

**Improving Pregnancy Outcomes  
through Smoking Cessation**





# Improving Pregnancy Outcomes through Smoking Cessation

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## Executive Summary

Healthy New Jersey 2020's goal is to reduce the percentage of women who smoke during pregnancy to 5.5 percent of mothers giving birth in New Jersey. In order to achieve this goal, smoking cessation efforts in pregnant women will need to be promoted. Central Jersey Family Health Consortium was contracted by the Rutgers Center for State Health Policy, as a component of their State Innovation Model (SIM) design award funded by the Center for Medicare and Medicaid Innovation (CMMI), review the literature on the impacts of smoking during pregnancy, to conduct an analysis of birth records and other data, summarize programs available for smoking cessation, identify gaps in services and provide recommendations to identify opportunities for improving birth outcomes.

The health impacts of smoking during pregnancy are well documented, with a burgeoning literature showing additional impacts of second and third hand smoke on birth outcomes. The impacts of smoking, second hand smoke and third hand smoke on pregnancy and the postpartum period include:

- Women of childbearing age who smoke are at greater risk of reduced fertility and adverse pregnancy outcomes.
- Exposure to tobacco in utero is associated with increased risk of preterm birth, low birth weight, placental abruption and stillbirth.
- Exposure to second hand smoke in utero increases the risk for preterm birth, neonatal intensive care unit admissions, respiratory distress syndrome and small for gestational age.
- Smoking during the postpartum period increases the risk of sudden infant death syndrome.



- Long-term negative health consequences of the infant including allergies, asthma, Type 2 Diabetes, gestational diabetes, hypertension, behavioral problems and cognitive delays.

In addition to health consequences, there are significant financial consequences of smoking during pregnancy, such that babies born premature or low birth weight cost more than 12 times that of normal uncomplicated births. These costs can be greatly reduced through smoking cessation programs which can provide a cost savings of nearly \$5 million dollars for New Jersey.

Although the health consequences are well documented, research suggests that social and family support, the environment, stress and finances are significant barriers to smoking cessation for pregnant women.

Data regarding birth outcomes among women who smoke lend support for the relationship between smoking and adverse birth outcomes. Analysis was conducted using three datasets: Perinatal Risk Assessment, Electronic Birth Certificate and the Pregnancy Risk Assessment Monitoring System. Results indicate that:

- Smoking has a negative impact on births in New Jersey.
- Between 2009 and 2011 more than five percent or nearly 18,000 infants were born with tobacco exposure.
- Risk factors associated with smoking during pregnancy were lower education, being younger, having an unplanned pregnancy, having a spouse that was unemployed, experiencing domestic violence, having inadequate social support, being in poverty and being a minority.
- The percent of infants born with adverse birth outcomes was also higher among women who smoked.
- Smoking was associated with low birth weight, preterm birth, placenta previa, placenta abruption, lower APGAR scores and increased risk of infant mortality.
- Although, the findings suggest New Jersey experiences negative outcomes from smoking during pregnancy, currently only 37 percent of women report the provider assisting them with how to quit.

Significant research has been conducted to determine which programs work best at increasing smoking cessation. The research suggests that there are six evidence-based strategies that purport results:

- Brief interventions and the 5 A's
- Psychosocial interventions
- Quitlines
- Medications-pharmacotherapy
- Nicotine replacement therapy

There are several smoking cessation programs available nationally and within New Jersey. However, the majority of programs do not focus on pregnant women. There are three programs that focus on pregnant women:

- SmokeFreeMom
- Mom's Quit Connection
- Perinatal Addiction Prevention Program

The remaining programs are offered to the general public. The programs identified, with the exception of two (5 A's and New Jersey Quitline), were not evidence-based programs; however, many of the programs integrate evidence-based components into their programs.

There were several gaps identified in smoking cessation services to pregnant women including:

- Limited availability of programming focused on pregnant woman
- Program initiation being physician-based or within the medical setting
- Referral-based programming
- Lack of focus on second and third hand smoke
- Limited service locations

In order to reduce the number of pregnant women who smoke and achieve the Healthy New Jersey 2020 goal, smoking cessation efforts in pregnant women will need to be promoted. Recommendations for achieving cessation among pregnant women include both prevention and intervention techniques.

Prevention includes:

- Anti-smoking marketing campaigns

- Evidence-based educational programs during middle school

Intervention includes:

- Expansion of school-based youth services
- Providing training to providers regarding the 5 A's
- Partnering with WIC to offer a smoking cessation services site
- Engaging public health professionals
- Expanding New Jersey smoking cessation programs

In order to expand New Jersey smoking cessation programs, there is a need to provide additional funding and resources dedicated to such programs. Moreover, providing funding to expand programs focused on pregnant populations are needed.

## Introduction

Healthy New Jersey 2020 (HNJ 2020), New Jersey's state health promotion and disease prevention agenda, has identified five health priorities: asthma, diabetes, obesity, hypertension, and tobacco use (specifically during the prenatal period). As part of the focus on tobacco use, the Healthy New Jersey 2020's goal is to reduce the percentage of women who smoke during pregnancy to 5.5 percent of mothers giving birth in New Jersey. In order to achieve the goal smoking cessation efforts among pregnant women will need to be promoted.

Central Jersey Family Health Consortium was contracted by the Rutgers Center for State Health Policy to conduct an analysis of birth records and other data to identify opportunities for improving

birth outcomes as a component of their State Innovation Model (SIM) design award funded by the Center for Medicare and Medicaid Innovation (CMMI).

This report will focus on the topic of tobacco use, specifically: (1) understanding what the data say about smoking during pregnancy in New Jersey (2) strategies for decreasing tobacco use during pregnancy, (3) integrating behavioral health services, and (4) addressing Medicaid cost/value, especially for high-cost patients. The report will also include recommendations for best clinical practices to increase smoking cessation during pregnancy while understanding the personal, social, and financial barriers that prevent a pregnant woman from seeking out and successfully completing treatment.

