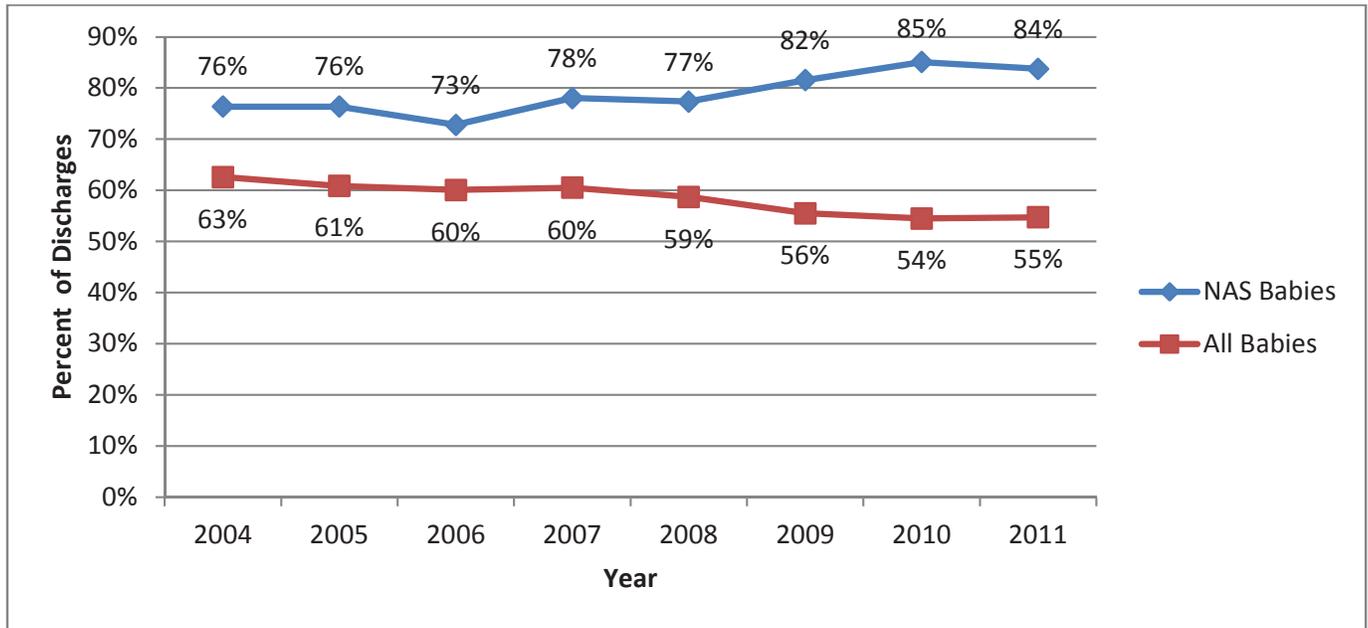


Source: Ohio Hospital Association

Payer

Medicaid was the primary payer for inpatient and outpatient discharges every year (Figure 2). In 2011, 84.7 percent of all hospitalizations were billed to Medicaid, while the other 15.3 percent were billed to non-Medicaid sources (i.e., private, self-pay and other). The percentage of NAS hospitalizations billed to Medicaid was much higher than the percentage of all Ohio births billed to Medicaid (84 percent vs. 55 percent in 2011). Inpatient discharges accounted for the bulk of NAS hospitalizations and increased every year. The percentage of inpatient hospitalizations billed to Medicaid increased from 76 percent in 2004 to 84 percent in 2011. Outpatient visits related to NAS billed to Medicaid increased from 80 percent in 2010 to 89 percent in 2011. Outpatient data are unavailable before 2010.

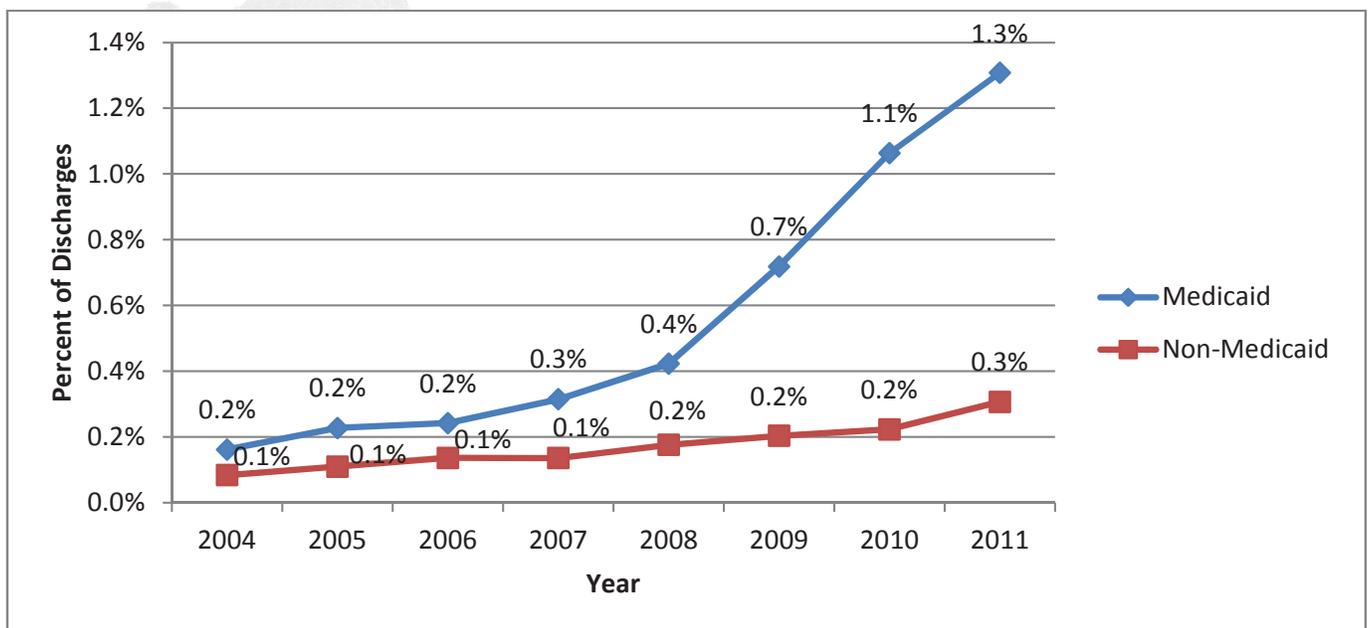
Figure 2: Percent of inpatient discharges paid by Medicaid, NAS infants vs. all infants, Ohio, 2004-2011



Source: Ohio Hospital Association

NAS infants represent only a small portion of Medicaid births, averaging 0.5 percent over the eight year period (Figure 3). The percent of NAS inpatient discharges has increased for Medicaid payers from 0.2 percent in 2004 to 1.3 percent in 2011. NAS infants represent an even smaller fraction of non-Medicaid payers, averaging 0.2 percent during the study. While the percentage of non-Medicaid NAS infants has increased over time, this increase is relatively small (0.2 percent).

Figure 3: Percent of NAS inpatient discharges related to all Medicaid births, Ohio, 2004 - 2011

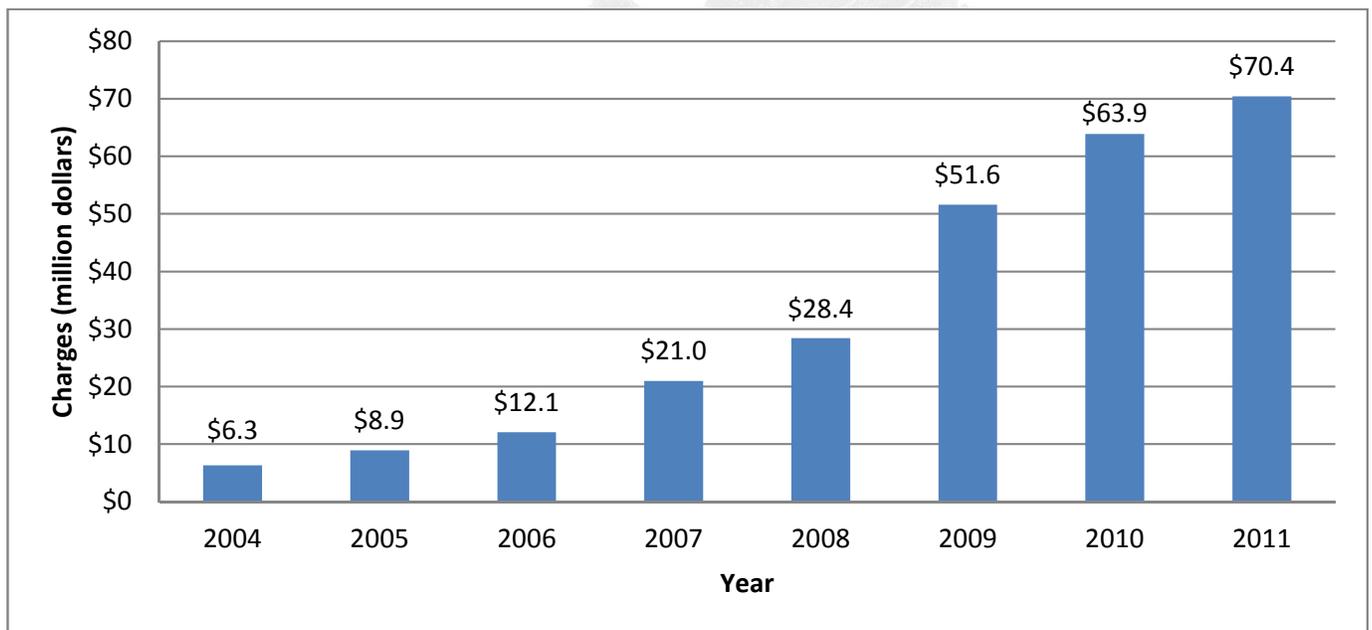


Source: Ohio Hospital Association

Costs of NAS on Ohio's Healthcare System

Approximately \$70.4 million in inpatient hospital charges were associated with treating infants with NAS in 2011, growing 11-fold over from 2004 to 2011 (Figure 4). Charges associated with outpatient hospital services were a relatively minor percentage of the total charges related to NAS infants in 2011 (0.3 percent). However, outpatient costs increased for NAS infants seen in outpatient settings. Outpatient discharges for NAS infants grew substantially from 170 in 2010 to 467 in 2011 (175 percent), and costs for these infants kept up pace, increasing 279 percent from 2010 to 2011.

