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## The Growing Crisis in Maine: Neonatal Abstinence Syndrome

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The Growing Crisis in Maine: Neonatal Abstinence Syndrome

by

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Honors Thesis

Science, Technology and Society Program

Colby College

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## **PREFACE**

Dear Reader,

My goal in writing this paper is to shock you. I learned about neonatal abstinence syndrome only weeks before choosing to research this epidemic for my thesis, and was moved by the tragic reality of neonatal abstinence syndrome in Maine. In short, I was shocked and want to relay that shock to you. Your understanding defines the importance of creating this thesis. This paper is for everyday citizens that have never heard of neonatal abstinence syndrome or may not know the full impacts it has on the Maine community. I want you to digest this information and spread it to your peers so that the fight against neonatal abstinence syndrome extends beyond the halls of government offices and medical examination rooms.

Sincerely,

Olivia

## INTRODUCTION

Neonatal Abstinence Syndrome (NAS) is a Maine epidemic. In addition to having medical repercussions, NAS is intrinsically linked to social, political and economic factors. NAS is a conglomeration of symptoms, short-term and long-term, that affect a child that has been exposed to opioids in utero. These factors that impact NAS are interdependent. This paper explores the social, political and economic landscape surrounding NAS in an effort to describe fully the syndrome's effect on both individuals and the community as a whole.

Characterizing NAS involves a complex series of positive and negative impacts. Socioeconomic status influences the risk of opioid addiction and thus, NAS. Societal views of drug abuse, particularly during pregnancy, can discourage opioid-addicted pregnant women from seeking medical attention. NAS treatment is heavily reliant on state and federal funds for a variety of services; addiction care for mothers, longer than normal hospital stays for newborns with NAS, and lifelong developmental treatment, and specialized medical services. As such, the recent spike in NAS is not only an individual struggle, but also a problem for state and federal budgets, threatening the availability of care. Additionally, legislation regarding NAS and associated topics, such as child-care, impact society's perspective of drug use during pregnancy.

In order to investigate the NAS epidemic in Maine, I explore the causes of opioid abuse in Maine, factors that increase the risk of opioid or other drug abuse, and possible root causes of opioid abuse among pregnant women. Throughout this paper, I often use drug abuse by the general population as a proxy for drug abuse by pregnant women in Maine. This substitution is due to the assumption that factors increasing the instance of

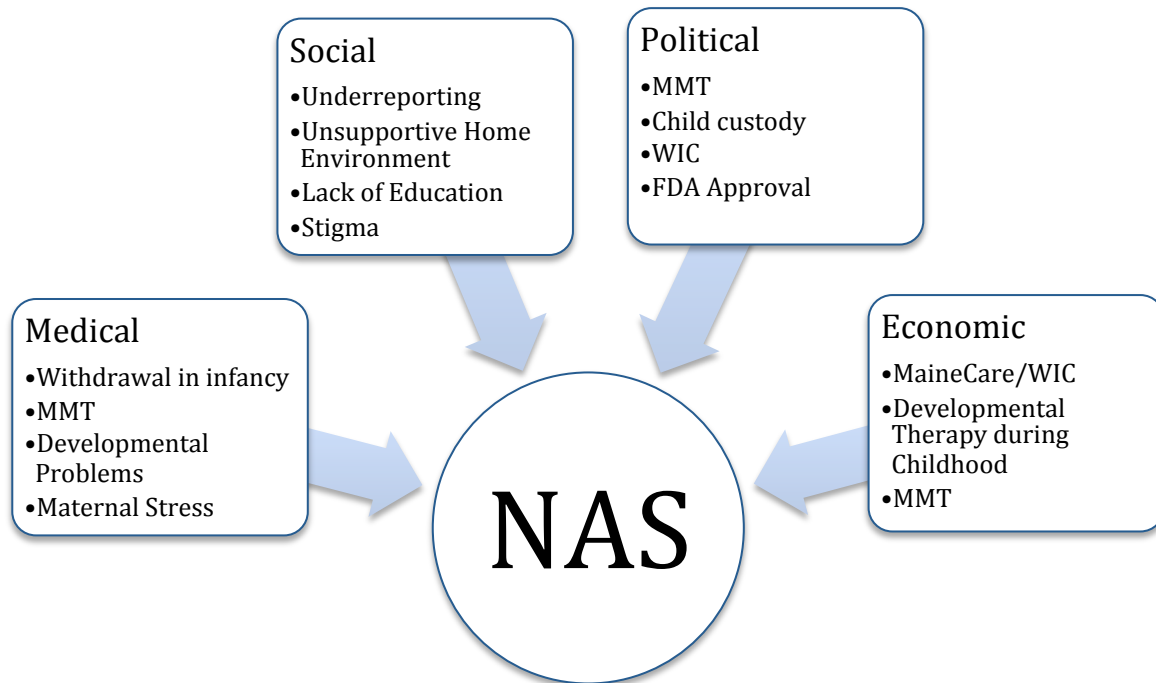
drug abuse statewide are equally impacting women of childbearing age or pregnant women. More specifically, I explore the impact of a number of factors, including addiction and psychological distress, socioeconomic factors, and systemic inefficiencies.

Through this investigation, I also discuss the types of programs and services established to aid opioid-abusing pregnant women and their families. Providing medical and educational services for opioid-abusing pregnant women can reduce harm for both the mother and her fetus. Additionally, I analyze obstacles to care, such as transportation difficulties, societal stigma and a lack of financial support. Though there are already such programs in place, these obstacles represent aspects of the program that can be improved.

NAS risk is much higher in some regions than others, pointing to the impact of the characteristics regions on addiction risk. The home environment of a child with NAS is likely to include many of the addiction risk factors that influenced his or her mother to turn to opioid abuse. This creates a generational cycle of addiction and NAS. Establishing programs to combat the possible adverse effects of the home environment, through building psychological resiliency, can break this cycle.

Chapter 1 provides a detailed description of the scientific and political components surrounding NAS, providing the reader with a substantial basis for understanding the rest of the paper. Chapter 2 involves an analysis of the sources of the recent upwards trend in NAS, touching upon both general and pregnant women-specific causes. Chapter 3 describes efforts to reduce the incidence of NAS, providing readers with hope for the future of NAS. My exploration concludes with an overview of Maine's current policies and programs aimed at reducing substance abuse and assisting families. With this information, I make suggestions as to how Maine can halt this trend.

## NAS AT A GLANCE:



This chart serves as a helpful tool in understanding all of the various factors that influence NAS. The most influential factors are included, meaning that there are many more factors not shown that will be discussed in this paper.

## **CHAPTER 1. DEFINING NAS AND ITS PROBLEMS**

The first step in understanding NAS is to learn the biological basis of NAS, which is the scientific explanation of how opioids impact the fetus and then the child later on in life. By first describing the impact of NAS on individuals and then on the community and population level, I can fully present the NAS epidemic in Maine. The biological basis of NAS is an important tool in understanding how addiction works and why opioid exposure in utero is so detrimental.

The recent upward trend in NAS cases is extremely steep; the number of instances of NAS has increased 380% in the past 6 years. This incredible statistic raises the urgency in revisiting the causes of drug abuse in Maine. Besides medical consequences, a variety of influences can increase NAS risk. Experiences associated with having a low socioeconomic status can cause pharmacological as well as psychological harm to children with or without NAS. The increase in NAS cases puts a burden on state and federal spending, incentivizing policies that reduce the availability of healthcare. Convolutional politics create obstacles to care for both pregnant women and their children. Understanding these determinants is key to finding a solution to reduce the number of cases of NAS in Maine.

### ***What is NAS?***

A scientific understanding of NAS is as crucial to understanding the epidemic as any other component of this public health problem. NAS is characterized by numerous symptoms associated with opioid withdrawal in neonates, or infants. Infants are at risk for NAS if born to opioid-dependent mothers. Though most cases are related to opioid



dependency, NAS symptoms can also be due to some sedative-hypnotics drugs, such as benzodiazepines.<sup>1</sup> However, the most severe cases of NAS are most often due to methadone and other opiate withdrawal.<sup>2</sup> Opioids consist of natural and synthetic substances that activate the  $\mu$ -opioid receptors in both the central nervous system (CNS) and the gastrointestinal tract.<sup>3</sup> These receptors are strongly agonist-dependent, meaning they rely on opioids or opioid-like substances for activation. Opioids and opiates are functionally the same pharmacologically; some medical professionals use the term opiates to refer specifically to non-synthetic opioids<sup>4</sup> whereas synthetic opioids include prescription medications such as methadone and buprenorphine. Once activated, they cause enhanced mood and activation of central dopamine pathways<sup>5</sup>, which leads to pain relieving effects.<sup>6</sup>

Opioids ingested by the mother can easily cross the placenta and come in contact with the fetus.<sup>7</sup> As a result, the opioids can trigger the  $\mu$ -opioid receptors, activating the central dopamine pathway, in the fetus's developing brain, creating the same effect in the fetus as in the mother. Frequent dopamine pathway activation causes the fetus to develop

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<sup>1</sup> Lauren Jansson, "Neonatal abstinence syndrome," UptoDate, ed. Joseph, A. Garcia-Prats and Melanie S. Kim, (2014), <http://www.uptodate.com/contents/neonatal-abstinence->

<sup>2</sup> J. Oei and K. Lui, "Management of the newborn infant affected by maternal opiates and other drugs of dependency," *Journal of Paediatrics and Child Health* 43, no. 1-2 (2007): 9–18, <http://www.ncbi.nlm.nih.gov/pubmed/17207049>.

<sup>3</sup> Jansson, Lauren, "Neonatal abstinence syndrome," 2014.

<sup>4</sup> "Opiates/Opioids," *The National Alliance of Advocates for Buprenorphine Treatment*, accessed February 10, 2015, [https://www.naabt.org/education/opiates\\_opioids.cfm](https://www.naabt.org/education/opiates_opioids.cfm)

<sup>5</sup> C. Contet, B. L. Kieffer and K. Befort, "Mu opioid receptor: a gateway to drug addiction," *Current Opinions on Neurobiology* 14, no. 3. (2004): 370-378, <http://www.ncbi.nlm.nih.gov/pubmed/15194118>.

<sup>6</sup> R. Al-Hasani and M. R. Bruchas, "Molecular mechanisms of opioid receptor-dependent signaling and behavior," *Anesthesiology* 115, no. 6 (2011): 1363-1381, doi: 10.1097/ALN.0b013e318238bba6.

<sup>7</sup> E. Gerdin, A. Rane and B. Lindberg, "Transplacental transfer of morphine in man," *Journal of Perinatal Medicine* 18, no. 4 (1990): 305–312, <http://www.ncbi.nlm.nih.gov/pubmed/2262875>.

a dependency on opioids.<sup>8</sup> Though all opioid exposure can lead to NAS symptoms, controlled, daily doses of methadone, a common opioid, are safer for the fetus than uncontrolled doses of opioids obtained outside a healthcare setting.<sup>9</sup> Daily methadone doses, called methadone maintenance treatment, are often encouraged as a treatment for both the mother and the fetus. Controlled methadone or other opioid treatments provide scheduled opioid exposure, reducing the possible onset of withdrawal symptoms that often occur due to the inconsistency of access to drugs outside controlled treatment.<sup>10</sup> This is beneficial to the fetus because it prevents withdrawal symptoms in the womb, which account for many of the developmental problems in NAS children.<sup>11</sup> Alternatively, if a mother began her pregnancy while addicted to opioids, attempting to quit opioid use is can be fatal to the fetus, because the fetus will suffer through the stress of the mother's withdrawal.<sup>12</sup> This supports the continuation of methadone maintenance treatment programs for pregnant mothers. Methadone maintenance treatment programs are aimed at controlling drug intake in the mother and are vital for the fetus's survival. Studies also indicate that longer duration of methadone maintenance treatment in pregnant mothers is

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<sup>8</sup> Ibid.

<sup>9</sup> Stephen Meister (developmental and behavioral pediatrician) in a discussion with the author, February 2015.

<sup>10</sup> Neil S. Seligman and Vincenzo Berghella, "Methadone maintenance therapy during pregnancy," *UptoDate*, ed. Susan M. Ramin and Andrew J. Saxon. Last updated October 4, 2014, [http://www.uptodate.com/contents/methadone-maintenance-therapy-during-pregnancy?source=see\\_link](http://www.uptodate.com/contents/methadone-maintenance-therapy-during-pregnancy?source=see_link)

<sup>11</sup> Ibid.

<sup>12</sup> Lauren M. Jansson, Janet Dipietro and Andrea Elko, "Fetal response to maternal methadone administration," *American Journal of Obstetrics & Gynecology* 193, (2005): 611-617, doi: 10.1080/14767050802452291.

associated with healthier infants at birth, supporting the use of methadone maintenance treatment programs for the entirety of the pregnancy.<sup>13</sup>

The initial concerns for opioid-exposed infants are complications due to premature birth. More specifically, these conditions are linked to respiratory distress syndrome, seizures, hypoglycemia, intracranial hemorrhage and hyperbilirubinemia, or a buildup of bilirubin, a by-product of red blood cell breakdown. Hyperbilirubinemia is particularly dangerous because it can cause irreversible neurological damage to the brain at high concentrations in an infant's body. Additional symptoms associated with withdrawal and often used in diagnoses are increased muscle tone, irritability<sup>14</sup> and seizures.<sup>15</sup> Most infants exposed to opioids in utero experience NAS symptoms to some degree and require prolonged hospital stays.<sup>16</sup> This causes repercussions for the cost of medical care, as will be discussed later.

In some cases, mothers do not report opioid use, causing some infants to be sent home after birth before they can be diagnosed with NAS. This is due to the lag between birth and the onset of NAS, which can be as long as 72 hours.<sup>17</sup> This lag occurs because residual opiates in the neonate's system can stave off withdrawal symptoms immediately after birth; the time lag between birth and withdrawal is directly related to the half-life of

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<sup>13</sup> Peles Einat, Shaul Schreiber, Miki Bloch, Shaul Dollberg, and Miriam Adelson, "Duration of methadone maintenance treatment during pregnancy and pregnancy outcome parameters in women with opiate addiction," *Journal of Addiction Medicine* 6, no. 1, (2012): 18-23, doi: 10.1097/ADM.0b013e318229bb25.

<sup>14</sup> S. W. Patrick et al. "Neonatal abstinence syndrome and associated health care expenditures: United States, 2000-2009." *Journal of the American Medical Association* 307, no. 18: 1934-1940. (2012), accessed February 20, 2015. <http://www.ncbi.nlm.nih.gov/pubmed/22546608>.

<sup>15</sup> Gerdin et al., "Transplacental transfer of morphine in man," 1990.