*Among pregnant women, tobacco use is still one of the few remaining causes of adverse birth outcomes that are completely preventable.*

## Health Effects of Smoking in Pregnancy

Tobacco related mortality is the leading cause of preventable death in the U.S. People who smoke have a mortality rate three times greater than non-smokers. In New Jersey, lung cancer is the leading cause of cancer related death with 90 percent of lung cancers being linked to smoking (HNJ2020). Among women, tobacco use is a major cause of reduced fertility, maternal and infant morbidity and mortality. For pregnant women, smoking and exposure to second hand smoke (SHS) is particularly problematic due to the long term effects on the mother's health as well as her growing fetus. Prenatal exposure to smoking is strongly associated with low birth weight, preterm birth, placental abruption and stillbirth. Chemicals associated with tobacco from maternal smoking and second hand smoke pass from the pregnant woman to the fetus through the placenta (OHS 2006). Nicotine, a main component of tobacco, is present in the placenta at higher concentrations than in maternal blood. This along with carbon monoxide in tobacco smoke can affect the baby's growth and can lead to low birth weight (<2500 grams), preterm birth (<37 weeks gestation), low APGAR scores and other negative outcomes mentioned above (Andriani & Kuo 2014). An APGAR score is a tool used by the delivering provider to assess a baby's wellbeing at one minute of life and at five minutes (low=<6 out of 10). Although APGAR scores are primarily used to assess the baby's health after birth, there is some evidence associating low APGAR scores to predicting infant morbidity, specifically fetal infections, and infant mortality (Iliodromiti, Mackay, Smith & Pell 2014).

### Smoking and Pregnancy

The health effects of smoking have a very clear clinical impact on pregnant mothers by producing poor birth outcomes such as:

- Low birth weight
- Preterm births
- Small head circumference
- Low APGAR scores
- Placental abruption
- Stillbirth



## Pregnancy and Second Hand Smoke

Passive second hand smoke (SHS) exposure to tobacco is of growing concern as well. The Stillbirth Collaborative Research Network (SCRN), funded through a cooperative agreement from the National Institute of Child Health and Human Development to understand causes of stillbirth, improve stillbirth reporting, and develop preventative interventions, conducted a study which concluded SHS as one of the factors associated with increased risk of stillbirth (Varner, Silver, Hogue *et al.* 2014).

A study by Ashford *et al.* found that women exposed to prenatal SHS were two to three times more likely to have a preterm birth than a nonsmoker or someone who was not exposed to SHS. Furthermore, when compared to a mother who smoked during pregnancy, a woman exposed to SHS was equally as likely to have a preterm birth. This study also found women exposed to SHS in the prenatal period had a significant increase in neonatal intensive care unit (NICU) admissions. These mothers were two to four times more likely to experience complications than nonsmoking mothers; complications were reported as respiratory distress syndrome and small for gestational age (Ashford, Hahn, Hall, Rayens *et al.* 2010). Data are also being collected on third hand smoke. Third hand smoke is considered residual nicotine and chemicals left on indoor furniture (i.e. carpeting, clothing, and furniture). Compared to research on the effects of maternal smoking on birth outcomes, there is limited but growing research on the effects of second and third hand smoke, also known as passive smoking. Preliminary results of the negative effects of second and third hand smoking for pregnant women and their babies' warrant discussion (Schvartsman, Farhat, Schvartsman & Saldiva 2013).



### Smoking and SIDS

One of the leading factors attributable to SIDS is smoking.

- SIDS risk increases if a mother smokes regardless of smoking status in utero
- Smoking accounts for 11% of the population attributable risk of SIDS

## Smoking During the Postpartum Period

Not only is smoking and exposure to smoke harmful in utero, a growing body of literature suggests significant negative impacts of smoking exposure during the postnatal period. The risk of sudden infant death syndrome (SIDS) is increased in the postpartum period when a mother smokes, regardless if she smoked during pregnancy and continued to smoke after the baby was born or quit smoking during pregnancy and then relapsed at a later time. In 2006, *Pediatrics* reported the population attributable risk (PAR) for SIDS to postpartum maternal smoking alone was 11 percent, suggesting that PAR would be even higher if smoking status of other house members were taken into account (Kum-Nji, Meloy & Herrod 2006). Exposure to SHS in infancy not only increases risk for SIDS, but to other infections such as respiratory system and ear infections (Rode, Kjoegaard, Damm *et al.* 2013). Smoking past pregnancy and into the postpartum period exposes the infant to second and third hand smoke. This tobacco smoke exposure puts infants at an increased risk for Sudden Infant Death Syndrome (SIDS), respiratory problems and otitis media during their infancy and wheezing (Rode, *et al.* 2013). These studies demonstrate the negative health effects of tobacco exposure in the postnatal period and that smoking cessation should be encouraged not only through the perinatal period, but throughout the life of the child.

# Smoking and the Life Course

Whether it is tobacco exposure in utero when a pregnant woman smokes or passive smoking exposure during the postpartum period by either mother or family members, the infant is at increased risk for negative health outcomes throughout life.

According to the life course perspective, past exposure to health risk behavior may have the same impact on the reproductive outcomes as the current exposure. Such that, in utero environment is shown to have a significant impact on health in later adulthood. For example, a study focused on maternal smoking and obesity found that babies born to women who smoked during pregnancy were lighter at birth than their non-smoking counterparts; however, by age 11 for females and 16 for males, they were at increased risk for obesity. Moreover, the risk increased over time such that at age 33, males born to smokers were 1.56 times more likely to be obese than non-smokers and females were 1.41 times more likely (Power and Jefferies 2002). In addition to obesity, in utero tobacco exposure has also been linked to food allergies, asthma, adverse birth outcomes for female infant's offspring, Type 2 Diabetes, gestational diabetes, hypertension, and atherosclerosis risk among other things (Kulig et al 1999; Wang & Pinkerton 2008; Geerts et al 2008; Cupul-Uicab et

al 2012). These early life exposures create chains of risk that persist throughout life.

Although rates of smoking among pregnant women have declined, nationally more than 400,000 babies are born each year having been exposed to tobacco in utero. Women who are disadvantaged (younger, low income, low education, and mental health disorders) are more likely to smoke during pregnancy, causing greater disadvantage for their infants through risk of the long term effects of preterm and low birth weight.