Figure 4: Total inpatient hospital charges* among NAS infants, Ohio, 2004 - 2011

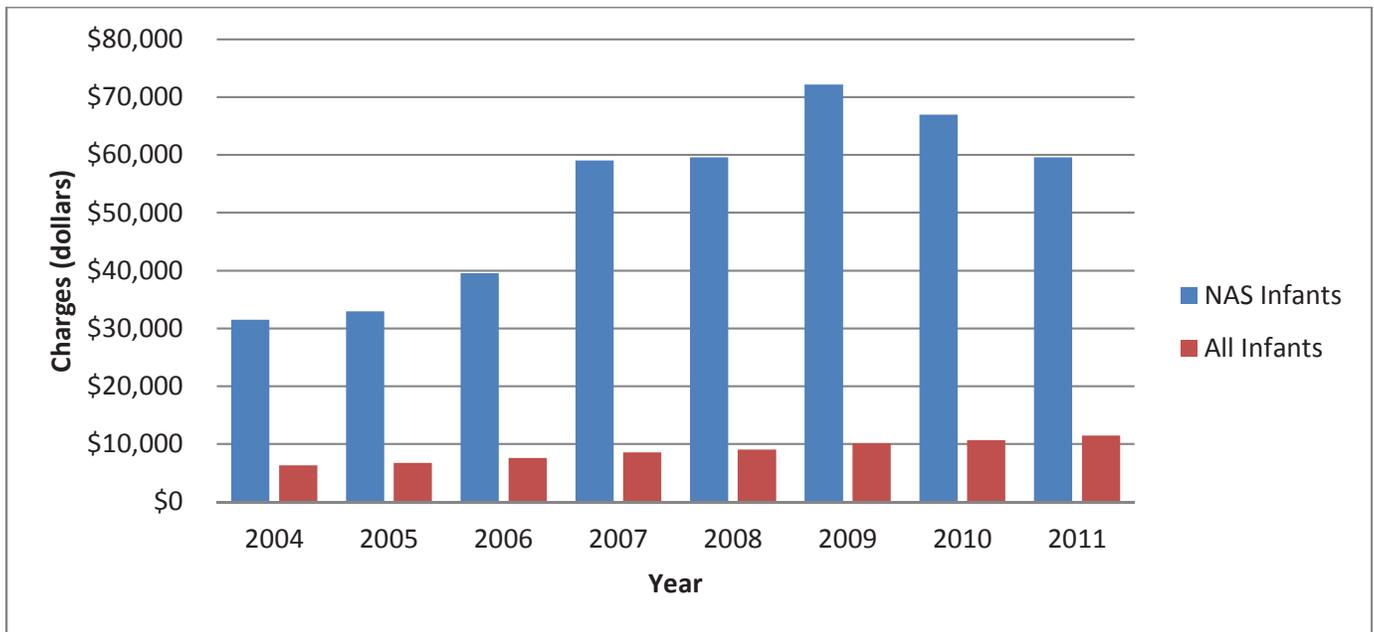


*Adjusted for inflation, 2011 US \$

Source: Ohio Hospital Association

Average inpatient hospital charges for NAS infants are typically between five and seven times higher than charges for all infants. In 2011, the average inpatient hospital charge associated with NAS infants was \$59,574; whereas, it was only \$11,499 for all infants (Figure 5 [next page]; Please see Table 2 on pages 23-24, for data points that correspond to Figures 5, 8, 10, 13, 14, 15 and 17.) Average charges increased over time for both groups; average costs for NAS infants grew by 89 percent and average costs for all infants grew by 81 percent from 2004 to 2011. Hospital charges for NAS infants appear to have peaked in 2009 and now seem to be trending downward to the levels seen in 2007 and 2008.

Figure 5: Average inpatient hospital charges*, NAS infants vs. all infants, Ohio, 2004-2011

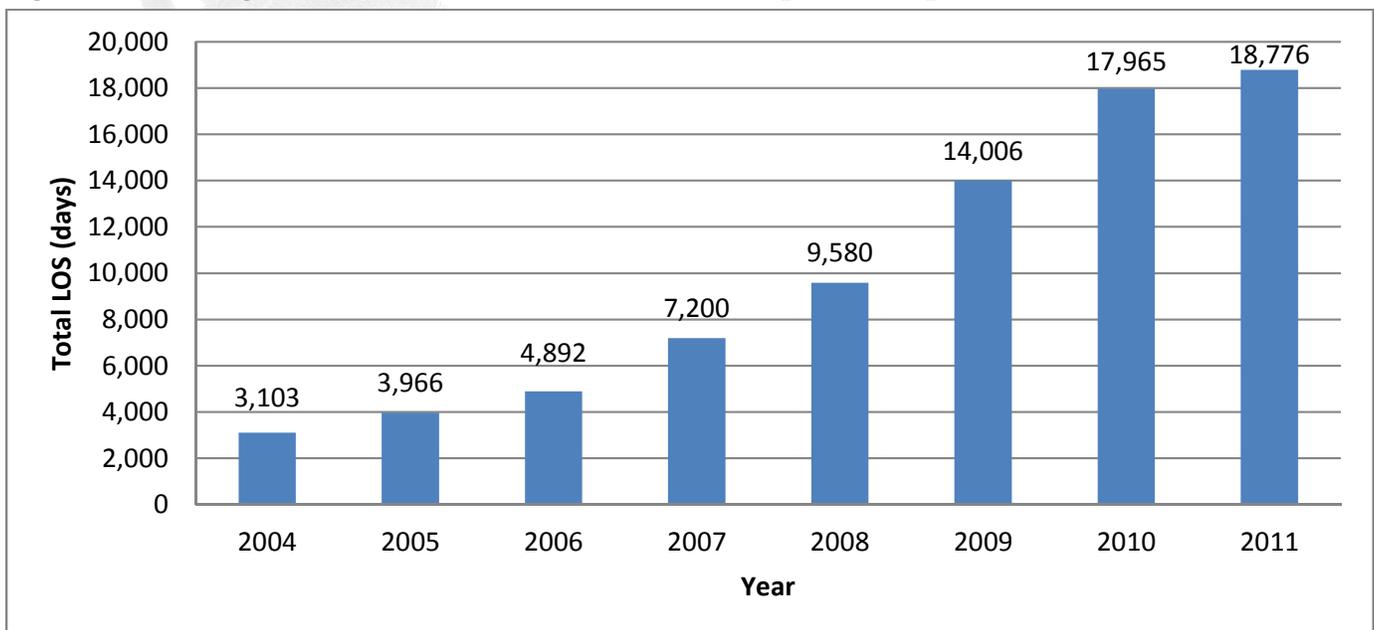


*Adjusted for inflation, 2011 US \$

Source: Ohio Hospital Association

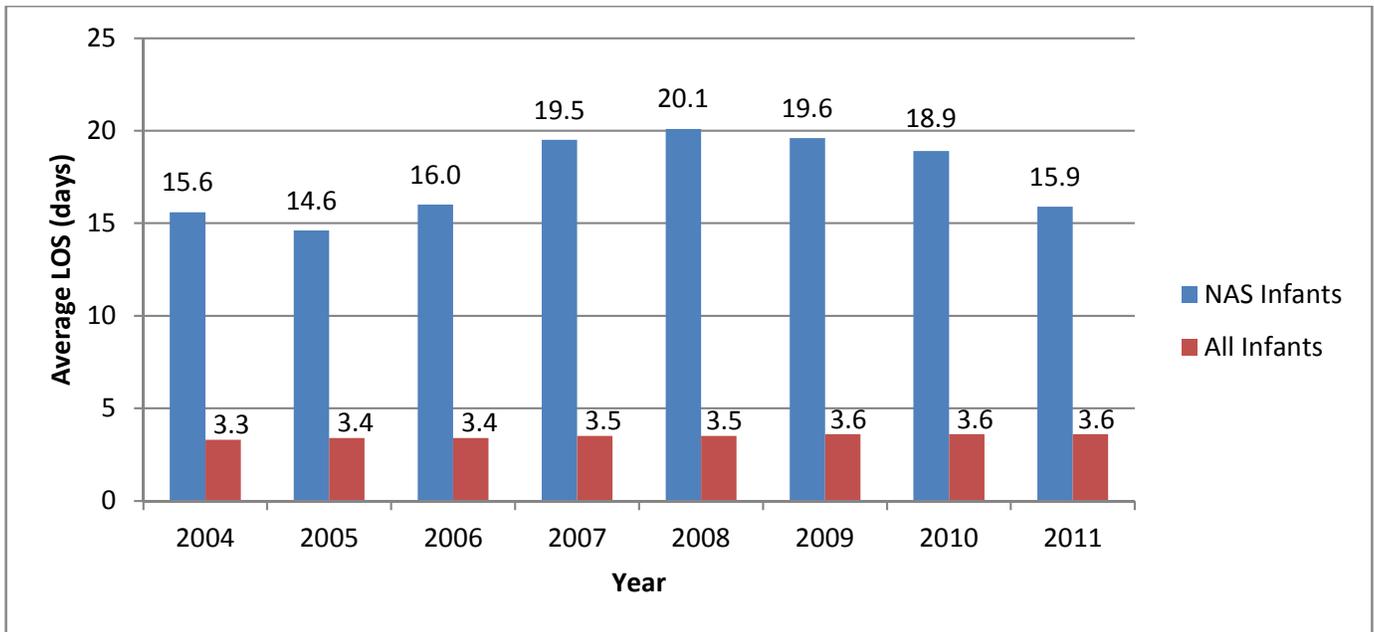
NAS was associated with over 79,000 days in inpatient hospital settings during the previous eight years. The total LOS associated with hospitalization for NAS increased six-fold from 2004 to 2011 (Figure 6). In 2011 alone, NAS infants accounted for almost 19,000 inpatient hospital days, with an average of 15.9 days in the hospital. The average LOS was similar from 2004 to 2006 and then increased in 2007 and 2008. After 2008, average LOS decreased from a peak of 20.1 days in 2008 to 15.6 in 2011. The average LOS among infants with NAS was over four times higher than the average for all infants born in Ohio throughout the study period (Figure 7).