<sup>16</sup> L. M. Jansson, M. Velez, and C. Harrow, "The Opioid Exposed Newborn: Assessment and Pharmacologic Management," *Journal of Opioid Management* 5, no. 1, (2009): 47-55, <http://www.ncbi.nlm.nih.gov/pubmed/19344048>.

<sup>17</sup> Ibid.

the drug causing withdrawal.<sup>18</sup> Whereas heroin has a short half-life, thus causing withdrawal to begin approximately 24 hours after birth, other opiates such as methadone and, in particular, buprenorphine have much longer half-lives, extending the time lag between birth and the onset of NAS symptoms to 72 hours and potentially reducing developmental damage during the critically important first days of life.<sup>19</sup> Some pediatricians hypothesize that a substantial number of infant deaths in the first weeks of life are actually due to undiagnosed NAS.<sup>20</sup> This hypothesis supports the implementation of mandatory drug-testing programs aiming to reduce the instances of NAS death.

Infants at risk for NAS are evaluated at birth using the Finnegan Neonatal Abstinence Scoring System. Typically, infants with suspected opioid exposure in utero will be scored every few hours after birth using the Finnegan system to diagnose NAS.<sup>21</sup> The Finnegan system involves a 31-item check-list of symptoms, including excessive high-pitched cry, mild tremors, frequent yawning, sweating, nasal flaring and regurgitation.<sup>22</sup> A child's diagnosis of NAS is dependent on the number of symptoms that the nurses observe. If Finnegan system shows a significant number of NAS symptoms, the child receives methadone treatment, in addition to other medications or

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<sup>18</sup> Eric Strain, "Treatment of opioid use disorder," *UptoDate*, (2014), accessed February 12, 2015. [www.uptodate.com/contents/treatment-of-opioid-use-disorder?source](http://www.uptodate.com/contents/treatment-of-opioid-use-disorder?source).

<sup>19</sup> Oei and Lui, "Management of the newborn infant affected by maternal opiates and other drugs of dependency," 2007.

<sup>20</sup> Alane O'Connor (Family Nurse Practitioner specializing in addiction medicine) in discussion with the author, February 2015.

<sup>21</sup> Marie J. Hayes and Mark S. Brown, "Epidemic of Prescription Opiate Abuse and Neonatal Abstinence: American Medical Association, Editorial," *JAMA*, published online April 30, 2012, doi:10.1001/jama.2012.4526.

<sup>22</sup> MaineGeneral Medical Center, *MaineGeneral Medical Center Maternity and Pediatrics Neonatal Abstinence Scoring System* (Augusta, Maine).

therapies, to prevent withdrawal symptoms. Children are weaned off methadone treatment over a period of 2-6 weeks.<sup>23</sup>

NAS causes short-term impacts due to withdrawal symptoms, but also has consequences on various physiological functions as a result of withdrawal later in life. In a study following NAS children during the first three years of life, opiate-exposed infants showed stunted psychomotor development as compared to non-opiate-exposed infants.<sup>24</sup> Other symptoms include reduced mental development,<sup>25</sup> reduced social responsiveness, poor social engagement,<sup>26</sup> and a decreased ability to understand social cues.<sup>27</sup> Opiate-exposed infants exhibit significant motor developmental delays within the first year of life<sup>28</sup>, though these symptoms diminish with time.<sup>29</sup> Conclusive research on NAS outcomes is scarce; few studies continue to track the symptoms and development of NAS infants past the age of 2 or 3. The majority of long-term studies on the effects of NAS on children are currently in progress.

Though scientific explanations can seem daunting to non-science oriented readers, having a multidisciplinary understanding of NAS is necessary for people of authority and

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<sup>23</sup> MaineGeneral Medical Center, *MaineGeneral Medical Center Obstetrics/Nursery/Pediatrics Maternal Substance Abuse and Neonatal Drug Withdrawal. Item J. Weaning guidelines* (Augusta, Maine).

<sup>24</sup> D. S. Messinger et al. "The maternal lifestyle study: cognitive, motor, and behavioral outcomes of cocaine-exposed and opiate-exposed infants through three years of age," *Pediatrics* 113, no. 6, (2004): 1677–1685, <http://www.ncbi.nlm.nih.gov/pubmed/15173491>.

<sup>25</sup> R. W. Hunt, D. Tzioumi, E. Collin and J. E. Jeffery, "Adverse neurodevelopmental outcome of infants exposed to opiate in-utero," *Early Human Development* 84, no. 1 (2008): 29-35, <http://www.ncbi.nlm.nih.gov/pubmed/17728081>.

<sup>26</sup> V. Bernstein, R. J. Jeremy, S. L. Hans, and J. Marcus, "A longitudinal study of offspring born to methadone-maintained women. II Dyadic interaction and infant behavior at 4 months," *American Journal of Drug and Alcohol Abuse* 10, no. 2, (1984): 161–193, <http://www.ncbi.nlm.nih.gov/pubmed/6475886>.

<sup>27</sup> Debra McSweeney (physical therapist) in a discussion with the author, January 2015.

<sup>28</sup> Beth A. Logan, J. A. Paul and N. A. Heller, "Long-term developmental outcomes in infants of opiate addicted women: Effects on cognitive and motor development," Montreal, QB: Society for Research in Child Development; 2011.

<sup>29</sup> Debra McSweeney (physical therapist) in a discussion with the author, January 2015.

the general public. With this understanding, public health authorities can create more effective policies. In public health, the scientific and political elements of specific issues often do not cross paths enough; politicians and scientists work discretely on a problem that would benefit from a team effort. As a result, I think a juxtaposition of both the scientific and political landscapes of NAS is necessary for not only public health officials to make educated decisions, but also to increase medical literacy in the general public.

### ***Post-withdrawal: The NAS Child***

NAS is not a brief syndrome; it implicates lasting medical and social consequences. Though there is much about NAS that is still unclear, researchers can conclude that opioid exposure in utero can influence growth and development, particularly cognitive development. In addition to opioid exposure, children with NAS are likely to experience complications with their physical development and live in a difficult home environment. As a result, children with NAS require specialized and often frequent medical and developmental attention throughout their childhood.

The home environment represents a critical factor in the development of a child with NAS.<sup>30</sup> The home environment is defined as the social characteristics of the home, including familial emotional availability, stimulation, family cohesion, the nature of day-to-day activities and stability.<sup>31</sup> A positive home environment nurtures strong family

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<sup>30</sup> J. Kim and J. Krall, "Literature Review: Effects of Prenatal Substance Exposure on Infant and Early Childhood Outcomes," *National Abandoned Infants Assistance Resource Center, University of California at Berkeley*, (2006), Accessed March 2, 2015, [http://aia.berkeley.edu/media/pdf/prenatal\\_substance\\_exposure\\_review.pdf](http://aia.berkeley.edu/media/pdf/prenatal_substance_exposure_review.pdf).

<sup>31</sup> Brenda Jones Harden, "Safety and Stability for Foster Children: a Developmental Perspective" *Children, Families and Foster Care* 14, no. 1 (2004), accessed April 4, 2015, <http://www.princeton.edu/futureofchildren/publications/journals/article/index.xml?journalid=40&articleid=133&sectionid=873>.

relationships.<sup>32</sup> Additionally, researchers believe that other home factors, such as maternal malnutrition, can further impact child development in children with NAS.<sup>33</sup> Some of the developmental delays associated with NAS may be due to comorbid, or co-occurring, factors in the home environment, such as an unsupportive family or a lack of parent-child bonding.<sup>34</sup> Children with NAS are less likely to receive the specialized care they typically require in an unsupportive home environment, worsening developmental issues. The characteristics of the home environment are equally as impactful as methadone exposure in utero.

In addition to experiencing the consequences of maternal malnutrition in utero, children with NAS are also less likely to be breastfed. Research shows that breastfeeding decreases the severity of NAS symptoms.<sup>35</sup> However, children raised in unsupportive home environments are less likely to be breastfed, possibly causing further problems for development.<sup>36</sup>

Opioid-abusing women are at higher risk for having a low socioeconomic status, meaning they can benefit from government food aid programs. Women who participate in The Special Supplemental Nutrition Program for Women, Infants and Children (WIC), a government food aid program, are less likely to breastfeed their children than others not in the program. Researchers state that the relationship between WIC and breastfeeding rates is not caused by WIC funding, but is due to comorbid behaviors common to women who

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<sup>32</sup> Ibid.

<sup>33</sup> Hayes and Brown, "Epidemic of Prescription Opiate Abuse and Neonatal Abstinence," 2012.

<sup>34</sup> Ibid.

<sup>35</sup> Ibid.

<sup>36</sup> A. B. O'Connor, A. Collett, W. A. Alto, and L. M. O'Brien, "Breastfeeding Rates and the Relationship Between Breastfeeding and Neonatal Abstinence Syndrome in Women Maintained on Buprenorphine During Pregnancy," *Journal of Midwifery & Women's Health* 58 no. 1, (2013): 383-388, doi: 10.1111/jmwh.12009.

participate in WIC.<sup>37</sup> This is partly due to the difficulty of breastfeeding in certain work environments for working mothers; some workplaces do not allow for break times for mothers to pump breast milk or do not have refrigerators for storing pumped milk.<sup>38</sup> A mother's actions, which can be dictated by her low socioeconomic status, can further increase the developmental harm of NAS.

To further complicate the health situation of NAS newborns, approximately 40% of opiate abusers in Maine also abuse alcohol.<sup>39</sup> As such, Fetal Alcohol Syndrome (FAS) is commonly comorbid with NAS, which further compromises a child's health and future development. Whereas opioid exposure in utero cannot be reversed, these circumstances can potentially be mitigated through education and improved healthcare.

Beyond the physiological impacts of opioid exposure, NAS children are statistically more likely to experience negative factors during development. The effects of having a low socioeconomic status, paired with medical conditions, cause many children with NAS to be at a disadvantage in development. Due to this disadvantage, NAS children typically requires specialized care, such as behavioral therapy, to treat their impaired development.

The effects of socioeconomic status and associated factors exemplify the importance of the social, political and economic aspects of NAS. The long-term effects of NAS demonstrate to importance of medical care and social services post-hospitalization. These services can improve the lives of children that have suffered

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<sup>37</sup> V. Oliveira and E. Frazao, "The WIC Program: Background, Trends, and Economic Issues, 2009 Edition, Economic Research Report No. 73," *U.S. Department of Agriculture, Economic Research Service*, last updated April, 2009, <http://www.ers.usda.gov/media/159295/err73.pdf>.

<sup>38</sup> Ibid.

<sup>39</sup> Logan et al. "Neonatal Abstinence Syndrome: Treatment and Pediatric Outcomes," 2013.



through withdrawal in infancy. The future health of NAS children lies in the understanding of their condition in order to develop effective healthcare programs.

### ***Recent Emergence of NAS Nationally and in Maine:***

A recent article in the *New York Times* describes the story of a worried mother, Tonya, and her suffering infant son. During her pregnancy, the fetus had suffered from exposure to Oxycontin, so she began controlled methadone treatments to control both her cravings and prevent withdrawal symptoms in herself and her unborn son. Even with treatment, Tonya's son still showed symptoms of NAS. As a result, the hospital needed to treat her 3-day old baby with methadone, a treatment reserved for the most severe cases of NAS.<sup>40</sup> Tonya's story is not unique; NAS is more prevalent today than ever recorded.

Between 2007 and 2013, approximately 5% of all women hospitalized for substance abuse treatment were pregnant, the majority of whom were using opioids.<sup>41</sup> In the last decade, the instance of nonmedical use of prescription opioids, such as Oxycontin, among pregnant women has increased by 33%.<sup>42</sup> Shockingly, the majority of pregnant women in the U.S. admitted for treatment in 2012 were treated for synthetic opioid use (Figure 1).

Whereas the percentage of pregnant women treated for other substance use, such as alcohol

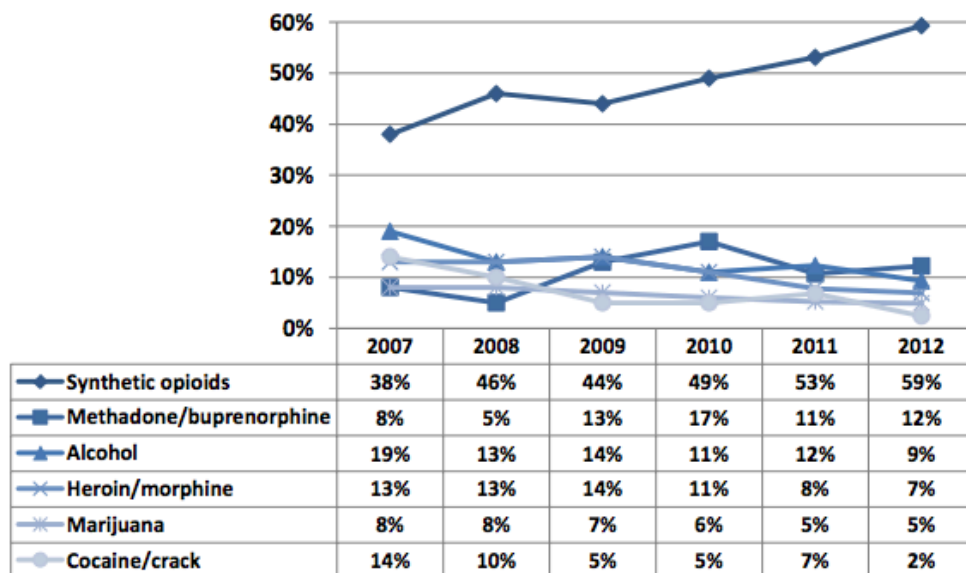
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<sup>40</sup> Abby Goodnough and Kate Zezima, "Newly Born, and Withdrawing from Painkillers," *The New York Times* (New York City, New York), April 9, 2011, Retrieved from [http://www.nytimes.com/2011/04/10/us/10babies.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2011/04/10/us/10babies.html?pagewanted=all&_r=0).

<sup>41</sup> Hornby Zeller Associates, Inc, "Substance Abuse Trends in Maine: State Epidemiological Profile," *Maine Department of Health and Human Services, Office of Substance Abuse and Mental Health Services*, April 2013, <http://www.maine.gov/dhhs/samhs/osa/pubs/data/2013/SEOWEpiProfile2013FINAL.pdf>.

<sup>42</sup> Anne Johnston, Todd W. Mandell, Marjorie Meyer, "Treatment of Opioid Dependence in Pregnancy: Vermont Guidelines," *University of Vermont College of Medicine*, November 2010, <http://www.uvm.edu/medicine/vchip/documents/ICONFULLTREATMENTGUIDELINESFINAL.pdf>.

and marijuana, has decreased in the past two years, the percentage of women treated for synthetic opioid use is the only category showing a steady increase. Dr. Mark Brown, the head of neonatology and pediatrics at Eastern Maine Medical Center, estimates that of the 800 babies he has seen with NAS, approximately 70-75% were exposed to buprenorphine or methadone, classified as synthetic opioids. Of the remaining infants, fewer than 10% were exposed to illicit narcotics and the rest were exposed to prescribed narcotics.<sup>43</sup> These estimations help characterize the opioid abuse problem in Maine.