According to the Center for Disease Control, babies born preterm can have lifelong problems such as cognitive development, vision loss, and respiratory issues. In addition, the CDC states low birth weight babies are at risk for delayed motor and social development, learning disabilities, and infections.

## Smoking and Pregnancy

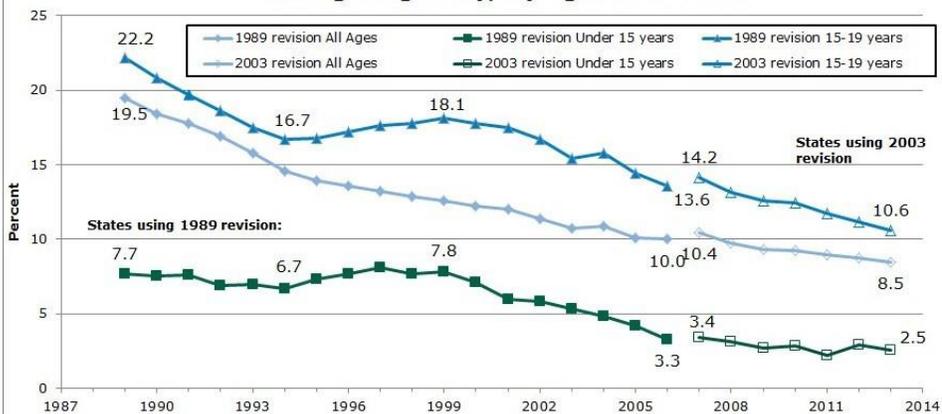
Long-term effects of prematurity and low birth weight include:

- Cognitive delays
- Vision loss
- Respiratory issues
- Delayed motor development
- Delayed social development
- Learning disabilities
- Infections

In addition, smoking exposure in utero is also associated with congenital malformations (Hackshaw et al. 2011) such as:

- Oralfacial Clefts
- Clubfoot
- Gastroschisis
- Congenital Heart Defects
- Craniosynostosis

**Percentage of Births Which Were to Mothers Who Smoked During Pregnancy, by Age: 1989-2013**



Note: The number of states using the 1989 and 2003 revisions of the standard birth certificate has varied over time. Sources: Data for 1990-2006: Centers for Disease Control and Prevention National Center for Health Statistics. (2008). Mothers who smoked cigarettes during pregnancy, by selected characteristics: United States, selected years 1990-2000 and selected states, 2005-2006. Table 11. Available at [http://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Publications/Health\\_US/hus99/Excel/table011.xls](http://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/Health_US/hus99/Excel/table011.xls) Detailed Asian race data and teen birth data for 2007-2011: National Center for Health Statistics, National Vital Statistics System. *VitalStats* online tool. Available at <http://205.207.175.93/vitalstats/ReportFolders/reportFolders.aspx>. All other data for 2007-2013 and education data for 2010: National Center for Health Statistics, CDC WONDER online tool.



## Immediate Impacts of Cessation

Smoking cessation during pregnancy has immediate positive outcomes compared with women who do not quit.

- Cessation by 12 weeks gestation eliminates head circumference differences
- Women who quit in the third trimester deliver:
  - Babies weighing more
  - Longer babies
  - Babies with larger head circumference



The ultimate goal is to prevent smoking initiation but if that isn't possible it is essential to promote smoking cessation before, during, and after pregnancy. If a woman is a smoker and becomes pregnant she can still decrease the chance of negative health outcomes to her unborn child if she stops smoking.

One study concluded smoking cessation before 12 weeks gestation eliminated differences between a smoker and a non-smoker in terms of the infant's head circumference. The child's head circumference was found to be only slightly smaller when comparing a pregnant woman who quit early in pregnancy to a non-smoking pregnant woman.

A child's head circumference is related to brain weight which was noted to be reduced in those children exposed to nicotine in utero and which ultimately resulted in neurodevelopmental effects (Vardavas, Chatzi, Patelrou, Plana *et al.* 2010). However, if a mom does not quit smoking early in pregnancy, efforts should still continue throughout pregnancy to quit smoking.

Quitting even later in pregnancy has beneficial effects compared to not quitting at all. In another study, women who quit by third trimester

gave birth to babies that weighed more, were longer, and had greater head circumference than those women who did not quit (Bailey 2011). All of these parameters are associated with healthier infants and children, therefore, there are benefits to

quitting smoking at any point during pregnancy.

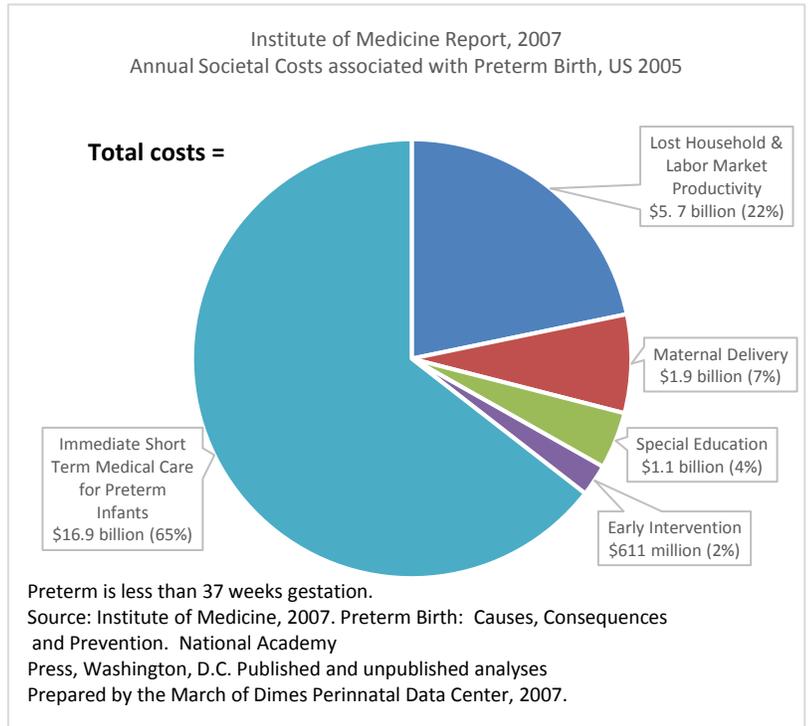
Pollack *et al.* (2000), found maternal smoking had a greater negative effect on twins than on singletons. This finding was substantiated considering multiple fetuses strain the uterine blood supply which is then further compromised by maternal smoking by the process of fetal hypoxia (Pollack, Lantz, & Fohna 2000). This is important to note considering multiple gestation births have increased over the past decade nationally and particularly in New Jersey.