Figure 6: Total length of stay in days associated with NAS inpatient hospitalizations, Ohio, 2004-2011



Source: Ohio Hospital Association

Figure 7: Average length of stay in days for inpatient settings, NAS infants vs. all infants, Ohio, 2004-2011



Source: Ohio Hospital Association

Noxious Substances Affecting Infants and Breastfeeding Children

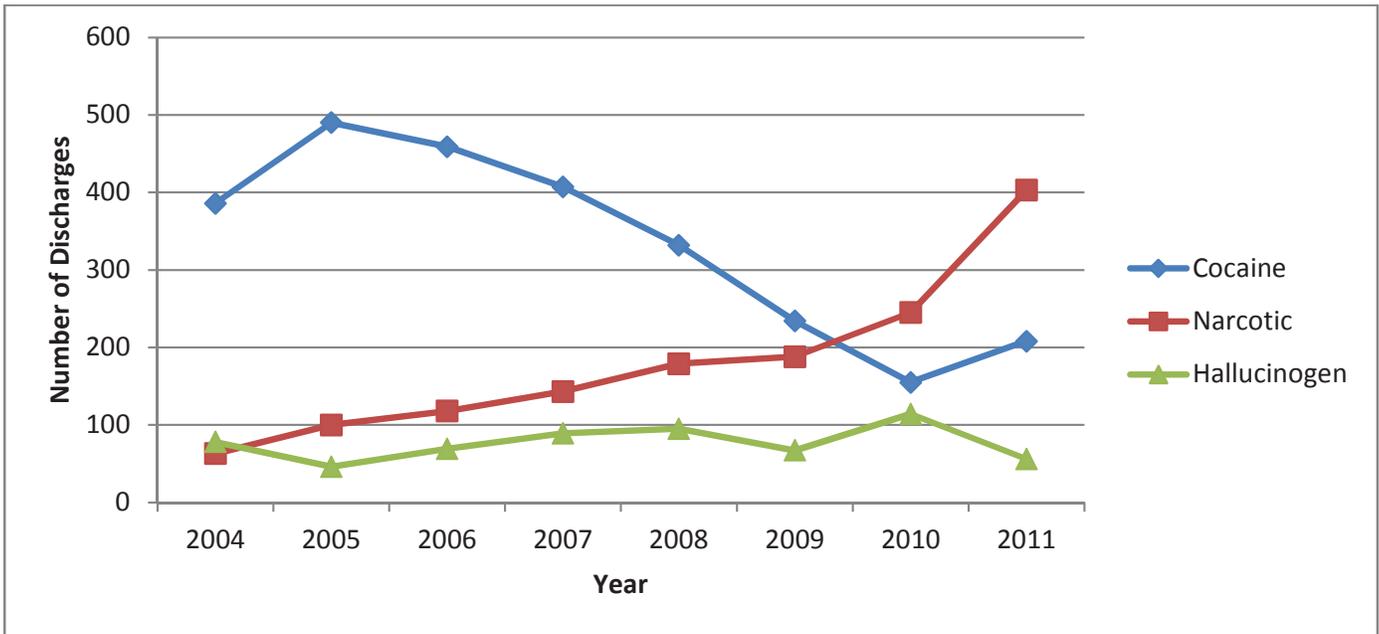
From 2004 to 2011, 4,197 inpatient hospitalizations among infants and breastfeeding children were diagnosed with exposure to one or more drugs, including cocaine, opioids or hallucinogens through the placenta or breast milk (Figure 8). Hospitalizations resulting from exposure to cocaine (2,285 hospitalizations or 54 percent) were the most frequent, followed by opioids (1,376 hospitalizations or 33 percent), and then hallucinogens (536 hospitalizations or 13 percent).

The trends in the number of hospitalizations resulting from drug exposure varied by substance. The number of hospitalizations associated with exposure to opioids increased 540 percent from 63 in 2004 to 403 in 2011 and surpassed cocaine as the most common noxious substance exposed to infants and breastfeeding children. In contrast, the number of hospitalizations resulting from exposure to cocaine decreased 46 percent, while the number of hospitalizations resulting from exposure to hallucinogens remained similar between 2004 and 2011.

The number of inpatient discharges with both an NAS and noxious substance diagnosis was relatively small (<7 percent) between 2004 and 2011. The small percentages of documented noxious substances were likely due to infrequent use of the diagnostic codes.



Figure 8: Number of inpatient hospitalizations resulting from exposure to noxious substances through breast milk or placenta by substance, Ohio, 2004-2011



Source: Ohio Hospital Association

Health Outcomes for Ohio Infants

Health outcomes for NAS infants are typically poor (Table 1). In 2010, thirty-one percent of NAS inpatient hospitalizations had respiratory symptoms documented in a discharge diagnosis field. Other common conditions documented in the discharge diagnosis fields include low birth weight (24 percent), feeding difficulties (21 percent) and seizure (2 percent). The percentage of inpatient hospitalizations with these documented conditions were significantly higher among infants with NAS compared to all infants born in Ohio. The percentage of infants with seizures was 10 times higher among those with NAS (2 percent) compared to all infants (0.2 percent). The percentage of infants with feeding difficulties was four times higher among NAS infants than all infants. The percentages of hospitalizations with both respiratory symptoms and low birth weight were approximately two to three times higher among NAS infants compared to all infants (data not shown).



Table 1: Health outcomes in inpatient settings, NAS infants* vs. all infants, Ohio, 2004-2011**

NAS Infants								
	2004	2005	2006	2007	2008	2009	2010	2011
Feeding difficulties	X	20.8%	20.6%	23.0%	20.7%	22.0%	20.7%	X
Low birth weight	X	32.0%	28.8%	32.3%	25.6%	29.1%	23.7%	X
Respiratory symptoms	X	36.8%	37.7%	40.3%	35.5%	36.2%	31.0%	X
Seizure & Convulsion	X	3.0%	3.1%	2.7%	2.3%	2.6%	1.8%	X
All Ohio Infants								
	2004	2005	2006	2007	2008	2009	2010	2011
Feeding difficulties	3.1%	3.3%	3.4%	3.6%	3.7%	4.1%	4.3%	4.4%
Low birth weight	11.1%	11.3%	11.7%	11.5%	11.6%	12.1%	11.9%	12.3%
Respiratory symptoms	10.0%	10.0%	9.9%	9.8%	9.8%	10.1%	9.9%	9.9%
Seizure & Convulsion	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%

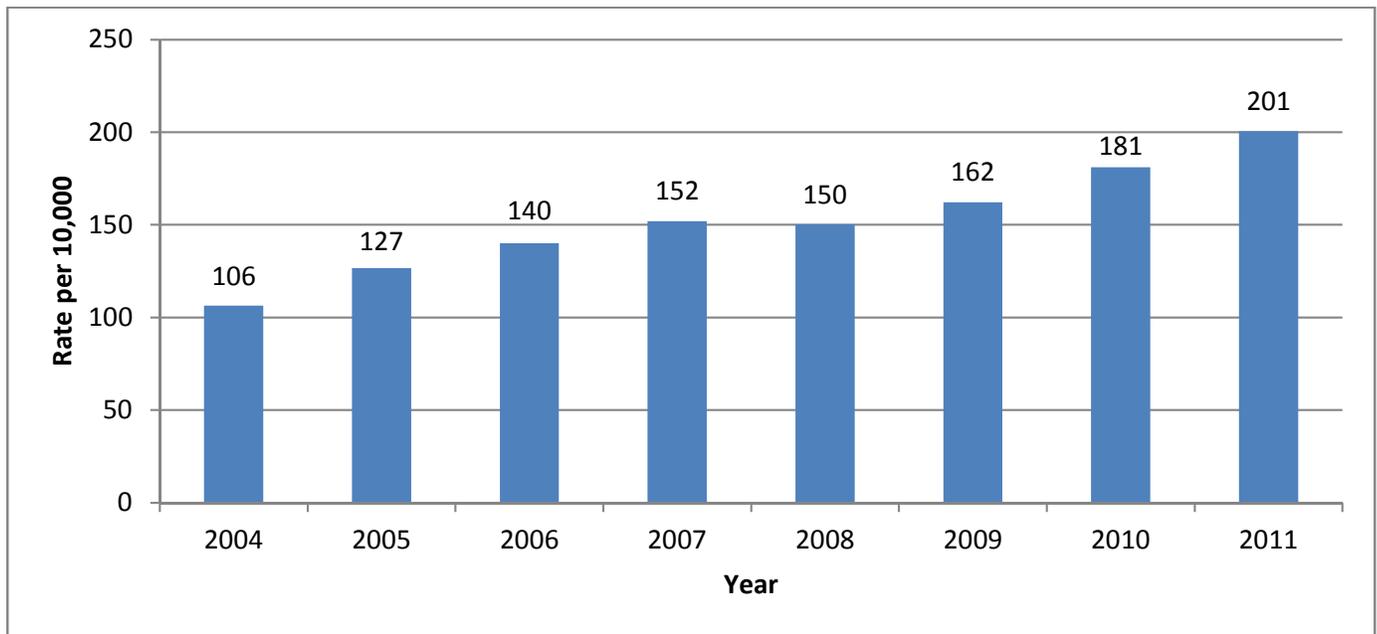
*Children may be diagnosed with more than one condition, so percentages do not add to 100