**Fig. 1. Pregnant treatment hospital admissions, by percent, from 2007-2012.**

*Source: Substance Abuse Trends in Maine State Epidemiological Profile 2013.*

On a similar trend, between 2000 and 2009, the incidence of NAS increased from 1.20 to 3.39 per 1000 births.<sup>44</sup> These statistics expose the gravity of this epidemic. The surge of NAS in the United States is largely unreported, yet it is becoming a major public

<sup>43</sup> Mark Brown (Physician, Head of Neonatology and Pediatrics) in a discussion with the author, March 2015.

<sup>44</sup> S. M. Bagley, E. M. Wachman, E. Holland and S. B. Brogly, "Review of the assessment and management of neonatal abstinence syndrome," *Addiction Science & Clinical Practice* 9, no. 19, (2014), doi: 10.1186/1940-0640-9-19.

health issue, impacting the development of the next generation of Americans. Opioid exposure in utero is not a recent phenomenon; similar cases occurred frequently in the 1970's.<sup>45</sup> Even though the formal definition of NAS was established fairly recently in order to streamline research and communication, the trend in NAS is not a result of more efficient medical reporting. Though NAS is prevalent throughout the U.S., the current outbreaks of NAS are in Maine, Kentucky, Tennessee and Washington.<sup>46</sup>

On a local level, Maine is cited as one of America's leading states in NAS deliveries.<sup>47</sup> Tonya and her son, who suffers from NAS, live in Bangor, Maine. She describes her workplace, an industrial bakery, as having an opioid-promoting culture.<sup>48</sup> Nearly everyone took opioids in order to manage their workload. This type of atmosphere is precisely what encourages widespread opioid abuse among the Maine population. However, I intend to find a more detailed explanation as to why so many Mainers, particularly women, experience a pro-opioid culture, particularly by determining the socioeconomic characteristics of these women.

Since 2005, the instances of NAS in Maine have skyrocketed (Figure 2). Data documenting the number of NAS cases at MaineGeneral Medical Center in Augusta, Maine as well as the State of Maine overall indicate a steady increase. Though Maine State data for 2014 are not available, MaineGeneral Medical Center reports that it treated 133 cases of NAS in 2014, translating to a 600% increase in the instances of NAS at this hospital as compared to in 2005. Similarly, Eastern Maine Medical Center in Bangor

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<sup>45</sup> S. R. Kandall et al., "The narcotic –dependent mother: fetal and neonatal consequences," *Early Human Development* 1, no. 2, (1977): 159-169, <http://www.ncbi.nlm.nih.gov/pubmed/617308>.

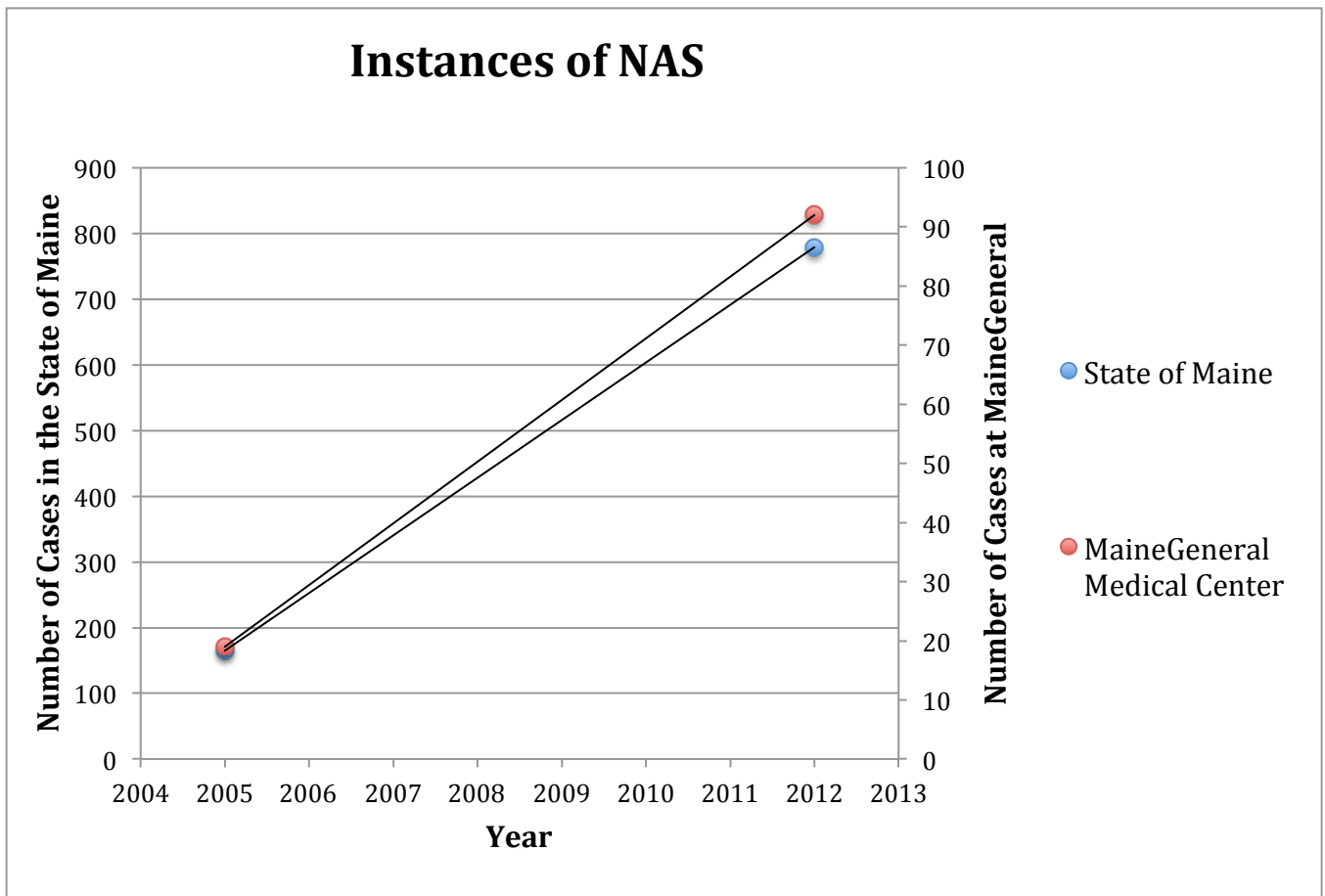
<sup>46</sup> Association of State and Territorial Health Officials, *Maine CDC Releases New Guidelines to Help Practitioners Care for Drug Affected Babies*, (2013), accessed February 12, 2015, <http://www.astho.org/Maternal-and-Child-Health/Maine-CDC-Snuggle-ME-Guidelines/>.

<sup>47</sup> Logan et al. "Neonatal Abstinence Syndrome: Treatment and Pediatric Outcomes," 2013.

<sup>48</sup> Goodnough and Zezima, "Newly Born, and Withdrawing from Painkillers," 2011.

treated 25 babies for NAS in 2002 and 180 babies in 2014 a 620% increase (Figure 3).<sup>49</sup>

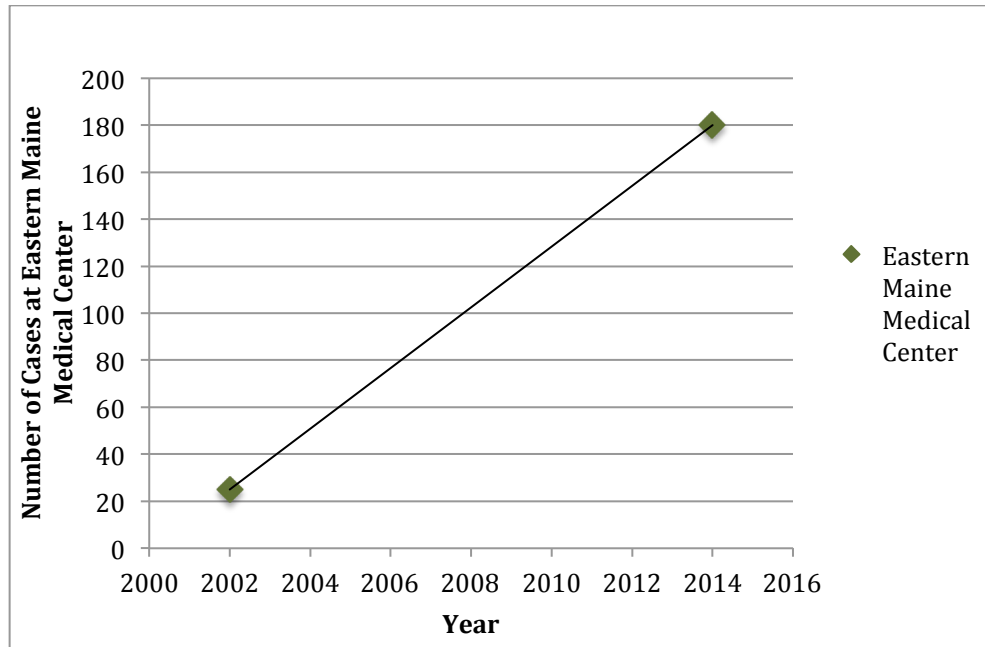
The rapid increase of NAS in the past two years helps characterize the syndrome as an epidemic in Maine.



**Fig. 2: Instances of NAS at MaineGeneral Medical Center and throughout the state of Maine from 2005 to 2012.** Note the trend alignment of in the data for both categories: both categories display an approximately 380% increase in NAS cases during this time period. *Source: Association of State and Territorial Health Officials. Maine*

<sup>49</sup> Mark Brown (Physician, Head of Neonatology and Pediatrics) in a discussion with the author, March 2015.

*CDC Releases New Guidelines to Help Practitioners Care for Drug Affected Babies 2013*  
*and author research.*



**Fig. 3. The instances of NAS at Eastern Maine Medical Center** *Source: Mark S. Brown, author research.*

Unfortunately, the statistics on drug-affected babies are highly susceptible to underreporting.<sup>50</sup> This is because mothers may not disclose their drug habits to their medical staff or, on a larger scale, hospitals only notify the Maine Department of Health and Human Services to report an NAS case if withdrawal treatment is needed. Importantly, a revision of Maine’s Child and Family Services and Child Protection Act in 2004 requiring birth attendants to notify child welfare authorities of children exposed to

<sup>50</sup> Kim and Krall, “Literature Review: Effects of Prenatal Substance Exposure on Infant and Early Childhood Outcomes. Berkeley, CA: National Abandoned Infants Assistance Resource Center, University of California at Berkeley,” 2006.

drugs or alcohol in utero helped boost reporting, thus contributing to the spike in cases.<sup>51</sup> However, this legislation cannot account for the entirety of the increase in NAS cases.

As a public health issue, NAS affects state and federal healthcare budgets. State programs, such as MaineCare, bear some burden of the increase in NAS cases due to the likelihood of opioid-abusing mothers to benefit from state healthcare funding. NAS treatment has advanced and improved in coordination with the upward trend in NAS cases, but it also requires a longer length of stay (LOS) in the hospital. Consequently, from 2000 to 2009, the average cost of hospitalization increased from \$39,400 to \$53,400. Hospitalization costs for NAS babies have increased due for a variety of reasons, but the escalation in hospital LOS is due to the increased time needed to wean the infants off of methadone.<sup>52</sup> As a result of this added cost, many programs are looking to decrease the LOS to reduce costs. LOS is a key value for public health officials; reducing the LOS number directly impacts health and lessens the need for financial support.<sup>53</sup> These statistics are glaring reminders of the huge impact that NAS has on Maine communities

### ***Problems with Medical Care Funding***

NAS is not an individual struggle. As a public health crisis, NAS requires the attention of authorities that can make large-scale political and financial decisions. These

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<sup>51</sup> Association of State and Territorial Health Officials, *Maine CDC Releases New Guidelines to Help Practitioners Care for Drug Affected Babies*, 2013.

<sup>52</sup> Bagley et al. "Review of the assessment and management of neonatal abstinence syndrome," 2014.

<sup>53</sup> "Socioeconomic Evaluations of Addictions Treatment," Center of Alcohol Studies, Rutgers University, (1992), accessed March 2, 2015, <http://www.namsdl.org/library/8622F711-19B9-E1C5-31693BB8E2CEDCAE/>.

decisions are complex. MaineCare budgets are tight, which clashes with the rising costs of medical treatment for NAS infants and the costs of methadone maintenance treatment and other resources for opioid abusing pregnant women. In critiquing how government handles the prevention of NAS, I believe it is more useful to critique the treatment of opioid abuse in pregnant mothers than the treatment of infants that already have NAS. Though medical treatment for opioid-abusing pregnant women is fully funded by MaineCare, a recent trend in reducing methadone maintenance treatment coverage for opioid addicts threatens this financial support.

Opioid abuse represents a massive financial burden for health care. In 2007, the health care costs related to prescription opioid abuse were \$25 billion, and has only risen since that year.<sup>54</sup> One study determined that the annual costs of health care for an opioid abuser were eight times higher than that of a non-abuser.<sup>55</sup> Additionally, opioid abusers visit the hospital 12 times more often than non-abusers and have higher risks for various forms of hepatitis and psychiatric illness.<sup>56</sup> The high cost of opioid abuse treatment has been targeted by state healthcare budget cuts in recent years and may act as a disincentive to seek treatment for people with limited or no health insurance.

Methadone maintenance treatment (MMT) is a common intervention strategy for at-risk pregnant mothers, but it is both expensive and controversial.<sup>57</sup> MMT programs are preventative care measures used nationwide, particularly in Maine. Developed in 1964 and approved in 1972 as a potential solution for New York City's heroin epidemic in the

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<sup>54</sup> H. Birnbaum et al., "Societal Costs of Prescription Opioid Abuse in the United States," *Pain Medicine* 12, no. 4, (2011): 657-667, doi: 10.1111/j.1526-4637.2011.01075.

<sup>55</sup> Alan White et al. "Direct Costs of Opioid Abuse in an Insured Population in the United States," *Journal of Managed Care Pharmacy* 11, no. 6. (2005): 469-479, <http://my.amcp.org/data/jmcp/3.pdf>

<sup>56</sup> Ibid.