Research has shown an association between tobacco exposure in utero and inattention and hyperactivity in childhood (Linnet, Dalsgaard, Obel, Wisborg *et al.* 2003). Low birth weight babies have been documented to have an increased risk of cognitive and behavioral development in childhood (Gray, Indurkha & McCormick 2004). Considering low birth weight babies are a well-known negative outcome of maternal smoking, an association between smoking during pregnancy to negative child behavioral outcomes is observed. Childhood behavior problems lead to reduced success both in a child's social and academic environment. There are multiple associated costs when a child does not succeed both academically or socially. For example education costs increase as those affected children receive specialized services and child care costs increase as children may need individualized care or residential placement (Scott, Knapp, Henderson & Maughan 2001). Another benefit to addressing maternal smoking early in a pregnancy is reducing the number of children who may have long term behavior problems.

## The Financial Impacts

There are very high costs associated with premature/low birth weight babies and their health care utilization, their medical expenses to employers, and their societal costs. Indeed, March of Dimes demonstrated higher health care utilization and employer costs compared with uncomplicated births. In addition, babies born prematurely or of low birth weight experienced more inpatient days, outpatient days, and increased prescriptions compared to their normal gestation/birth weight counterparts.

By reducing prenatal smoking, a significant reduction in medical cost will be seen through the reduction in adverse birth outcomes such as premature birth (Ayadi, Adams, Melvin *et al.* 2006).

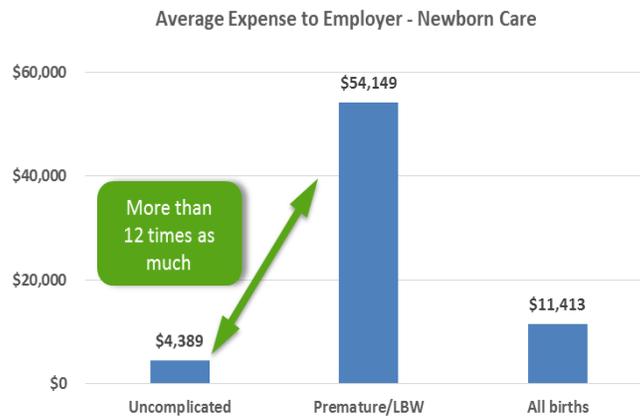


*New Jersey's potential healthcare cost savings is \$4.8 million by eliminating prenatal smoking.*

Russell R. *et al.* (2007) suggests preventing preterm or low birth weight babies results in reducing a high percentage of infant and pediatric costs in the U.S.

The differences in utilization and cost are substantial, with premature/low birth weight babies having seven times more inpatient days than uncomplicated births. Preterm births also cost employers more than \$12 billion in health care costs which accounts for approximately 11 percent of babies covered by employer health plans.

Employers, through employer funded health insurance, paid 12 times as much in healthcare costs for premature/low birth weight babies than babies born term/normal birth weight with one premature birth costing the equivalent of eight normal births.



Costs per infant include all employer payments for newborn medical care during the first year of life.  
Source: Truven Health Analytics, Inc. Costs of Preterm Birth. Prepared for March of Dimes, 2013.

### The Cost of Adverse Outcomes

Poor birth outcomes result in increased financial costs associated with medical care of more complex birth cases impacting:

- Families
- Insurers
- Employers
- State/federal government

## Savings through Cessation Programing

Smoking cessation programs have demonstrated cost effectiveness:

- For every \$1 spent, a net healthcare cost savings of \$25-\$36 per pregnancy.
- The cost savings of \$881 for each pregnant woman who quits with a \$24-34 cost.
- An annual savings of \$4.8 million in neonatal inpatient costs in New Jersey.
- One percent decline in the prevalence of prenatal smoking is a reduction of 1,300 low birth weight babies.
- One percent decline in the prevalence of prenatal smoking is a \$21 million reduction in health care costs (Albrecht, Maloni, Thomas, Jones, Halleran *et al.* 2004).

## Reducing Healthcare Costs



Besides longer hospital stay, intensive care costs, medication costs, supplies and on-going medical care there are other “costs” that impact a parent’s life. This includes time burden, transportation costs, and stress of caring for a preterm birth or low birth weight infant. Singer *et al.* (2007), addresses the issue of increased maternal stress that is associated with very low birth weight children at school age.

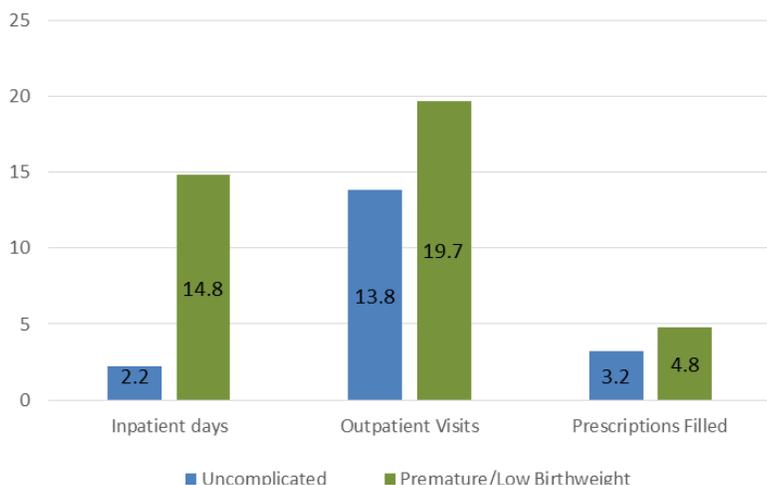
This study found that mothers of very low birth weight children differed from mothers of full term infants by worrying more for their child’s health and exhibiting greater family strain

(Singer, Kirchner, & Eisengart 2007). Hack et. al demonstrated that extremely low birth weight (less than 1,000 grams) children had high rates of chronic conditions compared to normal birth weight children (Hack, Taylor, Drotar, Schluchter *et al.* 2005). This additional “worrying” from caring for the long term chronic conditions of a preterm or low birth weight infant leads to stress. Numerous studies find that chronic stress and repeat activation of the bodies physiological stress response (HPA axis) leads to increased risk of cardiac disease and poor immune functioning (Kiecolt-Glaser, Preacher, MacCallum, Atkinson, Malarkey & Glaser 2003). Thus, the chronic stress of caring for a preterm/low birth weight infant has additional long term medical costs associated with diminished maternal health.