**Data unavailable for NAS infants in 2004 and 2011

Diagnosis of Drug Abuse and Dependence at Time of Delivery

Over 17,300 women were diagnosed with a variety of drug abuse conditions at their time of delivery between 2004 and 2011. Over the eight year timespan, the number of delivering women diagnosed with drug abuse or dependence increased from 1,553 in 2004 to 2,707 in 2011 (74 percent). Figure 9 displays the overall diagnosis rate per 10,000 live births for Ohio residents giving birth in Ohio. Annual drug dependence/abuse diagnosis rates for delivering mothers almost doubled from 106 per 10,000 live births in 2004 to 201 per 10,000 live births in 2011.

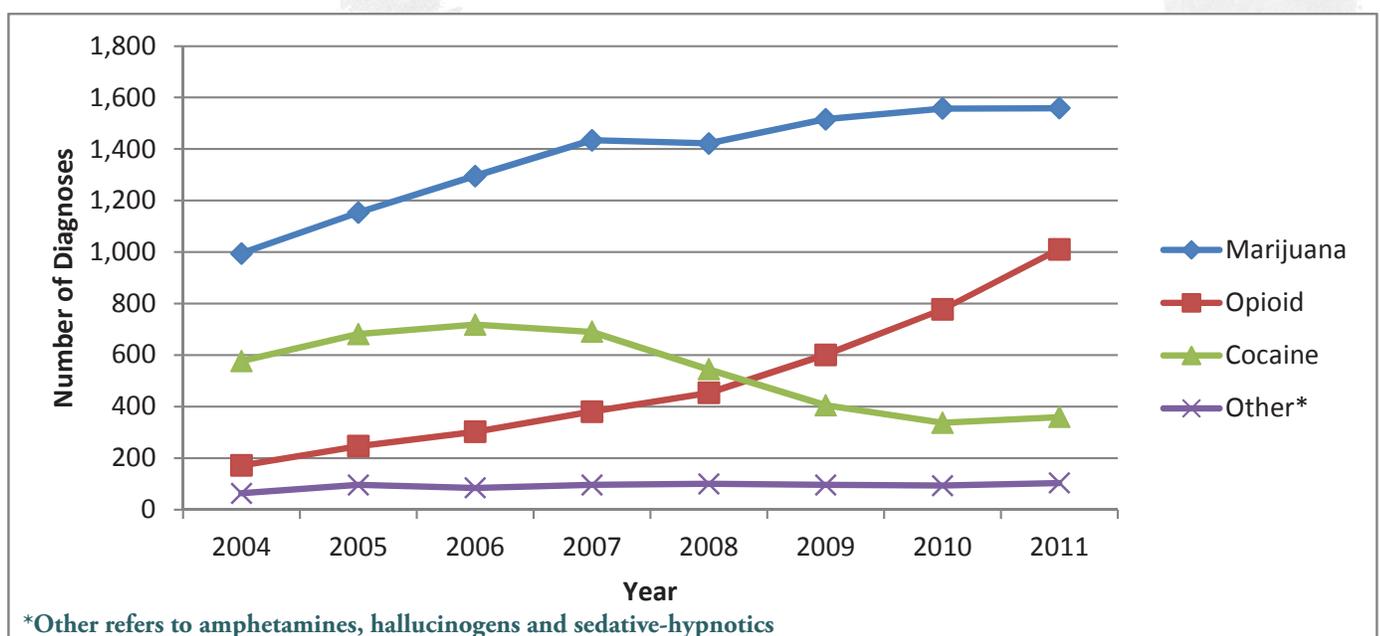
Figure 9: Drug abuse and dependence diagnoses rate per 10,000 live births, Ohio, 2004-2011



Source: Ohio Hospital Association

Delivering women were most often diagnosed with marijuana abuse or dependence (Figure 10). Women testing positive for marijuana increased 57 percent from 994 in 2004 to 1,559 in 2011. A diagnosis of cocaine abuse or dependence was the second most common diagnosis among delivering women in 2004, but this diagnosis was usurped by opioid-related diagnoses in 2009. Between 2004 and 2011, the diagnosis of opioid abuse or dependence grew 491 percent, while the diagnosis of cocaine abuse or dependence fell 38 percent among delivering mothers. Women diagnosed with abuse and dependence of other drug classes remained relatively stable between 2004 and 2011.

Figure 10: Number of drug abuse and dependence diagnoses at time of delivery by drug, Ohio, 2004-2011



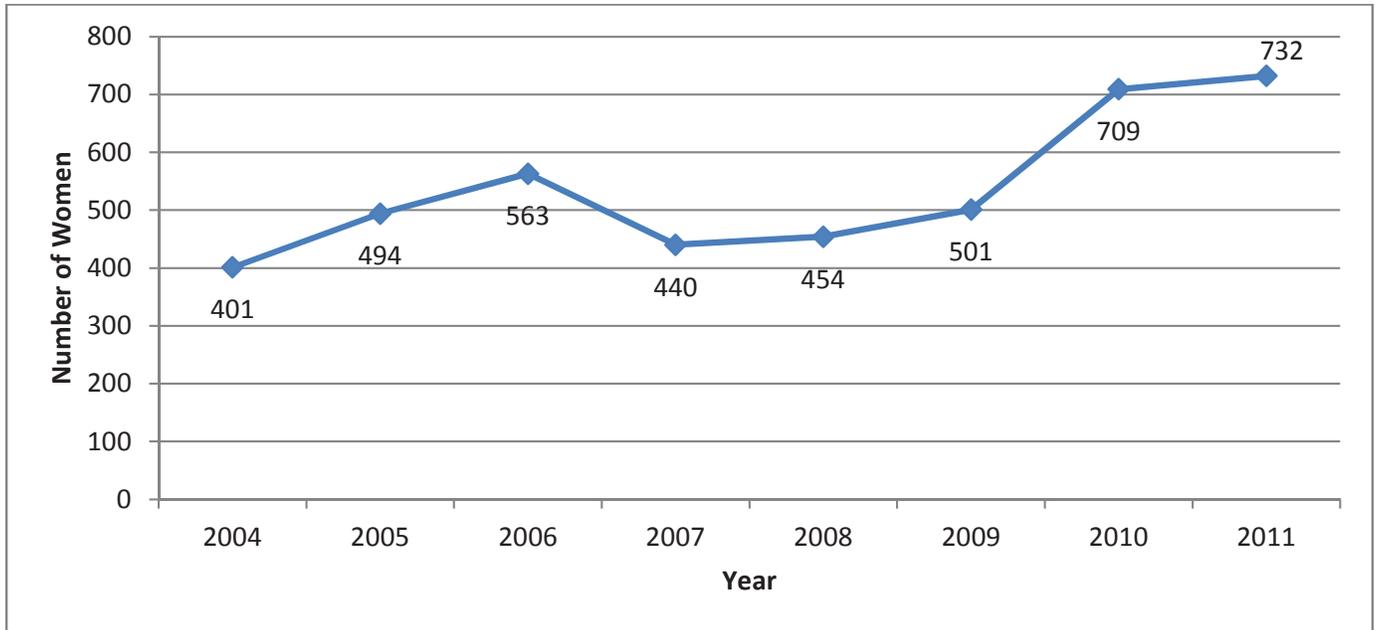
*Other refers to amphetamines, hallucinogens and sedative-hypnotics

Source: Ohio Hospital Association

Pregnant Women in Substance Abuse Treatment

More than 4,200 pregnant women were admitted to treatment between 2004 and 2011. While the percentage of pregnant women in treatment is relatively small compared to the percentage of all women in treatment (2.5 percent), it has been growing steadily over time. In fact, the number of pregnant women admitted for treatment grew 83 percent from 2004 to 2011 (Figure 11). While data are not available for every pregnant woman, most women (84 percent) gave birth while receiving treatment for their addiction.