<sup>57</sup> Hayes and Brown, "Epidemic of Prescription Opiate Abuse and Neonatal Abstinence," 2012.

post-World War II era, MMT programs have shown incredible successes in allowing addicts to return to normal life.<sup>58</sup> These treatment programs have a high success rate in reducing illicit opioid usage in addicts.<sup>59</sup> Currently, approximately 12-15% of opioid addicts in the United States benefit from MMT.<sup>60</sup>

MMT programs are harm-reduction programs developed to control cravings in opioid addicts. Since fluctuations in opioid exposure from illicit drug use are more dangerous to fetuses than controlled doses, such as those administered at MMT programs, MMT is the standard of care for opioid-abusing pregnant women.<sup>61</sup> Children born to mothers that did not take part in an MMT program are more likely to experience long-term health issues from NAS symptoms.<sup>62</sup>

The current state of MMT in Maine is problematic. Maine is one of the leading states for illicit drug dependence among people aged 18-25 (Figure 4).<sup>63</sup> Maine's struggle to provide adequate addiction treatment is exacerbated by the financial problems experienced by MMT programs. These programs, which are often for-profit, have had to lower their treatment costs drastically in recent years. As a result, many MMT programs are barely surviving.

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<sup>58</sup> H. Joseph, S. Stancliff and J. Langrod, "Methadone maintenance treatment (MMT): a review of historical and clinical issues," *Mt. Sinai Journal of Medicine* 67, no. 5, (2000): 347-364. <http://www.ncbi.nlm.nih.gov/pubmed/11064485>.

<sup>59</sup> J. D. Griffith, G. A. Rowan-Szal, R. R. Roark and D. D. Simpson, "Contingency management in outpatient methadone treatment: a meta-analysis," *Drug and Alcohol Dependence* 58, no.1-2, (2000): 55-65, <http://www.ncbi.nlm.nih.gov/pubmed/10669055>.

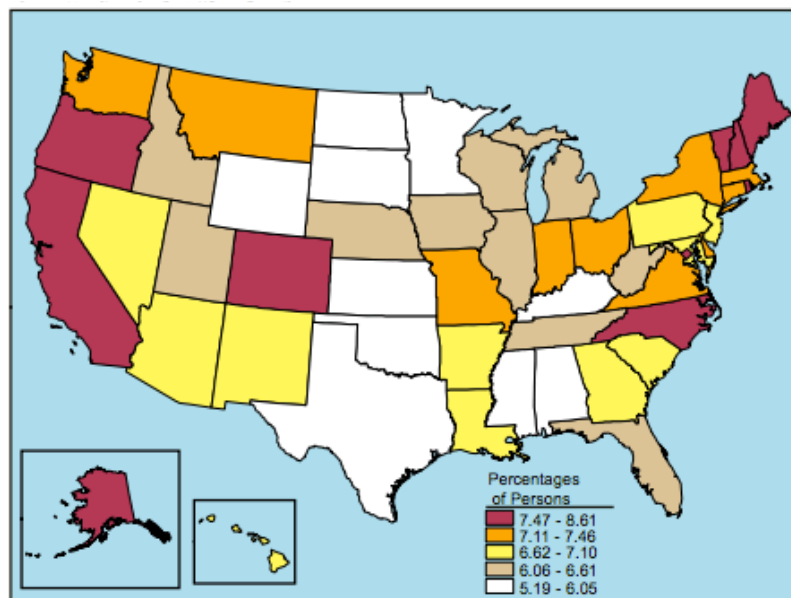
<sup>60</sup> Bryson, Ethan O, and Frost, Elizabeth A. M., *Perioperative Addiction: Clinical Management of the Addicted Patient*. New York: Springer-Verlag, 2011. <http://www.springer.com/us/book/9781461401698>

<sup>61</sup> Beth A. Logan, Mark S. Brown & Marie J. Hayes, "Neonatal Abstinence Syndrome: Treatment and Pediatric Outcomes," *Clinical Obstetrics and Gynecology* 56, no. 1. (2013): 186-192, Accessed February 17, 2015. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3589586/>.

<sup>62</sup> Gabriele Fischer, "Treatment of opioid dependence in pregnant women," *Addiction* 95, no. 9, (2002):1141-1144, doi: 10.1046/j.1360-0443.2000.95811411.

<sup>63</sup> Ibid.





**Fig. 4. Persons Needing but not Receiving Treatment for Illicit Drug Use in the Past Year among Adults Aged 18-25.** *Source: 2012-13 National Survey on Drug Use and Health (NSDUHS).*

Recent Maine legislation aims to cut MaineCare support of MMT programs. In 2012, Maine changed its policy to cap MaineCare funding of MMT at 24 months, whereas there was previously no time limit to funding.<sup>64</sup> In 2012, there were 4,760 Maine citizens benefiting from MMT programs, many of them also benefitting from MaineCare.<sup>65</sup> Additionally, Gov. LePage signed legislation that would reduce

<sup>64</sup> “24 Month Restriction on Suboxone/Subutex: Questions and Answers,” *MaineCare Services*, last updated November 2012. [http://www.maine.gov/dhhs/oms/pdfs\\_doc/news/Suboxone%20Informational%20Forum%20Questions%20and%20Answers\\_Final.pdf](http://www.maine.gov/dhhs/oms/pdfs_doc/news/Suboxone%20Informational%20Forum%20Questions%20and%20Answers_Final.pdf)

<sup>65</sup> Nok-Noi Ricker, “Two-year methadone treatment cap quietly passed in DHHS supplemental budget, starts Jan. 1,” *Bangor Daily News* (Bangor, ME), Dec. 27, 2012, retrieved from <http://bangordailynews.com/2012/12/27/news/state/two-year-methadone-treatment-cap-quietly-passed-in-dhhs-supplemental-budget-starts-jan-1/>.

MaineCare reimbursement for opioid treatment from \$72.00 per week to \$60.00 per week, contributing the financial struggles of MMT programs.<sup>66</sup> Pregnant women can receive MaineCare-funded treatment for longer than 24 months due to the fetal impact of untreated opioid abuse, but this policy change shows the reluctance of the Maine state government to fund MMT, potentially causing further problems in the future. More recently, in January of 2015, Gov. LePage proposed to stop MaineCare funding of MMT altogether, which would make Maine the first state to do so.<sup>67</sup>

In term of cost-benefit analysis, MMT programs are the better option when compared to the risks of untreated addiction during pregnancy. MMT during pregnancy can lessen the severity of NAS symptoms, reducing the need for treatment after birth. Alternatively, children exposed to street doses of opioids are at higher risk for developing more severe, long-term NAS symptoms, requiring specialized medical treatment and therapy throughout development.<sup>68</sup> Just as many opioid-abusing pregnant women benefit from MaineCare, their children are likely to as well, thus these specialized services would utilize MaineCare support.<sup>69</sup> The Edmund N. Ervin Pediatric Center in Waterville, Maine provides specialized health clinics for children with behavioral disabilities, some whose disabilities are due to NAS.<sup>70</sup> These clinics include the Pediatric Behavioral Medicine

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<sup>66</sup> “MaineCare Benefits Manual,” *Department of Health and Human Services, Office of MaineCare Services*, Oct. 31, 2012, accessed at <http://www.maine.gov/tools/whatsnew/attach.php?id=455440&an=1>.

<sup>67</sup> Joe Lawlor, “Thousands of patients lose if state cuts methadone benefit,” *Portland Press Herald*, (Portland, ME), January 23, 2015, retrieved from <http://www.pressherald.com/2015/01/23/thousands-of-patients-lose-if-state-cuts-methadone-benefit/>.

<sup>68</sup> Bernstein et al., “A longitudinal study of offspring born to methadone-maintained women,” 1984

<sup>69</sup> Hayes and Brown, “Epidemic of Prescription Opiate Abuse and Neonatal Abstinence,” 2012.

<sup>70</sup> Stephen Meister (developmental and behavioral pediatrician) in a discussion with the author, February 2015.

Clinic, which focuses on how emotional, medical or neurological problems impact societal functioning, the Pediatric Psychology and Social Work Services and the Developmental Evaluation Clinic.<sup>71</sup> These are primarily long-term programs, requiring regular payments and transportation to the Center for specialized services. In comparing the cost of MMT for the mother as opposed to specialized treatments for the duration of her child's childhood, cost-benefit analysis favors MMT programs.

### ***Confusion about Child Custody***

Legislation and stigma regarding child custody discourages opioid-dependent mothers from going to trial for the custody of their children. In Maine, health care providers are required to report cases to Child Protective Services, a sub-group of the Department of Health and Human Services (DHHS). Many mothers report that they did not report their drug usage to medical authorities for fear that their child would be taken away.<sup>72</sup>

Whereas popular thought among Maine communities follows that the state will take custody of any child born to a drug-abusing mother, this is actually not the case.<sup>73</sup>

Social workers aid families to try to keep child custody with the parents if the parents are deemed responsible; there are many actions a drug-abusing pregnant woman can take to keep her child. For instance, if a pregnant woman is admitted to the hospital for drug abuse but follows a MMT program successfully, meaning that all her urine toxicity screens are negative, and demonstrates the ability to raise her child competently,

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<sup>71</sup> "Specialized Services," *MaineGeneral Health, Edmund N. Ervin Pediatric Center*, accessed April 2, 2015, <https://www.maine-general.org/pages/Care-and-Services-A-Z/Children-s-Health/Edmund-N-Ervin-Pediatric-Center/Specialized-Services.aspx>.

<sup>72</sup> Alane O'Connor (Family Nurse Practitioner specializing in addiction medicine) in a discussion with the author, February 2015.

<sup>73</sup> Debra McSweeney (pediatric physical therapist) in a discussion with the author, January 2015.

then the social worker can make a case for her responsible behavior and give her custody of her child.<sup>74</sup> Obtaining child custody is possible for opioid-abusing women in certain situations.

However, the variability of this process makes it difficult for the general public to keep track of the legislation regarding child custody and drug abuse. Social workers and judges award child custody on a case-by-case basis.<sup>75</sup> Approximately 25% of substance-exposed children are handed over to foster care in Maine.<sup>76</sup> Regardless of this statistic, the general consensus is that mothers most often do not receive custody. This discrepancy in knowledge frightens women away from reporting drug abuse.

Moreover, Maine policy also allows the state to take custody of a child if past children were handed over to the state.<sup>77</sup> While this policy is intended to protect children from potentially dangerous households, it may also discourage positive lifestyle change. Unfortunately, rather than improving child-raising environments, parents that already have been deemed unworthy of children by the state are more likely to sign custody of their children to the state immediately as opposed to fighting for custody in trial.<sup>78</sup> Without the motivation to provide a better environment for children, substance-abusing parents are less likely to make constructive lifestyle changes. Thus, more children are put in foster care. Though foster care can be a more supportive environment for children in these situations, studies indicate that children in foster care have an increased risk for

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<sup>74</sup> Ibid.

<sup>75</sup> Alane O'Connor (Family Nurse Practitioner specializing in addiction medicine) in a discussion with the author, February 2015.

<sup>76</sup> Ibid.

<sup>77</sup> "Child and Family Services Practice Model," *Maine.gov*, accessed March 5 2015, <http://www.maine.gov/dhhs/ocfs/cw/policy/>.

<sup>78</sup> Alane O'Connor (Family Nurse Practitioner specializing in addiction medicine) in a discussion with the author, February 2015.

psychosocial and developmental problems.<sup>79</sup> Judgment on which environment (home or foster care) is better is an individualized process, but the lack of encouragement for change by state policies doesn't promote a better home environment.

The categorization of drug use during pregnancy as a crime stigmatizes opioid abuse in pregnant women and discourages drug use reporting. In 2003, a court in South Carolina convicted a woman of homicide due to cocaine usage during her pregnancy, claiming her drug usage caused the death of her fetus.<sup>80</sup> In 2010, a woman in Kentucky faced up to ten years in prison for endangering the life of her unborn baby due to cocaine use during her pregnancy.<sup>81</sup> Following this trend, Tennessee passed a law in 2014 labeling narcotic, or illicit drug, use during pregnancy an assault, resulting in jail.<sup>82</sup> In these situations, the court viewed drug abuse during pregnancy as a form of child abuse. In the U.S., there is currently no consensus on the position of a drug-abusing pregnant woman; her categorization as a criminal or a victim is entirely up to court ruling.<sup>83</sup> Though Tennessee is currently the only state that views narcotic use during pregnancy as a criminal act, there are 19 states that view narcotic use during pregnancy as child

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<sup>79</sup> D. Bruskas and D. H. Tessin, D, "Adverse childhood experiences and psychosocial well-being of women who were in foster care as children," *The Permanente Journal* 17, no. 3, (2013): 131-141, doi: 10.7812/TPP/12-121.

<sup>80</sup> Barry M. Lester, Andreozzi, Lynne and Appiah, Lindsey. "Substance use during pregnancy: time for policy to catch up with research," *Harm Reduction Journal* 1, no. 5, (2004), doi: 10.1186/1477-7517-1-5.

<sup>81</sup> Migdalia Saloum and Jonathan N. Epstein, "Drugs, Alcohol and Pregnant Women: Anesthetic Implications for the Mother," In *Perioperative Addiction: Clinical Management of the Addicted Patient*, ed. Ethan O. Bryson, New York: Springer-Verlag, 2011.  
<http://www.springer.com/us/book/9781461401698>.

<sup>82</sup> Gillian Mohny, "First Woman Charged on Controversial Law that Criminalizes Drug Use During Pregnancy," *ABC News*, July 13, 2014, retrieved from <http://abcnews.go.com/US/woman-charged-controversial-law-criminalizes-drug-pregnancy/story?id=24542754>.  
<http://abcnews.go.com/US/woman-charged-controversial-law-criminalizes-drug-pregnancy/story?id=24542754>

<sup>83</sup> Ibid.

abuse.<sup>84</sup> This view is problematic because it discourages pregnant women to seek treatment for their drug abuse.

Optimistically, there is considerable opposition to this problematic perspective. The 2014 Tennessee law criminalizing narcotic use during pregnancy was met with substantial pushback from the American Civil Liberties Union of Tennessee.<sup>85</sup> The American College of Obstetricians and Gynecologists officially disagrees with Tennessee's policy change and does not encourage states to take punitive actions against substance-abusing pregnant women.<sup>86</sup> This opposition is a positive change for reducing the stigma of substance-abusing pregnant women.

## **CHAPTER 2: EVALUATING THE NAS TREND**

As a reader exposed to the shocking facts about NAS, you may ask, “Why is this happening?” Though the cause of the recent trend in NAS is complex, discussing the numerous factors that contribute the trend can help tease out a clearer explanation. These factors include the prevalence of opioid addiction, impact of psychological illnesses on both the risk of opioid abuse and fetuses, the link between socioeconomic factors and high risk of drug abuse, and healthcare system inefficiencies. Addiction can be inherited or spurred by psychological distress, all within a social context with a lessened stigma for drug usage. Psychological distress and anxiety can impact the health of both the mother

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<sup>84</sup> “State Policies in Brief: Substance Abuse During Pregnancy,” *Guttmacher Institute*, April 1, 2015, retrieved from [http://www.guttmacher.org/statecenter/spibs/spib\\_SADP.pdf](http://www.guttmacher.org/statecenter/spibs/spib_SADP.pdf).