In addition to predicted savings, research suggests real savings have been experienced between 1990 and 2004. There has been a decline in women who reported smoking during pregnancy (18.4 percent in 1990 vs. fewer than 10 percent in 2004) consequently this has resulted in a decline of estimated infant healthcare costs (\$366 million in 1996 vs. \$122 million in 2004) (Adams, Melvin, Raskind-Hood, Joski *et al.* 2011). When considering the rate of health care inflation between 1962 and 2010 of 4.5 percent annually (Whitehouse Report 2013), the actual cost of health care in 1996 and in 2004 dollars would have been more than \$520 million had there not been the significant decline in adverse birth outcomes through smoking cessation programs.

This trend substantiates that efforts put forth to reduce smoking during pregnancy will yield less infant healthcare costs by reducing adverse birth outcomes that result from smoking.

Cost Drivers:  
Average Newborn Healthcare Utilization



Source: Truven Health Analytics, Inc. Costs of Preterm Birth. Prepared for March of Dimes, 2013.

## Barriers to Quitting

The negative health effects of smoking for women and their children (both prenatal and postnatal) are well documented. So why is it so difficult for pregnant women to quit smoking? Research suggests that women are aware of the potential health risks to the fetus, but in many cases this is not a sufficient motivator to quit smoking. In order to understand why women continue to smoke even when they

know it could harm their baby (Ingall & Cropley 2010), it is important to understand the barriers a pregnant smoking woman may face when trying to quit. By understanding these barriers a health care provider can refer her to an appropriate intervention. Common barriers to quitting include: partner support, environment, stress and finances.

## Social/Partner Support

A major barrier to smoking cessation for pregnant women is often that they are around others that smoke, especially detrimental to cessation is having a partner that smokes (Ingall & Cropley 2010). Support or lack of support from a pregnant woman's partner is an important predictor of tobacco cessation (Russell, Crawford & Woodby 2004). The presence of a smoker in the home may also create stress and conflict if the mother decides to quit while the partner continues to smoke. Women have referred to, for instance, partners stepping outside to smoke as a "token" gesture rather than fully supporting their efforts to quit by also quitting smoking themselves (Thompson, Prahoo, McCurry, O'Doherty *et al.* 2004). In order to attain the partner's

full support, the partner also needs to be educated and counseled on the negative effects of smoking on the fetus in the same manner in which the woman is counseled. By doing so, this can increase the chance that the partner will support the pregnant woman's efforts to quit smoking and may quit smoking themselves which would reduce the effects of SHS on the baby as well. Not only is it important for support from their partner, but also to have an environment that is smoke free to increase the success of smoking cessation while pregnant.

## Environment

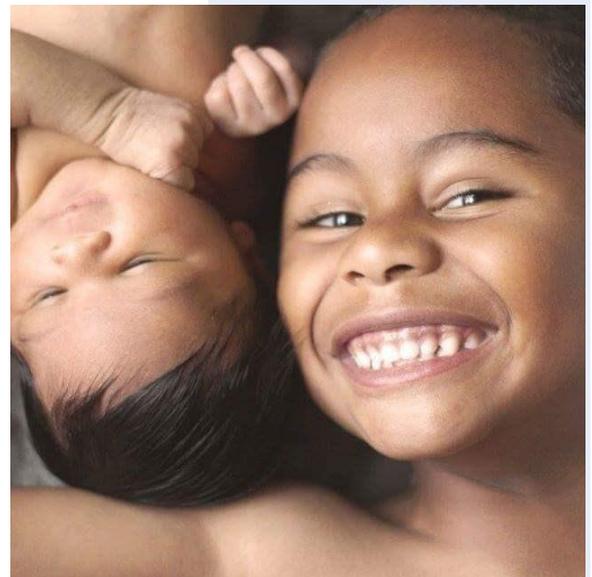
Pregnant women's environment can be one contributing factor in the success or failure of smoking cessation. Women who are pregnant report having the "moral authority" to insist upon a smoke free home; however, the policing of smoking in the home may become an additional stressor for the woman (Baxter *et al.* 2010). In addition to a partner, other family members or close friends smoking can serve as a trigger to her smoking during pregnancy. Conversely, quitting

smoking may also serve as a way to reduce conflict and social stigma in the home and social environments and serve as a motivating factor to quit smoking (Ingall & Cropley 2010).

### Quitting while Pregnant

Quitting smoking is difficult. According to the CDC, in 2011:

- Ten percent of women reported smoking during the last 3 months of pregnancy
- Of women who smoked prior to pregnancy 55 percent quit during pregnancy
- Of those who quit, 40% relapsed within 6 months after delivery



## Stress

Smoking is associated with stress relief, pleasure, comfort and reward that are embedded in the everyday lives of smokers. This association does not disappear when a woman becomes pregnant (Ingall & Cropley 2010). Moreover, as women's lives become more stressful during pregnancy, smoking is a way to alleviate that stress and smoking continues despite the knowledge of the harmful effects of smoking while pregnant (Ingall & Cropley 2010). Stress is a trigger to smoke, whether it is financial stress, emotional stress, partner-related stress, or traumatic stress. Financial and partner-related stressors can influence a pregnant woman to smoke during pregnancy (Tang 2015). Often, women who are not married are more likely to feel unsupported, have the stress of financially carrying the household, and/or feel anxiety of raising a child on their own or without formal commitment from a partner. Unmarried women may be more likely than married

women to experience these financial and partner-related stressors (i.e. unable to pay bills, be separated or divorced) which would influence their decision to smoke during pregnancy. A study by Tang (2015) examined the aforementioned stressors and its relation to maternal smoking. This study found a strong association between four types of stressors (financial, emotional, partner-related, and post traumatic) and a continuation to smoke by pregnant women. Stress as related to a pregnant woman's partner can be heightened when there are cases of domestic violence. In a study to determine the association of intimate partner violence (IPV) and smoking during pregnancy it was found women who reported IPV 1 year before or during pregnancy had two times the prevalence of smoking before pregnancy and were less likely to quit during pregnancy than those women who did not report IPV (Cheng, Salimi, Terplan & Chrisolm 2015).