Figure 11: Number of women pregnant at admission receiving treatment for drug abuse, Ohio, 2004-2011

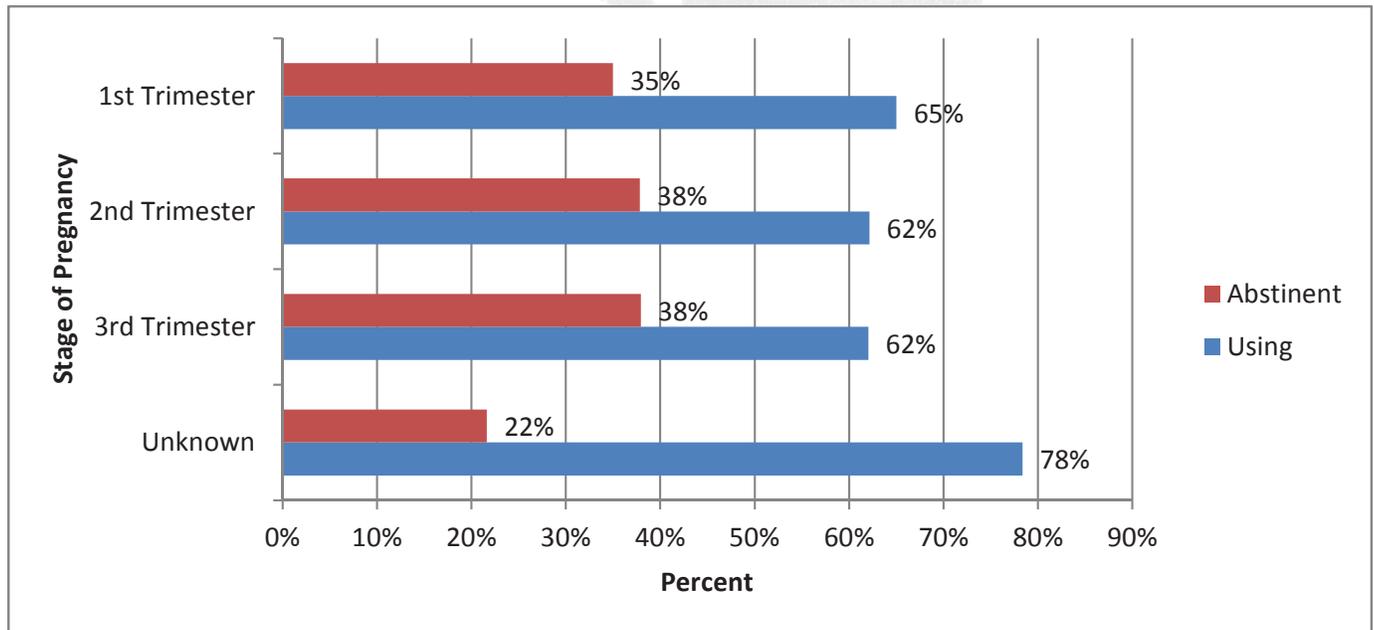


Source: OhioMHAS



Figure 12 examines drug use at time of admission for pregnant women between 2010 and 2011. Most pregnant women coming into treatment are actively using drugs. Pregnant women who come into treatment during their second and third trimesters are slightly more likely to be abstinent than women who come into treatment during their first trimester. The highest category of drug using women is in the “unknown” stage of pregnancy, which may indicate they were afraid to report their stage of pregnancy.

Figure 12: Comparing stage of pregnancy and drug use at admission, pooled data, Ohio, 2010-2011



Source: OhioMHAS

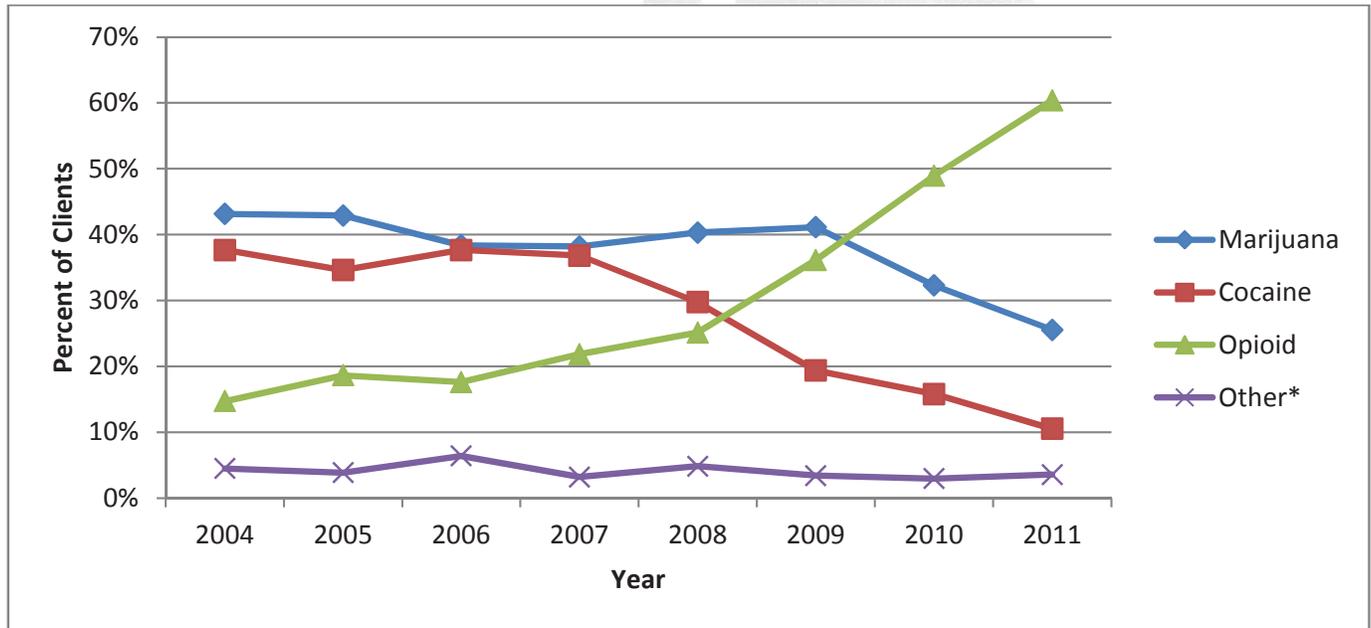
Between 2010 and 2011, 1,340 pregnant women reported their current trimester along with whether or not they were using drugs. Most women (33 percent) came into treatment during their second trimester, although many also came in during their first trimester (30 percent). Other pregnant women either came to treatment during their third trimester (21 percent) or did not report their stage of pregnancy to clinicians (15 percent).

Diagnoses of Drug Abuse and Dependence among Pregnant Women in Treatment

Pregnant women seeking help for drug abuse and dependence most often have a primary drug of choice related to cocaine, marijuana or opioids. The trends in drug preference over time reflect the growing popularity of opioids (Figure 13). From 2004 to 2011, the number of pregnant women with an opioid primary drug of choice grew more than seven-fold, rising from 59 to 442 (649 percent); whereas, the number of pregnant women indicating cocaine as a primary drug of choice fell from 151 to 77 (-49 percent). Opioid abuse has also increased dramatically among pregnant women compared to most other drug classes. In 2004, most pregnant women said their primary drug of choice was either marijuana (43 percent) or cocaine (38 percent). By 2011, opioids rose in preference from the third spot to the first spot; 60 percent of pregnant women said their primary drug of choice was opioids in contrast to marijuana (26 percent) and cocaine (11 percent). The trend for an increased preference for opioids mirrors the trend for these diagnoses in

children in Figure 7. However, the shift from cocaine-related diagnoses to opioid-related diagnoses among NAS infants occurred in 2009, nearly a year after the shift among pregnant women. One reason for this lag time may be due to the length of gestation (being around 40 weeks), resulting in the number of infants born with an NAS diagnosis roughly a year after the shift in drug use among pregnant women.

Figure 13: Percent of unique clients pregnant at admission by primary drug of choice, Ohio, 2004-2011



*Other refers to all other drugs (e.g., amphetamines and hallucinogens)