<sup>85</sup> Mohny, “First Woman Charged on Controversial Law that Criminalizes Drug Use During Pregnancy,” 2014.

<sup>86</sup> Saloum, and Epstein, “Drugs Alcohol and Pregnant Women: Anesthetic Implication for the Mother,” 2011.

and fetus, potentially causing NAS symptoms in the child. Finding a nuanced view of these factors helps to characterize what demographic should be targeted in amelioration programs.

NAS is often blamed for long-term impacts that may actually be due to other factors.<sup>87</sup> Importantly, some of these factors can be changed to reduce NAS or NAS-like symptoms. For example, women abusing opioids are statistically more likely to experience poverty than women not abusing opioids. Women in poverty are likely to be malnourished, and children born to malnourished pregnant women can experience developmental effects very similar to those seen as a result of NAS.<sup>88</sup> Malnourishment during pregnancy can theoretically be altered through better nutrition assistance. For this reason, in characterizing NAS, studying the impacts of addiction, psychology, socioeconomic factors and systemic inefficiencies is just as important as studying opioid abuse among pregnant women.

### ***Addiction and Psychological Factors***

#### **Addiction in Maine**

NAS is preceded by another disease: addiction. Drug usage does not become addiction until the addict is compelled to use drugs.<sup>89</sup> The Substance Abuse and Mental Health Services Administration recently determined Maine to have one of the highest

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<sup>87</sup> Marjorie Withers (licensed clinical professional counselor) in discussion with the author, April 2015.

<sup>88</sup> Hayes and Brown, "Epidemic of Prescription Opiate Abuse and Neonatal Abstinence," 2012.

<sup>89</sup> "The Neurobiology of Drug Addiction," *National Institute on Drug Abuse*, last updated January, 2007, accessed at <http://www.drugabuse.gov/publications/teaching-packets/neurobiology-drug-addiction/section-iii-action-heroin-morphine/10-addiction-vs-dependence>.

rates of prescription opiate abuse in the nation.<sup>90</sup> In 2013, the newest edition of the Diagnostic and Statistical Manual of Mental Disorders combined opioid abuse and opioid dependence under one title: opioid use disorder, which leads to addiction.<sup>91</sup> Thus, opioid abuse, dependence, and addiction are often discussed together. Causes of addiction include genetics, childhood experiences, social atmosphere and psychological instability.

The upwards trend in NAS aligns with a similar trend in opioid abuse in Maine overall.<sup>92</sup> As reported by the Treatment Episodes Data Set in 2007, the number of Americans admitted to substance abuse facilities quadrupled from 23,000 to 90,000 from 1999 to 2007.<sup>93</sup> The Center for Disease Control and Prevention found comparable statistics for that time frame.<sup>94</sup> This national trend is mirrored in Maine. In 2007-2008, Maine was cited as one of the top ten states in the country for instances of illicit drug use, including opioid use, among young adults between 18-25.<sup>95</sup> Though NAS specifically involves pregnant women, the syndrome is rooted in population-wide surges in opioid abuse.

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<sup>90</sup> Ibid.

<sup>91</sup> Eric Strain, "Opioid use disorder: Epidemiology, pharmacology, clinical manifestations, course, screening, assessment and diagnosis," *Uptodate*, ed: Andrew J. Saxon and Richard Hermann, Nov. 10 2014, accessed at <http://www.uptodate.com/contents/opioid-use-disorder-epidemiology-pharmacology-clinical-manifestations-course-screening-assessment-and-diagnosis>.

<sup>92</sup> Logan et al. "Neonatal Abstinence Syndrome: Treatment and Pediatric Outcomes," 2013

<sup>93</sup> Hornby Zeller Associates, Inc, "Substance Abuse Trends in Maine: State Epidemiological Profile," 2013.

<sup>94</sup> Birnbaum et al. "Societal Costs of Prescription Opioid Abuse in the United States," 2011.

<sup>95</sup> Office of National Drug Control Policy, "Maine Drug Control Update," (2010), accessed April 12, 2015. [https://www.whitehouse.gov/sites/default/files/docs/state\\_profile\\_-\\_maine.pdf](https://www.whitehouse.gov/sites/default/files/docs/state_profile_-_maine.pdf).



## **Causes of Addiction**

Opioid abuse, like many other types of substance abuse, has genetic ties; it can be inherited.<sup>96</sup> Studies have shown that abnormal dopamine receptor genes can impact a person's ability to complete detoxification or other addiction treatment programs.<sup>97</sup> Not only are some people genetically inclined to have a high-risk of addiction, but they will also have difficulty attempting to quit their drug habit. Addiction's inheritable properties may explain why it is so prevalent in certain communities.

Drug abuse and addiction are not stand-alone behaviors; they are often linked to psychological distress. Alane O'Connor, a Family Nurse Practitioner in Waterville who specializes in treating opioid abusing pregnant women, believes that her patients use drugs in order to reduce the psychological burden of trauma. A skilled medical professional with a highly specified patient group, O'Connor estimates that 50% of her patients have experienced sexual abuse, 60% may have experienced physical abuse, and nearly 100% have experienced verbal abuse.<sup>98</sup> These events are traumatic and cause psychological distress. In treating her patients, she comes to understand the rationale behind drug use and abuse, forming an emotional understanding and sympathy with her patients.<sup>99</sup> The connection between trauma and substance abuse exemplifies the connection between addiction and outside environmental factors.

Psychological trauma plays a considerable role in instigating opioid usage and sustained addiction. People often take up drug use in order to distract from deeper,

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<sup>96</sup> Bryson and Frost, "Perioperative Addiction: Clinical Management of the Addicted Patient," 2011.

<sup>97</sup> Oei and Lui, "Management of the newborn infant affected by maternal opiates and other drugs of dependency," 2007.

<sup>98</sup> Alane O'Connor (Family Nurse Practitioner specializing in addiction medicine) in discussion with the author, February 2015.

<sup>99</sup> Ibid.

psychological pains such as post-traumatic stress disorder or disorders related to physical or verbal abuse.<sup>100</sup> Additionally, studies have shown close correlations between drug dependence and domestic violence, child abuse, poverty, and single parenthood among women.<sup>101</sup> Drug addicted women have also reported higher instances of rape.<sup>102</sup> More specifically, there are also correlations between substance abuse during pregnancy and depression, stress, overt psychosis, or schizophrenia.<sup>103</sup> Many researchers believe that drug abuse risk is due to multiple risk factors. Thus, drug abuse is actually due to any combination of etiological factors as opposed to a specific few.<sup>104</sup> As a result, the number of risk factors is more conclusive than the actual risk factors themselves. This hypothesis makes it difficult to determine a single cause of addiction.<sup>105</sup>

As a result, drug-dependent women are also at high risk for co-occurring psychological disorders, such as depression.<sup>106</sup> Just as addiction is inheritable, a predisposition for certain mental illnesses is also inheritable. Traumatized women often use drugs as a coping mechanism to handle the psychological distress resulting from trauma.<sup>107</sup> Importantly, studies have shown a gendered difference to trauma response:

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<sup>100</sup> Ibid.

<sup>101</sup> Oei and Lui, "Management of the newborn infant affected by maternal opiates and other drugs of dependency," 2007.

<sup>102</sup> Stephanie S. Covington, "Women and addiction a trauma-informed approach," *Journal of Psychoactive Drugs Suppl. 5*, (2008): 377-385, accessed April 17, 2015 <http://www.ncbi.nlm.nih.gov/pubmed/19248395>.

<sup>103</sup> Oei and Lui, "Management of the newborn infant affected by maternal opiates and other drugs of dependency," 2007.

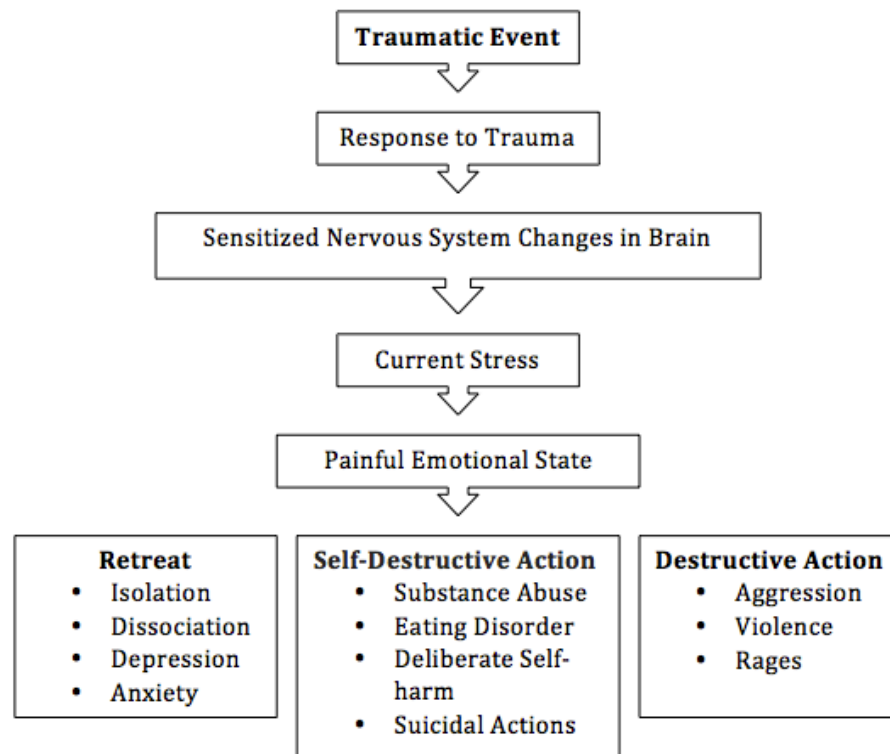
<sup>104</sup> Brenna H. Bry, Patricia McKeon, and Robert J. Pandina. "Extent of drug use as a function of number of risk factors." *Journal of Abnormal Psychology* 91, no. 4. (1982): 273-279, <http://psycnet.apa.org/journals/abn/91/4/273.pdf>.

<sup>105</sup> L. P Finnegan, T. Hagan, and K. A. Kaltenbach, "Scientific foundation of clinical practice: opiate use in pregnant women," *Journal of the New York Academy of Medicine* 67, no. 3, (1991): 223-239, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1807935/>.

<sup>106</sup> Oei and Lui, "Management of the newborn infant affected by maternal opiates and other drugs of dependency," 2007.

<sup>107</sup> Covington, "Women and addiction a trauma-informed approach," 2008.

whereas men tend to cope with trauma through destructive action, women tend to cope with trauma through self-destructive action (Figure 5).<sup>108</sup>



**Fig. 5. Chart outlining the relationship between trauma and substance abuse, among other factors. Source: Covington 2003.**

### **Addiction's Impact on the Child**

Parental addiction can impact a child beyond in utero opioid exposure. Mothers of children with NAS are likely to experience significant psychological disorders. As a result, children with NAS, many of whom require highly planned parenting, are likely to have mothers that have untreated psychological illness. This creates a difficult home

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<sup>108</sup> Ibid.

environment involving at least one opioid-abusing parent. The child of an opioid-abusing woman may develop an altered perception of drug abuse, which can increase drug abuse risk. A child raised by parents that regularly use drugs is much more likely to abuse drugs his or herself due to the lessened social stigma of drug use in that setting.<sup>109</sup>

Psychological distress during pregnancy can cause physiological harm to the fetus. Toxic stress, or, “prolonged activation of stress response systems in the absence of protective relationships,” in pregnant women can alter the brain chemistry of their fetuses.<sup>110</sup> Additionally, depression in pregnant women can increase cortisol levels, hormones associated with stress, and cause decreased fetal growth and increase the risk of premature birth<sup>111</sup>, effects commonly cited as NAS symptoms. As a result, maternal psychological distress adds to the web of interdependent factors that can impact the fetus.

As described, the basis for NAS is too complex to cite a single factor as the cause for the trend. As a result, studies struggle to claim that certain effects are due to only opioid exposure, particularly when poly-drug use, anxiety, and low socioeconomic status might cause similar effects. Many health professionals cite this complex relationship between factors as an example of why prevention programs need to be multifaceted.<sup>112</sup> Reducing opioid abuse in women is only a piece of the puzzle.

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<sup>109</sup> John A. Clausen, “Social and Psychological Factors in Narcotic Addiction,” *Law and Contemporary Problems* 22, no. 1. (1957): 34-51, [http://www.jstor.org/stable/1190431?seq=1#page\\_scan\\_tab\\_contents](http://www.jstor.org/stable/1190431?seq=1#page_scan_tab_contents).

<sup>110</sup> “The Effects of Toxic Stress During Pregnancy,” *National Scientific Council on the Developing Child, Science Briefs*, 2006, accessed April 2, 2015 at <http://www.developingchild.net>.

<sup>111</sup> “Maternal Depression Can Undermine the Development of Young Children: Working Paper No. 8,” *Center on the Developing Child at Harvard University*, 2009, accessed April 2, 2015 at <http://www.developingchild.harvard.edu>.

<sup>112</sup> Marjorie Withers (licensed clinical professional counselor) in discussion with the author, April 2015.

Ethical issues involved in performing clinical studies on pregnant women further obstructs NAS-related research.<sup>113</sup> As a result, much of the current information comes from animal trials or small clinical studies, which are less likely to produce robust data.<sup>114</sup> Additionally, scientific studies on this particular cohort are difficult to control; commonly co-occurring behaviors such as alcohol and nicotine use can impact the validity of the studies on NAS in pregnant women because the researchers attribute results to a specific variable.<sup>115</sup>

### **Stigma and Addiction**

In addition to handling the burden of addiction itself, society's addiction stigma adds to the struggle of fighting addiction. In part, drug abusers find it difficult to seek treatment for their addiction because of this stigma. Most often, literature that describes addicts depicts the addict as inherently bad, whereas all other characters in a non-addicted state are inherently good.<sup>116</sup> This polarizing view discourages addicts from pursuing treatment; consequently, some opioid addicts are not diagnosed and treated.

Addiction can change an addict's relationship with those closest to him or her. Addiction can be humiliating; addicts are seen as indulgent and reckless by their friends and family. The seemingly impulsive behavior of drug addicts negatively impacts people in their lives, such as family, friends and coworkers, due to society's unfavorable

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<sup>113</sup> A. Unger et al., "Randomized controlled trials in pregnancy: scientific and ethical aspects. Exposure to different opioid medications during pregnancy in an intra-individual comparison," *Addiction* 106, no. 7, 2011: 1355-1362, doi: 10.1111/j.1360-0443.2011.03440.

<sup>114</sup> W. F. Rayburn and M. P. Bogenschultz, "Pharmacotherapy for pregnant women with addictions," *American Journal of Obstetrics and Gynecology* 191, no. 6, (2004): 1885-1897, <http://www.ncbi.nlm.nih.gov/pubmed/15592269>.