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*Barriers to quitting are compounded by the fact that many women believe that the risks of smoking in pregnancy are exaggerated.*

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## Financial

Finances can also be a barrier for a pregnant woman seeking tobacco cessation counseling. Once a pregnant woman resolves to quit smoking and initiates the process of identifying treatment, financial barriers could hinder accessing a smoking cessation program. Finances to be considered would be cost of a treatment program, travel cost to a program, and lost wages if program time conflicts with work schedule. Even with insurance coverage there can be provisions that can present as financial barriers to cessation program access, these include

co-payments, requirements for prior authorization, and limitation on number and duration of treatments (Singleterry, Jump, Lancet, Babb *et al.* 2014). Moreover, those who tend to smoke during pregnancy are economically disadvantaged and public insurance (Medicaid) may not cover all smoking cessation counseling and the use of medications to treat tobacco addiction may be seen as just as detrimental to the fetus as smoking itself.

## Summary

When these are considered together, lack of partner support, environment, stress and finances the barriers to quit smoking become greater in counseling a pregnant woman. The woman feels the responsibilities of upcoming motherhood and can see her first act of motherhood being to quit smoking for the benefit of the child. However, there is fear of being unable to maintain abstinence especially if in a smoking environment, while at the same time social pressure and guilt of being unable to quit (Ebert &

Fahy 2007). This is compounded by the fact that many women believe that the risks of smoking in pregnancy are exaggerated (Baxter *et al.* 2010). In order to initiate and maintain abstinence from smoking, programs must address these barriers and also be accessible to the population in greatest need. The next section investigates what the smoking characteristics are of smokers generally and pregnant smokers, specifically.

## Smoking Prevalence: The Impact on Public Health

According to the Behavioral Risk Factor Surveillance System, in 2013, 17.3 percent of adults (aged 18+ years) in New Jersey are current cigarette smokers. Additionally, 14.4 percent of women of childbearing age (ages 18-44) smoke. New Jersey ranks third lowest among all states for the prevalence of cigarette smoking, falling behind Utah and California who report lower rates of smoking prevalence (New Jersey ties with Hawaii in smoking prevalence). In the 2009-2010 National Adult Tobacco Survey, nearly 60 percent of smokers reported trying to quit in the last year; however, less than one percent (0.2 percent) accessed the state quit line. Among pregnant women, tobacco

use is still one of the few remaining causes of adverse birth outcomes that are completely preventable. Despite national and state public health campaigns focused on raising awareness about the dangers of smoking, use of tobacco remains a consistent public health issue. In New Jersey, smoking during pregnancy has decreased; however, it continues to plague a new generation of pregnant mothers and their children.

New Jersey experiences approximately 100,000 births per year. Of those births, fewer than six percent of babies born are to mothers who smoked during their pregnancy.

*In 2012, 5,611 New Jersey infants were exposed to tobacco in utero.*

### The Data

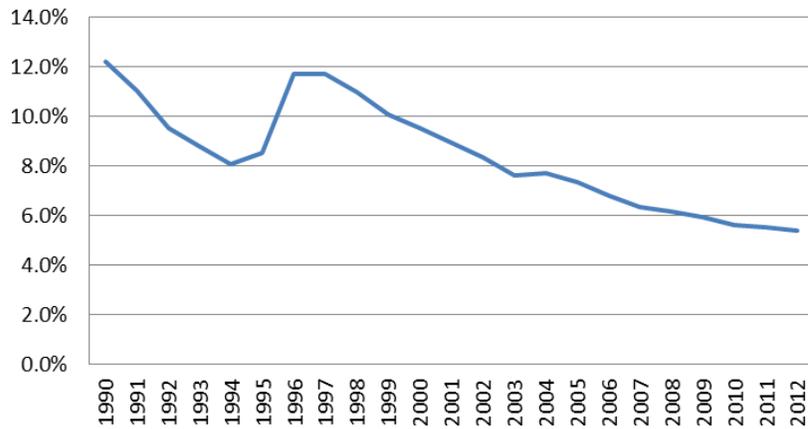
To understand factors influencing tobacco usage and characteristics of mothers who smoke before, during and after pregnancy, data are compiled from three separate data sets: the Perinatal Risk Assessment (PRA), the Electronic Birth Certificate (EBC), and the Perinatal Risk Assessment Monitoring System (PRAMS). The PRA is a prenatal screening that helps providers identify and treat various risk factors early in pregnancy. The PRA is conducted during the first prenatal visit. The New Jersey EBC is an integrated statewide perinatal database. The EBC is a comprehensive birth record that provides information on mother's and father's demographic characteristics, prenatal care, and birth outcomes (gestational age, birth weight, birth defects, infant mortality, etc). Information from the EBC comes from the prenatal record, hospital admission, labor and delivery, newborn screening, maternal depression screening, maternal discharge, and infant discharge. Finally, PRAMS is a joint project of the New Jersey Department of Health and Centers for Disease Control and Prevention, where a sample of postpartum women with newborns are sampled. PRAMS is a survey of randomly selected mothers delivering in New Jersey with one out of 48 women giving birth in New Jersey being selected to participate in the PRAMS survey each month. Women are asked about their feelings and experiences before, during, and after pregnancy. PRAMS assesses the smoking status of women prior to pregnancy, during pregnancy, after pregnancy, and healthcare professionals responses to smoking status (PRAMS 2007).