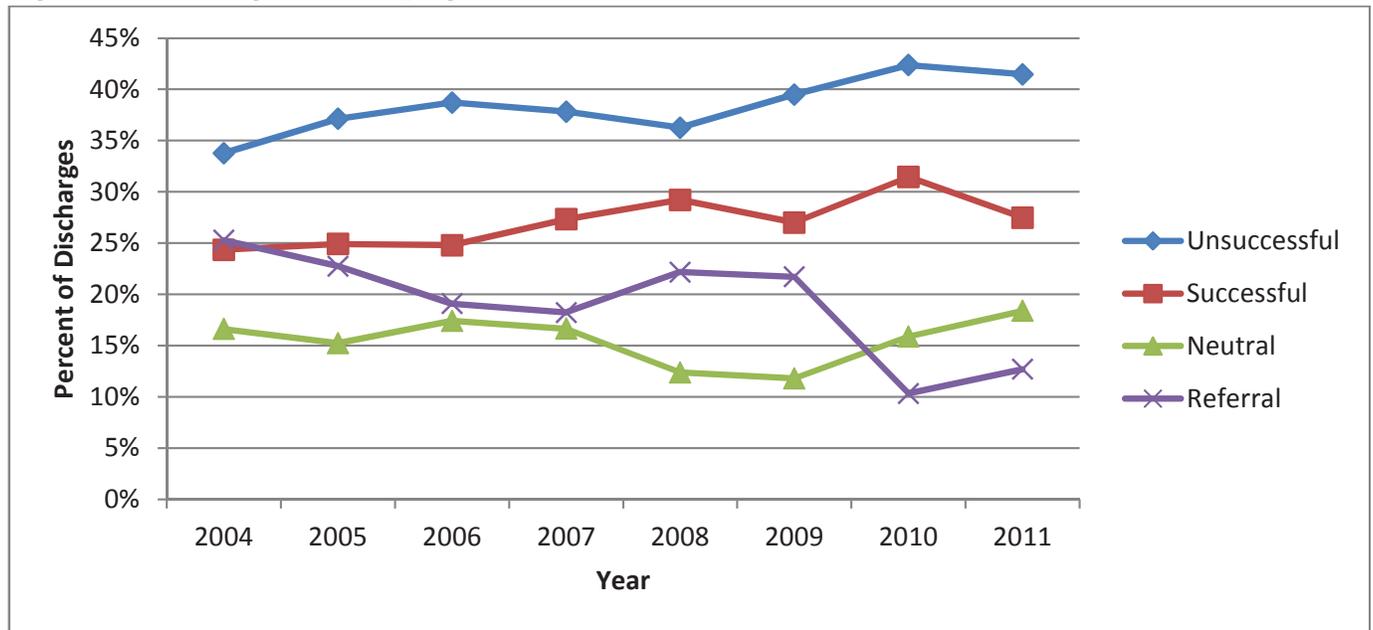
Source: OhioMHAS

Discharge Status for Pregnant Women

Pregnant women seeking substance abuse treatment may receive a variety of discharge codes (Figure 14). In 2011, most pregnant women (75 percent) were treated at the substance abuse facility instead of being referred out for addiction treatment services (25 percent). The most common discharge status over the eight year period is “unsuccessful” followed by “successful.” Both discharge statuses remain relatively stable over the eight-year period. Neutral discharges are less common than the other treatment-related discharges, and there is more year-to-year variation in their frequency. The percentage of pregnant women referred out to another treatment facility has decreased substantially over time from 25 percent in 2004 to 13 percent in 2011.



Figure 14: Discharge status of pregnant women, Ohio, 2004-2011

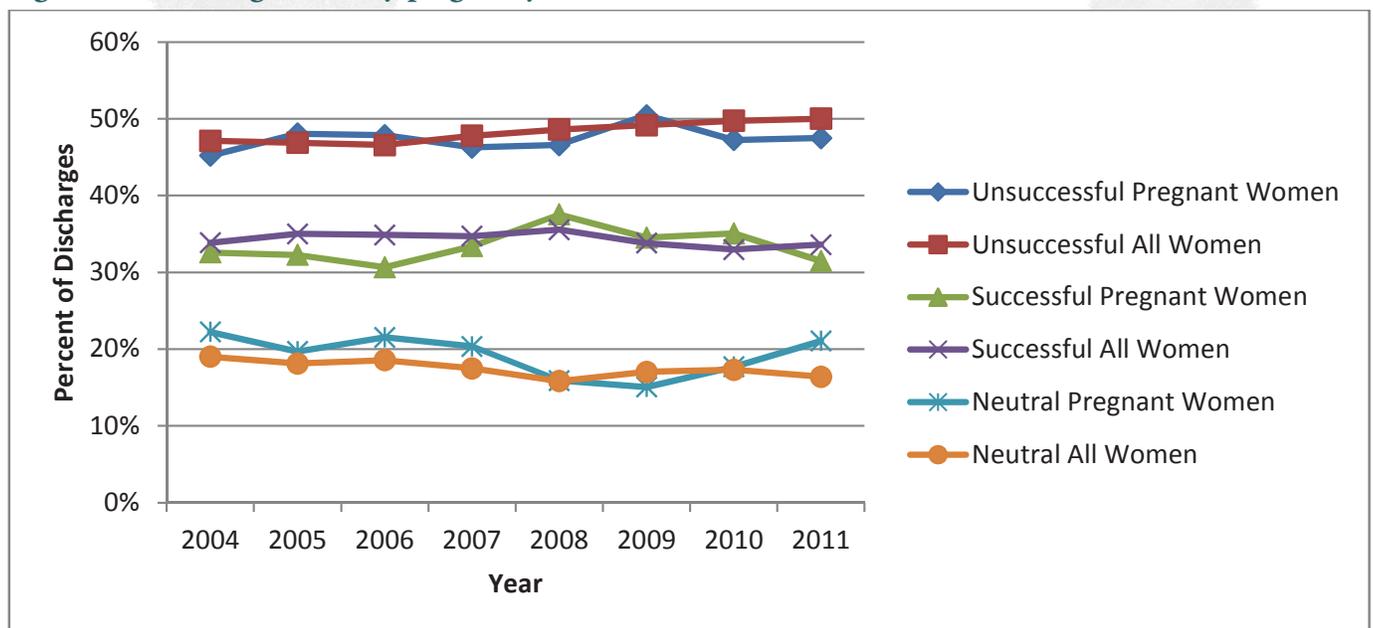


Source: OhioMHAS

Pregnant Women in Substance Abuse Treatment

Over 4,200 pregnant women were admitted to treatment between 2004 and 2011. While the percentage of pregnant women in treatment is relatively small compared to the percentage of all women in treatment (2.5 percent), it has been growing steadily over time. In fact, the number of pregnant women admitted for treatment grew 83 percent from 2004 to 2011 (Figure 11). While data are not available for every pregnant woman, most women (84 percent) gave birth while receiving treatment for their addiction.

Figure 15: Discharge status by pregnancy status*, Ohio, 2004-2011



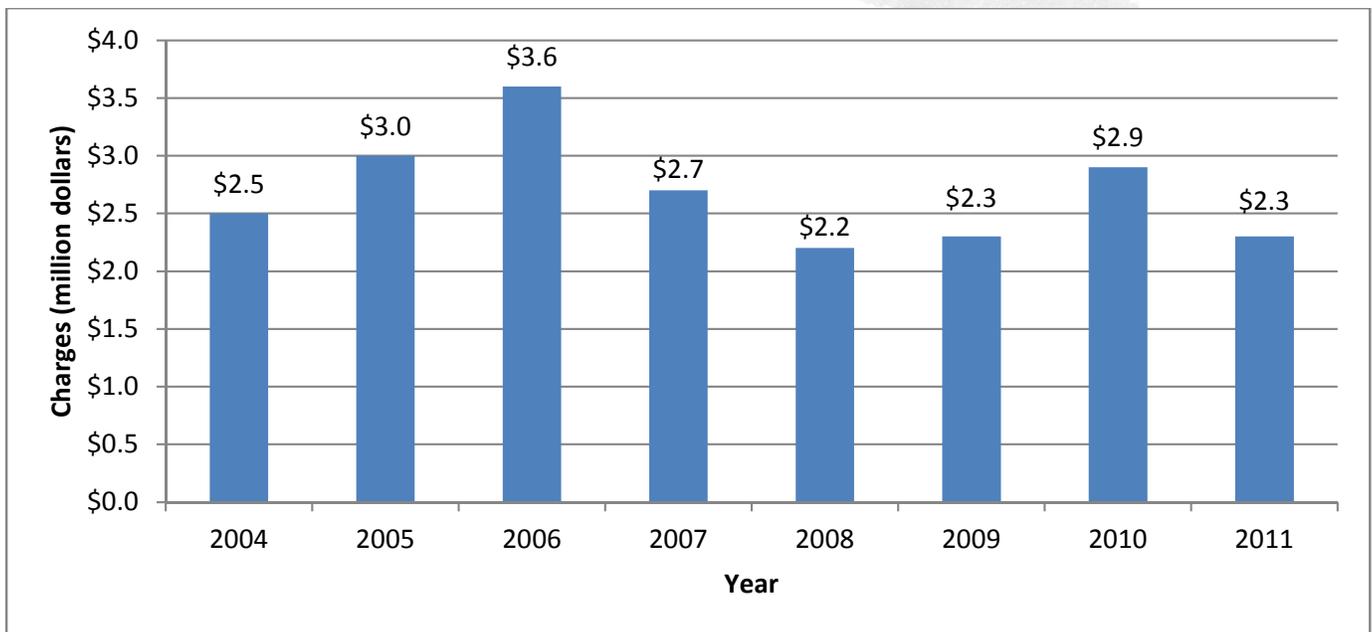
* Percentages add to 100 for pregnant women and also for all women

Source: OhioMHAS

Treatment Costs for Women from All Payer Sources

Between 2004 and 2011, services provided to pregnant women cost \$21.5 million, which represents a fraction (\$485 million; 4.4 percent) of the cost of services provided to all women. Services for pregnant women cost an average of \$2.7 million per year while services for all women cost an average of \$60.6 million per year during the eight year period. Charges associated with pregnant women peaked in 2006 at \$3.9 million and then decreased over time (Figure 16). After adjusting for inflation, services for pregnant women were \$0.2 million less in 2011 than in 2004. On average, services provided to pregnant women are more costly than services provided to all women (Figure 17). In 2004, the average costs associated with pregnant women and all women were very similar, but the gap between the two grew nearly every year, and 2011 charges for pregnant women are 1.7 times higher than for all women.