<sup>115</sup> Unger et al., "Randomized controlled trials in pregnancy: scientific and ethical aspects. Exposure to different opioid medications during pregnancy in an intra-individual comparison," 2011.

<sup>116</sup> Helen Keane, "What's Wrong with Addiction," (New York, NYU Press, 2002), 8.

perspective.<sup>117</sup> This effect is most dramatic in lower socioeconomic classes because there are fewer resources to combat the negative impacts of drug abuse.<sup>118</sup> The stigmatized view of addicts impedes addiction recovery.

In a majority of studies, addiction is cited as a disease resulting from internal or external factors as opposed to the choice of the addict. Addiction fulfills all the necessary requirements of an illness,<sup>119</sup> which is beneficial it encourages addiction treatment to have similarities to other disease treatment, especially other diseases that are not affiliated with stigma.<sup>120</sup> Though societal views of addiction still contain remnants of contempt for addicts, the medical categorization of addiction as disease helps oppose this perspective.

Importantly, addiction can feel like a trap for pregnant women. In her many years of experience treating substance abusing women, Marjorie Withers emphasizes that not one mother ever wanted her addiction.<sup>121</sup> Addiction can become the enemy and is viewed as an obstacle for women in providing the best care for the child they love.<sup>122</sup> Women show this outlook when they are concerned about losing custody of their child. This mindset is important to recognize because it provides the mother's perspective, a viewpoint that is often ignored in discussions about NAS.

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<sup>117</sup> Jim Orford, "Power, powerlessness and addiction," (Cambridge: Cambridge University Press, 2013), 74.

<sup>118</sup> Ibid.

<sup>119</sup> Dan J. Stein et al. "What is a Mental/Psychiatric Disorder? From DSM-IV to DSM-V," *Psychological Medicine* 40, no. 11 (2010): 1759-1765, doi:[10.1017/S0033291709992261](https://doi.org/10.1017/S0033291709992261)

<sup>120</sup> Glenn D. Walters. "Drug seeking-behavior, Disease or Lifestyle?" *Professional Psychology* 23, no. 2. (1992): 139-145. <http://psycnet.apa.org/journals/pro/23/2/139.pdf>.

<sup>121</sup> Marjorie Withers (licensed clinical professional counselor) in discussion with the author, April 2015.

<sup>122</sup> Ibid.

### *Socioeconomic Factors*

Addiction is largely internal whereas external socioeconomic factors are largely out of the control of pregnant woman. Simply by having a certain living situation, a woman can have a higher risk of opioid abuse. In this situation, her environment is acting upon her.

NAS risk is not equally distributed throughout the population; there are certain socioeconomic factors that increase NAS risk. In this section, the socioeconomic factors discussed characterize the pregnant woman, and occasionally her extended family, as opposed to the child with NAS. Identifying these risks is crucial for creating effective, targeted prevention and education programs. In general, NAS risk is closely associated with lower socioeconomic status; newborns with NAS are more likely to reside in zip codes within the lowest income quartile.<sup>123</sup>

The home environment is a critical factor in drug use risk. Research suggests that drug use risk can increase as a result of low maternal education attainment<sup>124</sup>; insufficient prenatal care and low test scores.<sup>125</sup> Peer drug use,<sup>126</sup> age at first independent use of alcohol, perceived parental love, poverty and unemployment are also associated with a high risk of drug use.<sup>127</sup> Though each factor individually increases the risk of drug abuse,

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<sup>123</sup> Patrick et al. "Neonatal abstinence syndrome and associated health care expenditures: United States, 2000-2009," 2012.

<sup>124</sup> Chandice Y. Covington et al. "Birth to age 7 growth of children prenatally exposed to drugs: A prospective cohort study," *Neurotoxicology and Teratology* 24, no.4, (2002): 489-496, <http://www.sciencedirect.com/science/article/pii/S0892036202002337>.

<sup>125</sup> Ibid.

<sup>126</sup> Bry et al., "Extent of drug use as a function of number of risk factors." 1982.

<sup>127</sup> H. Spiller, D.J. Lorenz and E. J. Bailey, "Epidemiological Trends in Abuse and Misuse of Prescription Opioids," *Journal of Addictive Diseases* 28, no. 2 (2009): 130-136, doi: 10.1080/10550880902772431.

studies suggest that a more sophisticated explanation is that drug abuse is a function of numerous etiological factors, the basis of the “multiple risk factors” hypothesis.<sup>128</sup>

State and federal financial information can provide important inferences on how the population is utilizing funds and thus, the socioeconomic characteristics of those that benefit from financial support. NAS risk is already associated with low socioeconomic status through studies, and the prevalence of NAS children benefitting from state medical and nutrition aid further supports this relationship. A recent survey of the WIC program reports that beneficiaries of WIC often receive state funding from other programs, such as Medicaid, or MaineCare, and the (EBT) Food Stamps program.<sup>129</sup> This implicates that children with NAS are likely to benefit from both MaineCare and WIC.

The impact of socioeconomic factors is considerable, yet the link between socioeconomic factors and NAS is slightly different than that of psychological distress. Psychological distress is considered a direct cause of opioid usage. On the other hand, socioeconomic factors increase the risk of opioid use. Simply, the relationship between socioeconomic factors and opioid usage is a second-degree relationship, whereas that of psychological distress and opioid usage is a first-degree relationship.

### ***Systemic Inefficiencies***

Healthcare system inefficiencies are other problems outside of the control of substance-abusing women and can reduce the availability or efficiency of healthcare treatment. Maine has scarce resources to support medical care for opioid-abusing

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<sup>128</sup> Bry et al., “Extent of drug use as a function of number of risk factors,” 1982.

<sup>129</sup> Patrick et al. “Neonatal abstinence syndrome and associated health care expenditures: United States, 2000-2009,” 2012.



mothers. Alane O'Connor, introduced earlier, describes herself as the only family practice health provider that specifically treats opiate dependent women.<sup>130</sup> As such, she is able to see her patients for approximately 15 minutes each week. That is her limit. In addition to all duties, she must try her best to diagnose likely co-occurring psychological distress in an incredibly short period of time. Patients that require more intensive supervision are not able to benefit from her care.<sup>131</sup>

Maine's addiction medicine scarcity is not unique. The scarcity in medical care nationwide is potentially due to a shortage in medical health providers specializing in addiction medicine. In 2012, the American Board of Addiction Medicine Foundation (ABAM) declared America's medical school education as "sorely lacking" in addiction medicine.<sup>132</sup> Prior to the formation of ABAM, the Accreditation Council for Graduate Medical Education (ACGME) did not include a single addiction medicine residency program in all of the United States. The Board also predicted an increased demand for addiction medicine physicians because of the surge of newly insured Americans due to the Affordable Care Act.<sup>133</sup> Nevertheless, there is still a substantial lack in addiction medicine care, which negatively impacts health outcomes for drug addicts.

Addiction medicine scarcity is particularly impactful on MMT programs. The scarcity of MMT program availability, logistical difficulties associated with the required regularity of MMT, treatment of patients by MMT employees, and stigma experienced as a result of MMT programs impact the program's efficacy. Many medical staff believe

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<sup>130</sup> Alane O'Connor (Family Nurse Practitioner specializing in addiction medicine) in discussion with the author, February 2015.

<sup>131</sup> Ibid.

<sup>132</sup> Tartaglia, Dennis, "Nation's Tenth Addiction Medicine Residency Accredited," *Advancing the Practice of Addiction Medicine*, 2013, accessed March 23, 2015 at [http://www.asam.org/docs/fellow/abam-foundation\\_residency\\_accredited.pdf?Status=Master](http://www.asam.org/docs/fellow/abam-foundation_residency_accredited.pdf?Status=Master).

<sup>133</sup> Ibid.

that a lack of availability of MMT facilities creates an obstacle for women seeking drug abuse treatment in Maine.<sup>134135</sup> Not only are facilities limited to the number of patients they are legally allowed to treat, but medical practitioners licensed to prescribe Suboxone and Subutex, popular alternatives to methadone, also have legal limitations; they are only allowed to prescribe these medications to 100 patients.<sup>136</sup> Subsequently, MMT programs have very few openings for new patients. Often, there are waiting lists for treatment.

Logistical issues contribute heavily to the high dropout rate of patients in MMT programs.<sup>137</sup> Patients must travel to the treatment facilities nearly everyday in order to receive treatment, yet this commute may be long or costly for some patients. MMT patients report that the inconvenience of the facility's location, along with extensiveness of the hours of operation, drastically impacted whether they could receive their dose on a steady basis. Pregnant women, who might have other children, have to travel to these facilities with their children, yet MMT has side effects such as drowsiness. A typical situation would include a woman driving herself and her children to the MMT facility, receiving treatment, and then driving home in a drowsy, medicated state, putting herself, her children, and other drivers in danger. However, there are rarely other options. If patients are not able to receive daily treatment, they have no other option than to attempt to continue daily life, even while experiencing withdrawal symptoms. Even worse, the

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<sup>134</sup> Mark Brown (Physician, Head of Neonatology and Pediatrics) in a discussion with the author, March 2015.

<sup>135</sup> Stephen Meister (developmental and behavioral pediatrician) in a discussion with the author, February 2015.

<sup>136</sup> Tartaglia, Dennis, "Nation's Tenth Addiction Medicine Residency Accredited," 2013

<sup>137</sup> J. Harris and K. McElrath, "Methadone as Social Control: Institutionalized Stigma and the Prospect of Recovery," *Qualitative Health Research* 22, no. 6, (2012): 810-824, doi: [10.1177/1049732311432718](https://doi.org/10.1177/1049732311432718).

inability to receive MMT treatment incentivizes the use of street drugs, which increases the risk of overdose and blood-borne disease via needle use.<sup>138</sup>

The treatment of MMT beneficiaries at MMT facilities also contributes to the low retention rate, and effectiveness, of many MMT programs. MMT patients clearly articulate the positive impact of supporting, non-judgmental staff.<sup>139</sup> The suspicion of comorbid alcohol and illicit drug use (cocaine, benzodiazepines) during opioid abuse treatment can cause patients to receive a lower dose of methadone.<sup>140</sup> Since MMT staff cannot quantify the amount of other illicit drugs in a patient's system, lowering methadone dose can be subject to estimation. An insufficient dose of methadone can reduce the efficacy of a treatment program and potentially lead to additional use of street acquired opiates in order to satisfy opioid cravings.

In addition to the stigma associated with drug abuse by the general population, MMT programs can also create additional stigma for the patients. MMT programs are often cited as ineffective due to the opportunity for beneficiaries to experience stigma as a result of treatment.<sup>141</sup> One investigation in Canada found that MMT programs can actually make the patient's condition more visible to the community, inviting stigmatization.<sup>142</sup> MMT programs, which dispense methadone in a supervised

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<sup>138</sup> S. Anstice, C. J. Strike and B. Brands, "Supervised Methadone Consumption: Client Issues and Stigma," *Substance Use & Misuse* 44, no. 6 (2009): 794-808, doi: 10.1080/10826080802483936.

<sup>139</sup> C. Matheson, "Privacy and stigma in the pharmacy: illicit drug users' perspectives and implications for pharmacy practice," *Pharmaceutical Journal* 260, no. 6992, (1998): 639-641, doi:10.1186/1477-7517-2-25.

<sup>140</sup> J. D. Griffith, G. A. Rowan-Szal, R. R. Roark and D. D. Simpson, "Contingency management in outpatient methadone treatment: a meta-analysis," *Drug and Alcohol Dependence* 58, no.1-2, (2000): 55-65, <http://www.ncbi.nlm.nih.gov/pubmed/10669055>.

<sup>141</sup> Anstice et al., "Supervised Methadone Consumption: Client Issues and Stigma," 2009.

<sup>142</sup> Ibid.

environment, can make the patient feel uncomfortable or embarrassed about treatment.<sup>143</sup>

MMT beneficiaries are still associated with drug abuse, which has conventionally been linked to criminal behavior and other negative social contexts.<sup>144</sup> This common belief is associated with a mistrust of drug abusers and a suspicion that they will attempt to manipulate their methadone maintenance treatment.<sup>145</sup> This adds to the difficulty of treatment and psychological problems already associated with opioid addiction.

The influences of addiction and NAS risk help clarify the reason for Maine's shocking trend in NAS. The tight link between psychological distress and addiction implicates that Maine has a high rate of psychological illness. As O'Connor mentioned, this can be due to various kinds of abuse. These links, in conjunction with the lack of addiction treatment and psychological care in Maine, may explain the surge of NAS. Adding on to this issue, addiction stigma discourages opioid-addicted women to seek treatment, even when treatment is available. Since opioid-addicted women are more likely to have a low socioeconomic status, seeking medical care may involve too many barriers, such as transportation or time off of work. Even when MMT programs have available spaces, additional stigma at these treatment centers can further discourage women from staying in the program. These major complications heavily contribute to the high rate of NAS in Maine.

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<sup>143</sup> Matheson, "Privacy and stigma in the pharmacy: illicit drug users' perspectives and implications for pharmacy practice," 1998

<sup>144</sup> Anstice et al. "Supervised Methadone Consumption: Client Issues and Stigma," 2009.

<sup>145</sup> D. C. Des Jarlais, D. Paone, S. R. Friedman, N. Peyser, and R. G. Newman, "Regulating Controversial Programs for Unpopular People: Methadone Maintenance and Syringe Exchange Programs," *American Journal of Public Health* 85, (1995): 1577-1584, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1615684/>.

### CHAPTER 3: PLANS FOR THE FUTURE

The battle against the NAS epidemic in Maine is not hopeless. A recent surge in new information and data characterizing NAS and related problems, aligned with the rise in NAS cases, exposes the specific issues leading to NAS, which can be targeted and ameliorated. Efforts to reduce individual and community harm due to NAS fall into two categories: (1) ones that aim to decrease overall drug abuse in Maine and (2) ones that aim to provide educational and medical resources for opioid abusing pregnant women, their families, and their children. More specifically, the second category of prevention program entails aiding drug-addicted women with addiction treatment, neonatal health, post-natal health and all other medical services after a child with NAS is born. These include home visiting programs, state and federally funded nutrition aid, and education and therapy-based community centers. These programs have been deemed optimistic by many health officials and can feasibly lead to a healthier newborn population in Maine.<sup>146</sup>

Programs aimed at decreasing drug abuse in Maine include efforts to prevent the initial abuse of drugs, regardless of whether the potential abuser is a woman or not. These efforts are mainly focused around increasing resiliency during childhood: studies on Adverse Childhood Experiences (ACEs) are crucial to this effort. Through these two approaches, the future of NAS has the potential to involve a healthier Maine community with fewer children suffering from opioid withdrawal after birth.