### Source Data Descriptions

	PRA	EBC	PRAMS
Participants	Pregnant women	Pregnant women	Postpartum women
Number of Participants	~9,300	~100,000	1,500
Participant Selection	Clinician choice (some Medicaid managed care plans require it for payment)	Population of women delivering in New Jersey	Random sample of women who delivered (1 of every 48 deliveries)
Timing	First prenatal visit	At delivery	2-6 months postpartu
Purpose	Assess prenatal risk & provide referrals	Register births & collect health statistics	Surveillance project collecting information not available elsewhere



### Prenatal Smoking in New Jersey: 1990-2012



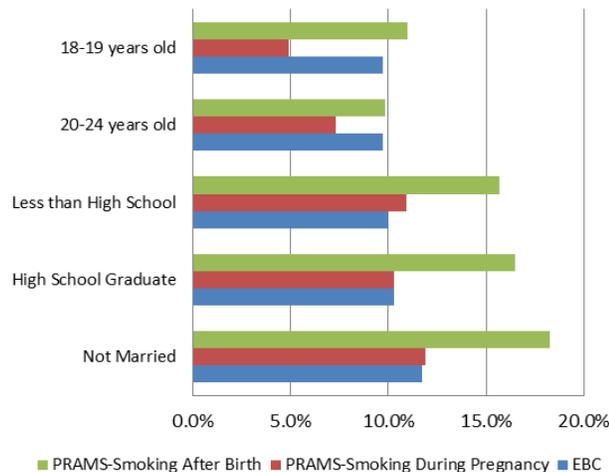
Source: New Jersey Birth Certificate Database. Retrieved on February 10, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data: <http://nj.gov/health/shad>.

### Maternal Characteristics

According to 2009-2011 EBC data, at the time of delivery 5.4 percent of New Jersey women reported smoking during pregnancy (EBC 2012). Although smoking rates have declined since 1990, characteristics of smokers have remained stable. Smoking rates are higher for women who are younger, less educated, and not married. Nearly 10 percent of women between 18 to 24 years old report smoking while pregnant. Of those women who attain a high school degree or less, slightly greater than 20 percent respond positively to smoking while pregnant. In contrast, 6.6 percent of college graduates and 1.5 percent of women with a post-graduate education (16+ years) report smoking during pregnancy. Approximately 12.0 percent of unmarried women are smokers compared to 2.6 percent of married women who were smokers.

Consistent with findings from the EBC, PRAMS data show women who are younger, less educated, and not married having higher smoking rates. Women 20-24 had the highest rates of smoking, with 7.3 percent smoking throughout pregnancy. Unmarried women had higher rates of smoking than married women (11.9 percent vs. 3.1 percent, respectively) and those with higher levels of education had lower rates of smoking (college =3.6 percent vs. < high school=10.9 percent). Demographic characteristics of women who smoke after birth are similar to those who smoke during pregnancy. Women under the age of 18 have the highest rates of smoking after birth (16.3 percent) followed. Women who are unmarried have higher rates of smoking after birth than married women (18.3 percent vs. 6.1 percent, respectively). Women with less than high school education (15.7 percent) and high school graduates (16.5 percent) had higher smoking rates than college graduates (7.1 percent).

### Characteristics of Prenatal Smokers



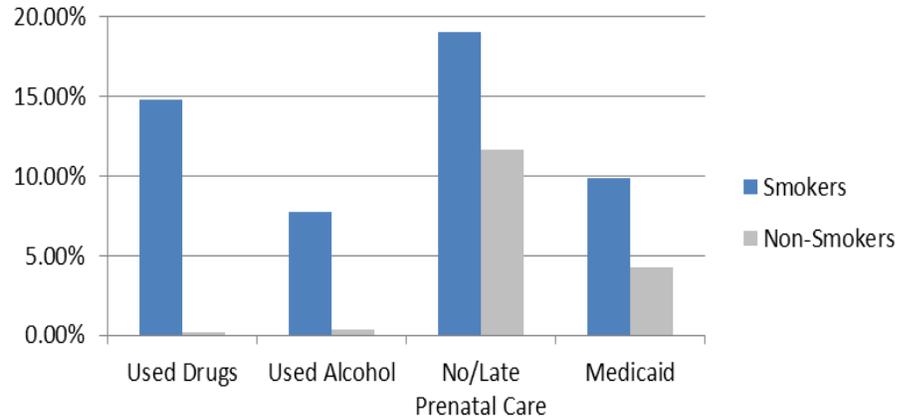
Source: NJ-PRAMS Chart Book Tables. Retrieved on September 19, 2015 from the New Jersey Department of Health, Family Health Services: <http://www.nj.gov/health/fhs/professional/prams.shtml#chart> and New Jersey Birth Certificate Database. Retrieved on February 10, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data: <http://nj.gov/health/shad>.

## Health Behaviors and Access

Based on data from the 2009-2011 PRA, smoking and exposure to second and third hand smoke were relatively high. Nearly 18 percent of women reported smoking in the month prior to finding out they were pregnant and 19 percent report exposure to second and third hand smoke in the month prior to determining pregnancy.

Differences in health behaviors and utilization are also present in women who smoke during pregnancy compared to those who do not. Women who smoke are also more likely to use drugs during pregnancy than women who don't smoke (15 percent vs. <1 percent, respectively). Women who smoke during pregnancy also use alcohol at higher rates than those who do not smoke (7.7 percent vs. 0.4 percent, respectively). Of those births who reported no prenatal care (PNC) or