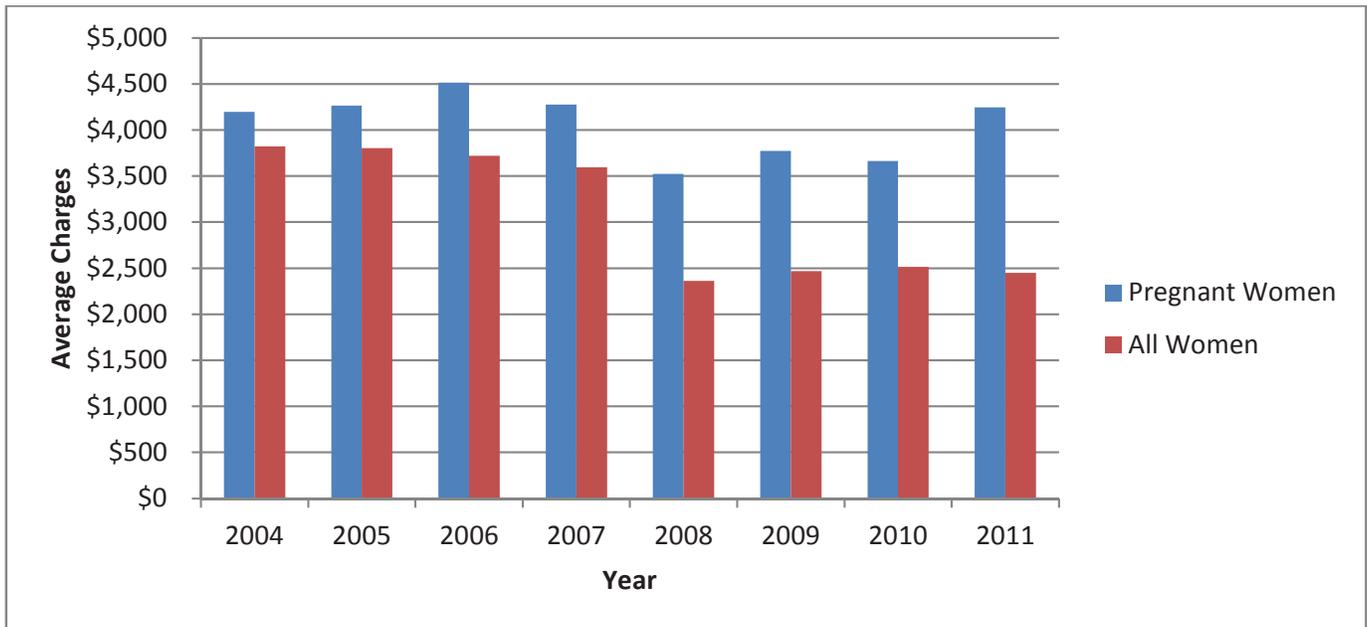
Figure 16: Service charges for pregnant women from all payer sources, Ohio, 2004-2011



Source: OhioMHAS



Figure 17: Average service charges for pregnant women compared to all women from all payer sources, Ohio, 2004-2011



Source: OhioMHAS

Limitations

This study has several important limitations. Results from this analysis likely underestimated the true incidence and healthcare burden of NAS. Not all hospitals have protocol in place for the diagnosis of neonatal abstinence syndrome. Hudak and Rosemarie (2012) explain, “In a recent survey of accredited US neonatology fellowship programs, only 55 percent had implemented a written NAS protocol, and only 69 percent used a published abstinence scoring system” (p. e548). Even if hospitals do have a protocol in place, then they may not test an infant’s meconium, the most reliable method of drug detection, because it may be several weeks before the results return, at which time the infant may begin to show signs of improvement.² Finally, NAS is likely to be underestimated because pregnant women are less likely to use drugs the further along they progress in pregnancy.⁸ In these cases, infants may be exposed to illicit substances, but these women may not test positive on a urine drug screen. Also, pregnant women may not warn their physicians because they do not anticipate that past exposure would have an impact on their children’s health and wellness. Finally, women are unlikely to tell medical professionals about their drug use because of the potential involvement of children’s services.

Discharges rather than individuals were the unit of observation. Discharges were used in place of individuals because identifiable data were not available. The use of discharges may result in duplication when multiple hospital admissions for the same patient occurred, and thereby overestimate hospitalization rates. The use of discharges may lead to smaller bias than the undercounting of NAS infants.

⁸Ebrahim, S. H. & Gfroerer, J. (2003). Pregnancy-related substance use in the United States during 1996-1998. *Obstetrics & Gynecology*, 101(2), 374-379.

Current Efforts

The Ohio Department of Mental Health and Addiction Services (OhioMHAS) is committed to addressing alcohol and drug abuse among pregnant women. The Substance Abuse and Mental Health Services Administration (SAMHSA) Block Grant requirements and OhioMHAS rules provide for priority of care for pregnant women entering publicly-funded treatment facilities. To help ensure priority treatment, Ohio has numerous grant-funded programs comprising a network of regional gender-specific services for women including 45 intensive outpatient programs, 26 outpatient programs and 34 residential programs with 803 beds exclusively for women. In state fiscal year 2011, 34 county Alcohol, Drug Addiction and Mental Health board areas received between \$20,000 and \$1.6 million in grants for these programs. Currently, OhioMHAS' grant-funded programs provide services to address the needs of the mother and the child. All grant-funded women's programs are required to provide or collaborate to obtain a developmental assessment of the child entering the program with their mothers and receive appropriate therapeutic interventions. By treating the mother and child, Ohio can benefit in terms of cost reductions that result from reducing reliance on foster care and other related public services.

Additionally, in partnership with the FASD steering committee, OhioMHAS also has a specialized statewide initiative for Fetal Alcohol Spectrum Disorders (FASD), which has established an integrated treatment approach across multiple systems. This initiative is currently encouraging OB/GYNs to utilize ICD-9-CM H codes for the alcohol/drug screen and alcohol/drug service to create an impact on the early identification of women's treatment needs and reduce infant mortality and lifelong disability needs for the alcohol exposed infants. Expansion of these efforts to address Neonatal Abstinence Syndrome (NAS) is underway, and we anticipate that the strategies that have proven cost effective for FASD will also demonstrate an impact on NAS.

Finally, the Kasich Administration is addressing the NAS epidemic through the Maternal Opiate Medical Support (M.O.M.S.) Project. The M.O.M.S. project is a \$4.2 million program supported by a \$2.1 million investment from the Health Transformation Innovation Fund, which is administered by the Office of Health Transformation. The Fund focuses on requests that advance Ohio's health system modernization strategies and create a return on investment for taxpayers while improving overall health system performance. The balance of the project will be funded from Medicaid dollars. The M.O.M.S. project builds upon and uses data resulting from the Ohio Children's Hospitals Neonatal Abstinence Syndrome research project funded by a Health Transformation Innovation Fund award of \$1 million in 2012.

Under the leadership of the Governor's Office of Health Transformation, OhioMHAS and the Ohio Departments of Health and Medicaid, the M.O.M.S. Project will support interventions and prenatal treatments that improve outcomes for 200 women and babies while reducing the cost of specialized care by shortening length of stay in Neo-Natal Intensive Care Units (NICU). In addition to treatment, the project will also support a limited amount of non-clinical services that are not reimbursable by Medicaid but that have been



found to greatly assist in recovery. Funds can be used for housing vouchers for women who need short-term transitional housing as well as transportation or brief babysitting for medical and treatment appointments. By engaging expecting mothers in a combination of counseling, Medication-Assisted Treatment (MAT) and case management, the three-year project is estimated to reduce infant hospital stays by 30 percent.

The Ohio Department of Health (ODH) is also committed to ensuring the health and wellness of Ohio's infants and pregnant women. ODH has numerous programs focused on prevention activities and the identification of problems through reviewing mortality statistics. Child and Family Health Services (CFHS) program is an organized community effort to improve the health status of women and children in Ohio. Currently the program has 59 sub-grantees which engage in at least one of the four major components: Community Health Assessment, Perinatal Health, Child Health and the Ohio Infant Mortality Reduction Initiative. The Ohio Collaborative to Prevent Infant Mortality is dedicated to the prevention of infant mortality and improvement of the health for women of childbearing age and infants by promoting effective health care for all women before and during their childbearing years; employing evidence-based approaches to the reduction of infant mortality, and educating Ohioans about having and raising healthy babies. Finally, the Reproductive Health and Wellness Program (RHWP) is an ODH program meant to improve the overall health and well-being of women, men, and children by improving health care access, promoting healthy lifestyles and encouraging the establishment of a reproductive life plan. RHWP currently has 32 sub-grantees serving 47 counties that seek to lower the risk of adverse perinatal and birth outcomes by assuring access to healthcare services to low-income, uninsured, under-insured and others, regardless of the individual's religion, race, national origin, handicapping condition, age, sex, number of pregnancies, marital status, culture, ethnicity or sexual orientation.

Some ODH programs regularly work on NAS- and FASD-specific prevention strategies. Healthy Steps bookmarks, developed by the Ohio Partners for Birth Defects Prevention group, have been widely distributed and educate women who may become pregnant to stop drinking alcohol, not use illegal drugs, and discuss any prescription medications with their health provider. The Focus on 5 online webinar for health professionals includes information on the impact that prenatal exposures from alcohol, illegal drugs, and prescription medications can have on the developing fetus and the increased risk for birth defects.

Conclusions/Recommendations

Report Findings:

- The hospitalization rate of NAS has increased rapidly in Ohio between 2004 and 2011. In 2011 alone, there were 1,649 admissions to inpatient and outpatient settings, which equates to nearly five admissions per day.
- Women diagnosed with drug abuse and dependence at time of delivery has increased rapidly. The rise in opioid abuse and dependence has largely driven this rise.
- Health outcomes for NAS infants (feeding difficulties, low birth weight, respiratory distress, and seizures/convulsions) are all significantly worse than for all Ohio infants.
- Treating NAS has placed a significant burden on Ohio's healthcare system with over \$70 million in hospital charges and nearly 19,000 days of hospital stay in 2011.