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<sup>146</sup> Marjorie Withers (licensed clinical professional counselor) in discussion with the author, April 2015.

### ***Medical and Societal Response to NAS***

There are viable solutions that can reduce the instance of drug abuse in Maine, improve drug abuse treatment for mothers, and enhance developmental treatment for children. These solutions function as a secondary prevention method; after the fetus has already been exposed to opioids, these are steps that the mother can take to reduce harm in the future. In order for these solutions to be effective, they need to address drug use underreporting, educational and financial resource availability, societal stigma and new research.

Women often neglect to report their drug usage, making it difficult for medical staff to determine if babies have been exposed to opiates in utero.<sup>147</sup> On an individual level, medical staff cannot fully treat an infant if they are completely unaware of his or her opioid exposure. According to Alane O'Connor, many babies die at home within ten days of birth due to complications from withdrawal that were never reported in the hospital, as NAS symptoms can present 24-72 hours after birth.<sup>148</sup> Thus, otherwise healthy babies are sent home before their symptoms arise, and suffer at home without professional medical treatment for withdrawal. O'Connor believes that establishing a mandatory drug test for all admitted pregnant women would easily amend this problem, though she acknowledges the difficulty of instituting such a rule. Mandatory drug tests would breach the privacy of patients and may cause problems with patient-family relationships. However, the benefit of knowing this key information is debatably as

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<sup>147</sup> Kim and Krall, "Literature Review: Effects of Prenatal Substance Exposure on Infant and Early Childhood Outcomes," 2006.

<sup>148</sup> Jansson et al., "The Opioid Exposed Newborn: Assessment and Pharmacologic Management," 2009.

important, particularly when considering the unknown number of infant deaths due to a lack of an NAS diagnosis.

Testing infants for drug exposure is noninvasive, yet these tests are unreliable. Though testing infants' urine or hair for opioid exposure could be an alternative to testing their mothers, these tests are not entirely accurate.<sup>149</sup> Thus, false negative results could lead to the same issue associated with a lack of opioid-use reporting in mothers. Additionally, drug testing can be problematic because it can introduce bias and stereotype into healthcare. Often racial or ethnic minorities or women of a low socioeconomic class are targeted for testing.<sup>150</sup> Stereotyping can contribute to the stigma and discomfort felt by drug-addicted women when seeking help. Making drug tests mandatory for all pregnant women would reduce the opportunity for stereotyping and stigma in the healthcare setting. This balance between patient privacy and effective healthcare is a contentious topic in reforming healthcare practices that impact NAS.

Providing medical services and education-based community centers are effective methods of providing much needed resources for substance abusing women and their children. These programs aim to reduce the harm of opioid exposure to the mother and child. After extended hospitalization, infants with NAS often do poorly at home.<sup>151</sup> This demonstrates the need for education opportunities and outpatient services for children with NAS and their families following hospitalization.

One such treatment center that provides medical and psychological care to substance-dependent pregnant women is the Family Center in Philadelphia,

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<sup>149</sup> M. Behnke and V. C. Smith, "Prenatal Substance Abuse: Short and Long-term Effects on the Exposed Fetus, Technical Report: American Academy of Pediatrics," *Pediatrics* 131, (2013): 1009–1024, <http://pediatrics.aappublications.org/content/131/3/e1009.full>.

<sup>150</sup> Ibid.

<sup>151</sup> Debra McSweeney (physical therapist) in a discussion with the author, January 2015.

Pennsylvania. The Family Center, created in 1988, is a voluntary outpatient center that provides MMT and other substance abuse services, accommodating low-income women and non-English speakers. Importantly, due to the length of time that the Family Center has been providing services, researchers have had the chance to study the efficacy of the Family Center's program. Finnegan, Hagan and Kaltenbach describe the unique care model adopted by the Family Center: a multi-factorial approach.<sup>152</sup> The clinic's care model is two-pronged: treatment and education. The Center utilized outreach approaches in order to facilitate a more personal relationship with patients and reduce the need for transportation, a common obstacle to care.

The Family Center strongly believes that if housing, clothing and food issues are still problematic for pregnant woman, they are unlikely to respond to drug treatment, thus supporting their multi-factorial treatment approach.<sup>153</sup> Many of the women treated at the Family Center were of a low socioeconomic status and likely benefitted from state nutritional aid such as WIC. The WIC program provides nutritional packages to pregnant women and children under 4 years old, but aims to supplement diets, not provide them. Since WIC does not require any Maine state funding, state policies often encourage WIC participation. However, this has repercussions for WIC's budget, which has dropped to threateningly low levels as WIC participation has steadily increased since its inception in 1974.<sup>154</sup> As a result, WIC nutritional packages may not be sufficient due to the large

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<sup>152</sup> Finnegan et al. "Scientific foundation of clinical practice: opiate use in pregnant women," 1991.

<sup>153</sup> Ibid.

<sup>154</sup> Oliveira and Frazao, "The WIC Program: Background, Trends, and Economic Issues, 2009 Edition, Economic Research Report No. 73," 2009.



population enrolled in the program, possible leading to higher rates of malnutrition for women and infants.<sup>155</sup>

Critics of the program insist that the extent of WIC support is not sufficient, leaving some women malnourished during pregnancy.<sup>156</sup> The WIC program is especially criticized for its lack of need acknowledgement, or providing aid based on need. Without a gradient of care, people who are at different levels of need receive the same benefits. Whereas this is sufficient for some participants, it is not for others. This is the point at which the Family Center provides additional aid to prevent food anxiety and malnutrition. Still, the WIC program could benefit from providing packages based on need, thus allocating more resources towards beneficiaries that demonstrate the most need.

Another criticism, described previously, outlines the lack of breastfeeding in women who participate in WIC. In 2007, policy changes made efforts to encourage breastfeeding among WIC participants, largely by providing larger food packages for women who breastfeed.<sup>157</sup> These changes are steps towards more efficient government funding and encouraging positive practices for opioid-abusing pregnant women.

In Maine, organizations such as Discovery House are a parallel to the outpatient MMT services and education provided by the Family Center in Philadelphia. There are four locations in Maine, spread out throughout the state (Bangor, Calais, South Portland

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<sup>155</sup> Patrick et al. "Neonatal abstinence syndrome and associated health care expenditures: United States, 2000-2009," 2012.

<sup>156</sup> Hayes and Brown, "Epidemic of Prescription Opiate Abuse and Neonatal Abstinence. American Medical Association, Editorial," 2012.

<sup>157</sup> Oliveira and Frazao, "The WIC Program: Background, Trends, and Economic Issues, 2009 Edition, Economic Research Report No. 73," 2009.

and Waterville).<sup>158</sup> Nationally, the services of Discovery House are considered successful. A large majority (88%) of addicts benefiting from Discovery House care felt they had acquired a better sense of self-control due to treatment.<sup>159</sup> Discovery House's success is likely due to the incorporation of many of the same values adopted by the Family Center, such as promoting a stable home environment, patient independence, and education.<sup>160</sup>

The Community Caring Collaborative (CCC) exemplifies a different approach to providing specialized care to substance-abusing women and their children. The CCC is located in Machias, Maine. Whereas programs such as the Family Center and Discovery House deal with patients directly, the CCC is a collaboration of agencies and healthcare providers that are specially trained to handle issues relating to NAS and drug abuse. Marjorie Withers, the organization's director, described the development of the CCC in Washington County as imperative and as a response to an ongoing 15-20 year opiate epidemic in Washington County.<sup>161</sup> The CCC currently has 44 partners that are educated in handling problems specific to NAS. This includes education of the biological effects of NAS, the best parenting practices for NAS children, how maternal stress impacts the fetus, etc. By reducing confusion among parents with NAS children, these children are more likely to receive the care they need. For example, inspired by studies at the Center for the Developing Child at Harvard University, educating mothers in relaxation and

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<sup>158</sup> "Locations," *Discovery House*, accessed April 17, 2015 at <http://www.discoveryhouse.com/locations/>.

<sup>159</sup> Emily Boyd et al. "Doing more... patients, associates, community, clinics, performances," *Discovery House*, 2012, accessed at <http://www.discoveryhouse.com/wp-content/uploads/2013/05/Discovery-House-2012-Annual-Achievements-Report.pdf>.

<sup>160</sup> "Overview of Services" *Discovery House*, accessed April 17, 2015. <http://www.discoveryhouse.com/overview-of-services/>.

<sup>161</sup> Marjorie Withers (licensed clinical professional counselor) in discussion with the author, April 2015.

coping techniques can reduce maternal stress and avoid developmental problems in their fetuses. The CCC's approach is simply to train professionals in already established agencies to handle problems specific to NAS, as opposed to creating a center specifically for NAS treatment.<sup>162</sup> The CCC has proven to be incredible resource for Mainers and serves as a model for similar programs throughout Maine.

### **New Research**

Much about NAS is still unknown, which contributes to struggles in care. For instance, many researchers have speculated on whether prenatal methadone dose impacts the severity of NAS after birth.<sup>163</sup> A study by Susie Lim and associates of Kaiser Permanente Northwest on infants exposed to various doses of methadone in utero found that dosage did not impact gestational age or birth weight.<sup>164</sup> However, researchers discovered that fewer infants in the low-dose methadone exposure group required methadone treatments as opposed to infants in the high dose methadone exposure group.<sup>165</sup> These finding could have consequences for post-natal methadone doses and reduce symptoms of NAS.

The recent addition of treatment options, alternative to MMT, provide a method of opioid abuse treatment that does not invite stigmatization. Suboxone or Subutex, market names for the opiate buprenorphine, are a more convenient and safer alternative to methadone treatment. Subutex and Suboxone treatments have been shown to stave off

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<sup>162</sup> Ibid.

<sup>163</sup> Jansson et al., "The Opioid Exposed Newborn: Assessment and Pharmacologic Management," 2009.

<sup>164</sup> S. Lim, M. R. Prasad, P. Samuels, "High-dose methadone in pregnant women and its effect on duration of neonatal abstinence syndrome," *American Journal of Obstetrics and Gynecology* 200, no. 1, (2009): 70, e71–e75, doi: 10.1016/j.ajog.2008.08.041.

<sup>165</sup> Ibid.

withdrawal symptoms for the mother and her fetus.<sup>166</sup> Buprenorphine occupies the same receptors that methadone occupies, but does not engage them. As a result, the patient does not experience any euphoric effects, such as with methadone, and can act normally.<sup>167</sup> The administration of Suboxone or Subutex does not have to be supervised; patients can take their doses home. This avoids many of the logistical issues and stigma associated with MMT.<sup>168</sup> Thus, treatment with Suboxone and Subutex, as opposed to MMT, can potentially increase the efficacy of maintenance treatment during pregnancy as a result of the convenience of administering these drugs.

Buprenorphine (Suboxone or Subutex) is safer than methadone and has a low risk of physical dependence.<sup>169</sup> Since buprenorphine is a partial agonist, or does not engage with opioid receptors completely, whereas methadone is a full agonist, the withdrawal effects due to buprenorphine are lessened.<sup>170</sup> Though buprenorphine maintenance treatment is approved for pregnant women, the use of buprenorphine-containing drugs for withdrawal treatment in infants is currently not approved by the FDA, even though many studies suggest that buprenorphine may actually be more beneficial than methadone in treating infant withdrawal.<sup>171</sup> Updating policies on opioid treatment to reflect more

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<sup>166</sup> Clifford Gevirtz (anesthesiologist) in a discussion with the author, April 2015.

<sup>167</sup> M. Prasad, "When opiate abuse complicates pregnancy," *Obstetrics-Gynecology & Women's Health*. February 1, 2014, retrieved from <http://contemporaryobgyn.modernmedicine.com/contemporary-obgyn/content/tags/drug-abuse/when-opiate-abuse-complicates-pregnancy?page=full>

<sup>168</sup> W. Ling, R. A. Rawson, M. A. Compton, "Substitution pharmacotherapies for opioid addiction: from methadone to LAAM and buprenorphine," *Journal of Psychoactive Drugs* 26, no. 2, (1994): 119-128. <http://www.ncbi.nlm.nih.gov/pubmed/7931856>.

<sup>169</sup> Clifford Gevirtz (anesthesiologist) in a discussion with the author, April 2015.

<sup>170</sup> Ibid.

<sup>171</sup> Jones et al., "Neonatal Abstinence Syndrome after Methadone or Buprenorphine Exposure," 2010.

current data could potentially reduce the harm associated with opioid maintenance treatment for fetuses.

### **Education**

Education is a crucial to fighting NAS. Establishments such as the CCC and Discovery House recognize this, yet there is still more work to be done. For example, though Child Protective Services has the authority to take custody of opioid exposed children when in the best interest of the child, there are plenty of routes that a drug-abusing pregnant woman can take to ensure that she keeps her child. Understanding the caveats to how the Child Protective Services handles cases of opioid exposed children is critical for substance abusing women and might motivate them to follow paths that could lead to them keeping custody of their child. Child Protective Services, however, is viewed more negatively by many due to a lack of correct information about the realistic consequences of reporting drug abuse during pregnancy.

Educating the general public on how MMT impacts the addict would also help reduce addict stigma. In a 2007 study, 84.2% of women of opioid-abusing women of child bearing age do not receive treatment and did not perceive a need for treatment.<sup>172</sup> This implies that the standard plan of action to recover from opioid addiction may not be obvious to the general public.

The biological basis of methadone treatment is often misunderstood; employers are often more sympathetic to untreated alcoholics than to patients on stable, controlled

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<sup>172</sup> “The NSDUH Report: Substance Use Treatment among Women of Childrearing Age,” *Substance Abuse and Mental Health Services Administration*, October 4, 2007, accessed at <http://oas.samhsa.gov/2k7/womenTX/womenTX.pdf>.

methadone doses.<sup>173</sup> Some regions are wary of introducing MMTs to the community, lest they encourage more drug use.<sup>174</sup> However, MMT actually allows the addict to be more independent and functional. Without cravings or the euphoric effects of street opiates, addicts are free to pursue other activities. The perception of treated opioid addicts does not align with the medical understanding of treatment.

The repercussions of drug addiction are partly dictated by society's perspective on drug abuse.<sup>175</sup> This demonstrates the importance of viewing drug abuse, particularly drug abuse during pregnancy, from numerous viewpoints: that of the pregnant woman, her family, medical personnel, public health officials and the fetus. Teaching a more thorough understanding of addiction as a disease to the community could help combat the stigma of addiction during pregnancy, encouraging treatment.

Just as NAS is caused by multiple factors, NAS must be managed via multiple factors. The Family Center, Discovery House and the CCC acknowledge this perspective and have shown progress in creating a healthier community. Still, these programs, as well as future programs, can improve by recognizing gaps in care, such as those due to stigma, a lack of funding, and unfinished research.