Report Findings (continued):

- Medicaid paid for a disproportionate number of NAS claims; however, NAS claims represented less than 1.5 percent of Medicaid claims in 2011.
- The number of pregnant women in treatment has risen. Women are disclosing that their primary drug of choice is changing from cocaine and marijuana to opioids.
- Most pregnant women in addiction treatment have similar discharge statuses to all women in treatment.

Comparisons with National Data⁷:

- Ohio's NAS hospitalization rate was higher than the national average of 34 per 10,000 live births in 2009.
- As in Ohio, hospitalization rates of NAS have increased rapidly throughout the U.S.
- The percentage of NAS hospitalizations with respiratory symptoms, feeding difficulties, and seizures were similar in Ohio and the U.S; however, the percentage with low birth weight was higher in Ohio than the national average.
- The percentage of NAS hospitalizations covered by Medicaid in Ohio was higher than the national average.
- The national averages for NAS hospital charges and LOS were lower than Ohio in recent years.

Implications for Healthcare and Substance Use Treatment:

- All newborns and at-risk breastfeeding children should be screened for NAS symptoms. Standardized instruments like the Neonatal Abstinence Scoring System⁹ should be used to evaluate these groups for NAS. Researchers should develop new instruments for other drug classes if none exist.
- All physicians and nurses who treat women should be educated about the signs of addiction and utilize brief screening tools for at-risk women. Women seeking prenatal care should be screened for substance use and counseled on the impact of such use on their babies. According to the Pregnancy Risk Assessment Monitoring System,¹⁰ 55 percent of mothers reported discussing alcohol, prescription medication, over-the-counter medication, and illegal drug use with the healthcare provider during a prenatal visit.
- Women of childbearing age being treated for substance abuse or dependence should be counseled on the impact of substance use on pregnancy. Women who screen positive for drug abuse and dependence should also be screened for Hepatitis C and HIV because of the high comorbidity.
- Prescribers should carefully consider whether opioid analgesics should be used on a long-term basis during pregnancy.
- Women who deliver drug-addicted babies should be provided with aftercare services, so the mothers can cope with their addiction and learn about the special needs of their infants.
- Alcohol and drug abuse prevention activities should be targeted to women of prime child-bearing age.
- Promising practices in the diagnosis and treatment of NAS should be identified and promoted throughout the state.

⁹Finnegan, L.P. (1990). Neonatal abstinence syndrome: Assessment and pharmacotherapy. In N. Nelson (Ed.), *Current therapy in neonatal-perinatal medicine* (2nd ed.). Ontario: BC Decker.

¹⁰Ohio Pregnancy Risk Assessment Monitoring System, Division of Family and Community Health Services, Ohio Department of Health. 2012.

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Table 2: Selected Results

Hospitalizations for Neonatal Abstinence Syndrome (Source: OHA)								
Year	2004	2005	2006	2007	2008	2009	2010	2011
Inpatient discharge*	199	271	305	369	477	715	953	1,182
<i>Medicaid Discharge</i>	152	207	222	288	369	583	811	990
<i>Non-Medicaid Discharge</i>	47	64	83	81	108	132	142	192
Average length of stay (days)	15.6	14.6	16.0	19.5	20.1	19.6	18.9	15.9
Total length of stay	3,103	3,966	4,892	7,200	9,580	14,006	17,965	18,776
Average charge**	\$31,514	\$32,951	\$39,561	\$59,033	\$59,580	\$72,158	\$66,960	\$59,574
Total charge**	\$6,271,265	\$8,929,844	\$12,066,087	\$20,982,542	\$28,419,546	\$51,592,956	\$63,813,186	\$70,415,888
Outpatient discharge*	X	X	X	X	X	X	170	467
Average charge**	X	X	X	X	X	X	\$360	\$371
Total charge**	X	X	X	X	X	X	\$63,325	\$240,033
In-state Births to Ohio Residents (Sources: OHA and OPHIW)								
Inpatient discharge	145,951	145,404	147,738	147,879	145,915	141,998	136,282	134,990
Average length of stay (days)	3.3	3.4	3.4	3.5	3.5	3.6	3.6	3.6
Average charge**	\$6,355	\$6,765	\$7,625	\$8,538	\$9,048	\$10,149	\$10,661	\$11,499

*May not reflect unique individuals; **Adjusted for inflation, 2011 US \$



Table 2 (continued)

Hospitalizations* Associated with Exposure to Substances through the Placenta or Breast Milk (Source: OHA)								
Year	2004	2005	2006	2007	2008	2009	2010	2011
Cocaine	386	490	459	407	332	234	155	208
Opioid	63	100	118	143	179	188	245	403
Hallucinogen	78	46	69	89	95	67	114	56
Drug Abuse and Dependence Diagnoses at Time of Delivery (Source: OHA)								
Marijuana	994	1,153	1,295	1,434	1,422	1,516	1,557	1,559
Opioid	171	246	302	380	453	601	777	1,011
Cocaine	576	681	718	690	544	405	337	359
Other	63	96	84	96	100	96	93	103
Unique Clients Pregnant at Admission for Addiction Treatment (Source: ODADAS)								
Marijuana	43.1%	42.9%	38.4%	38.2%	40.3%	41.1%	32.3%	25.6%
Cocaine	37.7%	34.6%	37.7%	36.8%	29.7%	19.4%	15.8%	10.5%
Opioid	14.7%	18.6%	17.6%	21.8%	25.1%	36.1%	48.9%	60.4%
Other	4.5%	3.9%	6.4%	3.2%	4.9%	3.4%	3.0%	3.6%
Discharge Status of Pregnant Women (Source: ODADAS)								
Unsuccessful	33.8%	37.1%	38.7%	37.8%	36.3%	39.5%	42.4%	41.5%
Successful	24.3%	24.9%	24.8%	27.3%	29.2%	27.0%	31.4%	27.5%
Neutral	16.6%	15.2%	17.4%	16.6%	12.4%	11.8%	15.9%	18.4%
Referral	25.3%	22.7%	19.1%	18.2%	22.2%	21.7%	10.3%	12.7%
Discharge Status by Pregnancy Status (Source: ODADAS)								
Unsuccessful Pregnant	45.2%	48.1%	47.8%	46.3%	46.6%	50.4%	47.2%	47.5%
Unsuccessful All	47.1%	46.9%	46.6%	47.8%	48.6%	49.2%	49.7%	50.0%
Successful Pregnant	32.6%	32.3%	30.6%	33.4%	37.5%	34.5%	35.1%	31.5%
Successful All	33.9%	35.0%	34.9%	34.7%	35.6%	33.8%	33.0%	33.6%
Neutral Pregnant	22.2%	19.7%	21.5%	20.3%	15.9%	15.1%	17.7%	21.0%
Neutral All	19.0%	18.1%	18.5%	17.5%	15.8%	17.0%	17.3%	16.4%
Average Service Charges** for Pregnant Women Compared to All Women (Source: ODADAS)								
Pregnant	\$4,197	\$4,264	\$4,515	\$4,278	\$3,521	\$3,771	\$3,663	\$4,247
All Women	\$3,820	\$3,805	\$3,718	\$3,596	\$2,363	\$2,467	\$2,513	\$2,449

*May not reflect unique individuals; **Adjusted for inflation, 2011 US \$



Glossary of Terms

Average length of stay – the average number of days in an inpatient setting.

Drug abuse and dependence diagnosis rate – the number of inpatient women diagnosed with drug abuse or dependence divided by the number of live births to Ohio residents, giving birth in Ohio. The rate is presented in units per 10,000 live births.

Drug class – a general category of drugs (e.g., crack cocaine, heroin) that can be used for licit or illicit purposes.

Inpatient setting – a person seen in the context of a hospital inpatient setting or skilled nursing facility.

In utero exposure – exposure to licit or illicit substances in the womb.

Medicaid discharge – a person who terminates medical services and has Medicaid as a payer source.

NAS hospitalization rate – the number of inpatient NAS hospitalizations divided by the number of live births to Ohio residents, giving birth in Ohio. The rate is presented in units per 10,000 live births.

Neutral discharge – a client who left treatment on their own against staff advice with satisfactory progress, was incarcerated due to an old warrant or charge before entering treatment, transferred to another facility for health reasons, moved away, needed other services not available at the treatment facility, or died.

Neonatal abstinence syndrome – a medical condition brought on by the termination of licit or illicit drugs. The condition is also known as neonatal withdrawal syndrome, and it is coded as drug withdrawal syndrome in newborns (779.5) in the ICD-9-CM.

Non-Medicaid discharge – a person who terminates medical services and pays for services with a private insurance or some other funding source.

Outpatient setting – a person seen in the context of a hospital outpatient setting or other setting including ambulatory surgery, observation, clinic, rehabilitation, psychiatry/psychology, recurring, lab, emergency, fast track emergency room or urgent care.

Primary drug of choice – the most preferred licit or illicit drug reported by the client.

Service charge – This definition differs by reporting entity. Service charges for OHA data reflect average or total charges billed on behalf of the hospital. Insurance-negotiated rates may or may not be included in these charges. These charges are an underestimate of total charges because they do not include physician bills that are separate from the hospital billing systems. Service charges for OhioMHAS data reflect paid claims. Services charges for OhioMHAS clients may be hourly, quarterly or per day rates. Rates may differ depending on the level of care or intensity of services provided.

Successful discharge – a client who left treatment and achieved all of his/her treatment goals.

Unsuccessful discharge – a client who left treatment on his/her own against staff advice without satisfactory progress, was removed from treatment due to nonparticipation, was removed from treatment due to violation of rules, or was incarcerated due to a new criminal offense while in treatment or recovery.