Madison-Dane county, in Wisconsin, used a multi-pronged approach to ultimately reduce community opioid abuse. This success story serves as a model for other regions. The approach included six major points of attack: (1) reduce access to drugs, (2) reduce inappropriate prescription use, (3) improve overdose intervention, (4) early intervention drug treatment and recovery, (5) integrate mental health care and (6) substance abuse

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<sup>173</sup> Joseph et al. "Methadone maintenance treatment (MMT): a review of historical and clinical issues," 2000.

<sup>174</sup> Ibid.

<sup>175</sup> Clausen, "Social and Psychological Factors in Narcotic Addiction," 1957.

prevention.<sup>176</sup> Included as part of these goals was opioid education, clinician education regarding mental illness and addiction, developing a network of recovering addicts, and reducing opioid supply. Although this effort was not specific to opioid abusing women, the scope of the effort exemplifies how diverse efforts to reduce NAS should be.

### ***Breaking the Generational Cycle: Building Resiliency***

NAS has a generational effect: children with NAS are likely to have home environments that increase their risk of drug abuse in their future. Subsequently, NAS can become a cycle, likely contributing to the regionality of NAS. Developing a more resilient younger population is crucial for reducing Maine's drug abuse problem. Impactful changes need to come from within family environments. Research shows that the ways children are treated in the first few years of their life are very influential on behavioral and developmental factors.<sup>177</sup> Psychological distress can impact drug abuse risk, particularly in women, but it can also increase future drug abuse risk in children. In the context of breaking the cycle of NAS, understanding what factors affect psychology is important in order to provide children with a stronger mental health background.

Recent research by Dr. Vincent Felitti hones in on the negative impacts of adverse childhood experiences (ACEs) on development and lifestyle. His work demonstrates how interconnected childhood experiences and development have long-term consequences,

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<sup>176</sup> "Madison-Dane County: A Coordinated Response to Stop Drug Overdose," *Safe Communities America*, 2009, accessed May 3 2015 at [http://www.nsc.org/RxDrugOverdoseDocuments/900006595\\_SCA\\_2015\\_Madison\\_Dane\\_County\\_Case\\_Study.pdf](http://www.nsc.org/RxDrugOverdoseDocuments/900006595_SCA_2015_Madison_Dane_County_Case_Study.pdf).

<sup>177</sup> "Maternal Depression Can Undermine the Development of Young Children: Working Paper no. 8" *Center on the Developing Child at Harvard University*, 2009, <http://www.developingchild.harvard.edu>.

(Figure. 6).<sup>178</sup> In a study investigating the relationship between illicit drug use and ACEs, Felitti and his fellow researchers found that each additional ACE increased the risk for early drug use by 2 to 4-fold. ACEs impact can be measured via a questionnaire, ultimately producing an ACE score that is used to predict risk for commonly comorbid, or co-occurring, behaviors.<sup>179</sup> Felitti’s research demonstrates the importance of providing resources for children during formative years and also the need for research to fully understand how ACEs impact a child’s psychological development.



**Fig 6. Flow chart outlining the long-term consequences of ACEs.** *Source: The Adverse Childhood Experiences Study.*

<sup>178</sup> “The Adverse Childhood Experiences Study,” *Center for Disease Control and Kaiser Permanente*, accessed April 3, 2015 at [www.acestudy.org](http://www.acestudy.org).

<sup>179</sup> S. R. Dube et al., “Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: the adverse childhood experiences study,” *Pediatrics* 111, no. 3, (2003): 564-572, <http://www.ncbi.nlm.nih.gov/pubmed/12612237>.



Early intervention strategies such as Home Visiting Programs (HVP) increase resiliency. HVP are programs aimed at creating supportive homes for children, particularly children with high risks for social, educational and developmental disparities. In contrast to similar efforts in hospital or community center settings, HVP are focused in providing services inside individual households.<sup>180</sup> They are created with the idea that the development and health of children are tightly connected to their home environments. Families can have difficulty providing a supportive, nurturing environment for their children for a variety of reasons. Often, parents are unaware of supportive parenting skills, have a weak support system in their neighborhood (particularly if new to the area), or are employed in time-intensive occupations that do not allow for family time. Socioeconomic disadvantages such as poverty, unemployment, and chronic illness further complicate parenting; creating larger barriers to supportive and healthy home environments.<sup>181</sup> HVP, in conjunction with effective health care can mitigate disparities in child health and development.<sup>182</sup>

HVP are not novel. Worldwide examples of HVP implementation have been successful. Countries with extensive HVP, which spend less on healthcare than the US, experience lower infant mortality rates than the U.S.. Early HVP in Denmark in 1937 resulted in lower mortality rates. France experienced similar results with a HVP targeting smoking, nutrition and drug use.<sup>183</sup> HVP are also currently available throughout the

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<sup>180</sup> B. H. Wasik and D. M. Bryant, "Home Visiting: Procedures for Helping Families," (Thousand Oaks, CA: Sage Publications, 2000).

<sup>181</sup> Ibid.

<sup>182</sup> Council on Child and Adolescent Health, "The Role of Home Visitation Programs in Improving Health Outcomes for Children and Families," *Pediatrics* 123, no. 2, (2009): 598-603, doi:10.1542/peds.2008-3607

<sup>183</sup> Ibid.

United Kingdom and in Latin America.<sup>184</sup> The success of these foreign programs encourage their use in America. Currently, there are already American HVP, yet many require reform to be more effective.

The U.S. experience with HVPs has been rocky. Household care has a long tradition in America, such as the increase in home care in New York City in the late 19<sup>th</sup> century<sup>185</sup>. The Head Start Home-Based Program, founded in 1972, focuses on serving families with pre-school aged children and represents one of the largest home care programs in America. Ninety percent of the families receiving care from the Head Start Home-Based Program are low-income. Out of this program came the Early Head Start program. A program in Hawaii called the Hawaii Healthy Start Effort, which later morphed into Healthy Families America, expanded its care to pregnant mothers and 3-year-old children.<sup>186</sup> This program, created in 1978, aimed at widespread care, attempting to outfit every family with a home visitor, was inspired by the ideals of C. Henry Kempe, a Nobel Prize winning pediatrician interested in child abuse. The program was judged to be ineffective and unable to cause any change in child health and development.<sup>187</sup> In 1988, the American Academy of Pediatrics decided that HVP should have a place on a family's health team.

The efficacy of HVP is difficult to quantify. Research supports both the benefits and inefficacy of HVP. A study specifically investigating the impact of HVP on low-income families suggested that the effects of HVP result in increased cognitive function

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<sup>184</sup> Wasik and Bryant, "Home Visiting: Procedures for Helping Families," 2000.

<sup>185</sup> Ibid.

<sup>186</sup> Ibid.

<sup>187</sup> Council on Child and Adolescent Health, "The Role of Home Visitation Programs in Improving Health Outcomes for Children and Families," 2009.

in young children.<sup>188</sup> This research was supported by various other studies looking at the relationship between low-income families and HVP.<sup>189</sup> Another study indicated that HVP can be beneficial in preventing child abuse.<sup>190</sup>

Still, evaluations of specific HVP, such as Hawaii Healthy Start Effort show little benefit. The efficacy of an HVP is tightly related to the unique demographic it serves. The most successful HVP aim to ameliorate the socioeconomic disparities that create the most negative childhood developmental outcomes. A failure to identify these disparities correctly weakens a HVP, thus region-specific programs are more likely to have a positive impact.<sup>191</sup> For example, the Maternal, Infant and Early Childhood Home Visiting Program, initiated in 2010 in the United States, includes separate funding specifically for a home visiting services for tribes, tribal organizations and urban Indian Organizations. This specificity bodes well for the success of this program; in targeting similar populations, the unique disparities that plague the population might be easier to identify. In her book, *The Future of Children*, Deanna Gomby insists that the negative evaluations of HVP should not deter their use; she insists that children are benefitting from these services even if evaluations suggest otherwise. Her perspective on the evaluation methods of HVP is not unique; there are other critics that are also suspicious

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<sup>188</sup> Ira J. Gordon and Barry J. Guinagh, "A home learning center approach to early stimulation," *Catalog of Selected Documents in Psychology* 8, no. 6, (1978), <http://eric.ed.gov/?id=ED115388>.

<sup>189</sup> Wasik and Bryant, "Home Visiting: Procedures for Helping Families," 2000.

<sup>190</sup> "Supporting Evidence-Based Home Visitation Programs to Prevent Child Abuse and Neglect Project: Utah Department of Health," *Children's Bureau*, Dec. 1, 2008, accessed at <http://www.acf.hhs.gov/programs/cb/resource/ebhv-grantee-utah>.

<sup>191</sup> Council on Child and Adolescent Health, "The Role of Home Visitation Programs in Improving Health Outcomes for Children and Families," 2009.

of evaluations or believe that the effects of HVP require a longer period in order to show dramatic improvement.<sup>192</sup>

HVP are not a sole solution. Brunner and Pies (2009) argue that home visiting services are ineffective as isolated strategies. Instead, HVP should be utilized in conjunction with other services such as medical healthcare and community center involvement. As such, they argue that the program not only should be just a piece of care, but also have clear, specific goals as to how the home visiting services augment the other services.<sup>193</sup> HVPs are more likely to succeed if they are based around supporting the positive behaviors and parenting methods of families instead of replacing parental authority altogether.<sup>194</sup>

## CONCLUSION

NAS treatment and distribution in Maine is a pressing, unsolved issue requiring attention from both scientific authorities and government public health officials. However, a general understanding of NAS by communities afflicted with high rates of opioid abuse is equally as important. Certain characteristics of NAS are clear targets for prevention programs. These include the lack of psychological care and addiction treatment in Maine, societal stigma of addiction, and insufficient funding for programs likely to benefit NAS-affected children.

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<sup>192</sup> Ibid.

<sup>193</sup> Wendel Brunner and Cheri Pies, "Intensive Home Visiting Programs Implications for California Counties," *Contra Costa Public Health*, 2009, accessed at [http://cchealth.org/public-health/pdf/home\\_visiting.pdf](http://cchealth.org/public-health/pdf/home_visiting.pdf).

<sup>194</sup> Wasik and Bryant, "Home Visiting: Procedures for Helping Families," 2000.

Psychological distress plays an important role in the influencing the high rate of addiction in Maine. As such, targeting mental illness, as opposed to addiction, could potentially reduce NAS instance. Increasing the availability of psychological medical treatment would require financial and political support; the primary obstacle to hiring more medical professionals in Maine is inadequate funds. Similarly, Maine could benefit from more addiction medicine specialists. Many of the medical professionals I spoke with emphasized the chaotic nature of their job. As addiction medicine specialists in a region with a high rate of addiction, they felt that more human resources are crucial to providing better care. This is particularly important when considering addiction treatment because medical professionals prescribing opioid maintenance treatments are legally restricted to a certain number of patients. Convincing political authorities of the necessity of psychological and addiction medical professionals is a critical step towards improving the mental health of Maine community members.

Societal stigma impacts care at two primary points; stigma prevents initial reporting and MMT program retention. Society's perspective of opioid abuse hinders treatment, leading to uncontrolled use of opioids and, potentially, infants with severe NAS. Addiction stigma is a product of societal norms. These perspectives can change given the right education. By clarifying that addiction is a disease and not the choice of the addict, society's perspective of addicts might become more forgiving. A forgiving environment would encourage opioid addicts to seek treatment and resources.

Ultimately, many of the problems influencing NAS are financially focused. NAS is more likely to affect individuals with a lower income, thus financial aid is crucial to providing adequate treatment and resources. Whereas many communities are stricken by

NAS, the financial means to set up a program such as the CCC are not always available. The CCC was made available through a federal grant and as a result, the surrounding community has access to resources and programs that are specifically intended to reduce opioid abuse and increase home environment stability. Providing an even larger population of Maine with such resources should be a state-wide goal, yet the financial obstacle is prohibitory.

As I have emphasized already, education is at the crux of battling NAS. Education can help change society's perspective to reduce stigma, yet it is also crucial for those at risk for opioid abuse in conjunction with pregnancy to be medically literate in NAS. Opioid-abusing pregnant women may be more likely to comply with treatment restrictions and guidelines if they understand the basis behind these rules. For example, it is crucial for a pregnant women undergoing MMT to receive her treatment everyday to prevent withdrawal, which can harm the fetus. Understanding this detail would serve as a strong motivator for complying with care. In my discussion with Marjorie Withers, she described one of the services provided by the CCC, which involves having a certified nurse or other professional accompany women to doctor's appointments during and after pregnancy to help them better understand what is happening<sup>195</sup>. I believe this program is very valuable and a positive step towards reducing the confusion around NAS.

Though many suggestions for reducing opioid abuse in Maine apply to the whole population of addicts, I believe that creating psychological or addiction treatment programs specifically for women can help pinpoint the specific obstacles of a female opioid addict. MMT programs represent a variety of problems for women, especially if

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<sup>195</sup> Marjorie Withers (licensed clinical professional counselor) in discussion with the author, April 2015.

they have children or few transportation options. Additionally, psychiatric treatment specifically tailored to the kinds of abuse experienced by many psychologically distressed women, in addition to providing education about NAS, could promote safer and healthier lifestyles.

In addition to these suggestions, more research on NAS would better equip society and those with authority to impact the trend of NAS. Simply, we need to know more. The lack of longitudinal studies on children with NAS and on pregnant women are detrimental to getting to the root of NAS from a social and medical standpoint.

First-hand research of this topic produced the view that there are not many professionals, either medically trained or not, working to ameliorate the problem of NAS in Maine. Unfortunately, many of the professionals that are in the many fields that impact NAS are already overworked or do not have the time to inspect the problem from the outside. In entering this public health dilemma as an outside observer hoping to characterize this problem sociologically, I hope that my view can be treated as unique and helpful to future efforts to reduce the instances of NAS in Maine.

## **ACKNOWLEDGEMENTS:**

### *Interviewees:*

**Mark Brown, M.D.:** Head of Neonatology and Pediatrics at Eastern Maine Medical Center in Bangor

**Clifford Gevirtz, M.D.:** Anesthesiologist specializing in Pain Management in New Rochelle, NY

**Debra McSweeney, PT, MSPT:** Pediatric Physical Therapist at the Edmund N. Ervin Pediatric Center in Waterville and Augusta, Maine

**Stephen J. Meister, MD:** Developmental and Behavioral Pediatrician and Director of the Edmund N. Ervin Pediatric Center in Waterville and Augusta, Maine

**Alane O'Connor, DNP:** Family Nurse Practitioner specializing in the treatment of opioid-dependent women with buprenorphine as part of the Maine Dartmouth Family Practice at the Thayer Center for Health

**Marjorie Withers, LCPC:** Director of the Community Caring Collaborative in Machias, Maine

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**Jim Fleming:** Professor of Science, Technology and Society at Colby College

**Matthew Archibald:** Professor of Sociology at Colby College



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