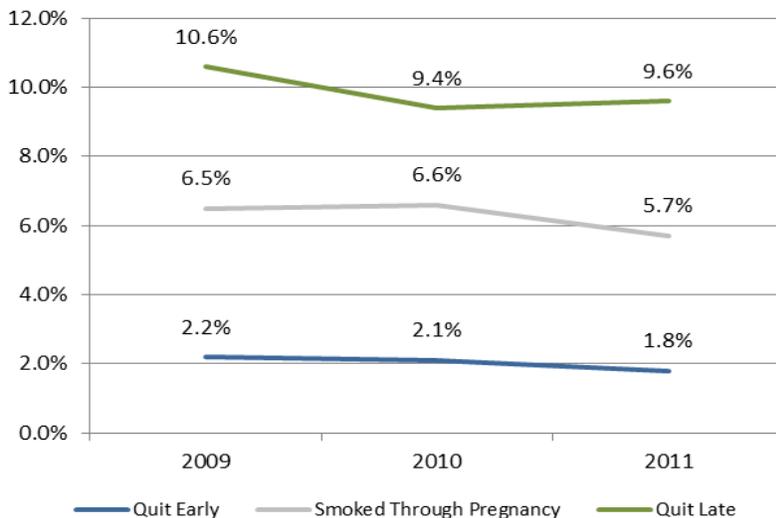
**Smoking Status & Health Behaviors and Access**



Source: New Jersey Birth Certificate Database. Retrieved on February 10, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data: <http://nj.gov/health/shad>.

prenatal care onset during the third trimester, 19 percent and 11.6 percent reported tobacco use during their pregnancy. Additionally, women who are living in poverty and qualify for publicly funded insurance (Medicaid) are more likely to smoke than those not living in poverty or who do not qualify for Medicaid (9.9 percent vs. 4.3 percent).

**Smoking Status Throughout Pregnancy**

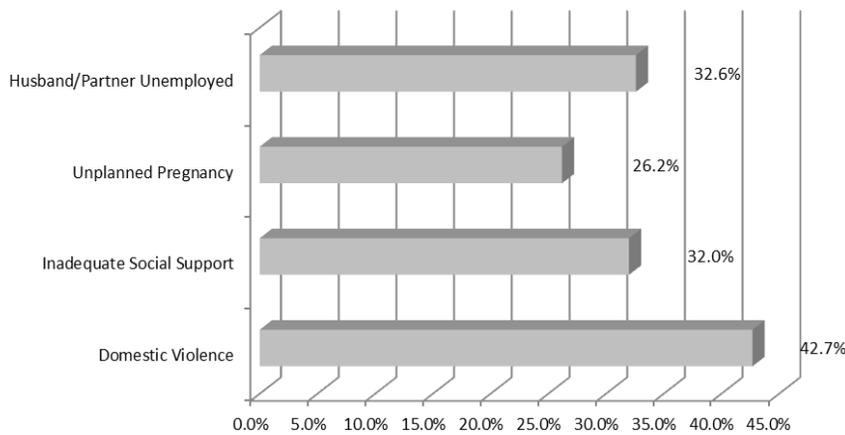


The PRAMS survey also collected responses to determine if a pregnant woman quit at any point in her pregnancy. Of the women surveyed 1.8 percent quit early, 9.6 percent quit late and 5.7 percent smoke throughout pregnancy. The intendedness of pregnancy is also associated with smoking, such that more than 24.7 percent of women who had an unwanted pregnancy smoke. More than 25 percent of women who were on SCHIP or Medicaid smoke. Finally, women with partners who smoke had the highest rates of smoking during pregnancy (37 percent). Nearly 10 percent (9.7 percent) of women surveyed smoke after the birth of the baby.

Source: NJ-PRAMS Chart Book Tables. Retrieved on September 19, 2015 from the New Jersey Department of Health, Family Health Services: <http://www.nj.gov/health/fhs/professional/prams.shtml#chart>

# Psychosocial Factors

Smoking and Psychological Risk Factors



Source: Perinatal Risk Assessment descriptive analysis from forms submitted statewide. Analysis provided by the Southern New Jersey Perinatal Cooperative.

violence. Women who have an unemployed husband or partner smoke at twice the rate of women who have an employed husband or partner (32.6 percent vs. 16.2 percent, respectively). Women with an unplanned pregnancy smoke at more than twice the rate of those who have a planned pregnancy (26.2 percent vs. 12.6 percent, respectively). Women experiencing inadequate social support

have 1.6 times higher rates of smoking (32 percent) compared with only 19.5 percent of women with adequate social support reported smoking in the month prior to finding out about pregnancy.

## Provider Interventions

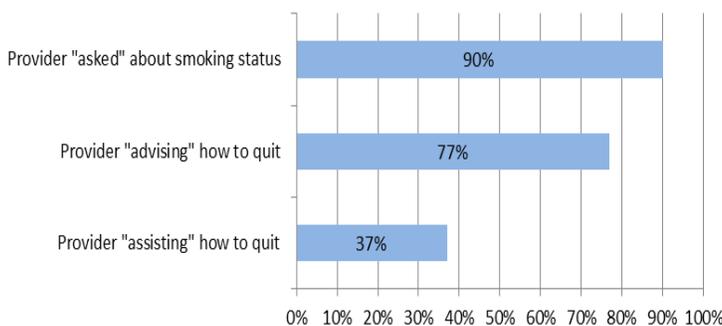
During the first prenatal visit providers can assess smoking status and provide women with advice to quit. Of women who smoke:

- Ninety percent report being “asked” smoking status
- Seventy-seven percent report being “advised” on how to quit smoking
- Only 37 percent report provider “assisting” in quitting

Women who experience psychosocial risk factors have higher smoking rates than those who do not. These psychosocial risk factors include having: a husband or partner unemployed, an unplanned pregnancy, inadequate social support, and experienced domestic

*Women with unplanned pregnancies smoke at nearly three times the rate of those who have planned pregnancies.*

Providers & Smoking Intervention



Source: Perinatal Risk Assessment descriptive analysis from forms submitted statewide. Analysis provided by the Southern New Jersey Perinatal Cooperative.

## Domestic Violence and Smoking

There is a strong correlation between intimate partner violence and smoking. Abuse is a significant stressor that is a barrier to smoking cessation. Internationally women experiencing domestic violence are 58 percent more likely to pick up smoking than women not experiencing violence. Indeed, data from the PRA suggests that the highest rates of smoking are among women reporting domestic violence. Nearly 43 percent of women who experienced domestic violence also smoked in the month prior to pregnancy, while only 20 percent of women who report not experiencing domestic violence smoked prior to pregnancy.

# Adverse Birth Outcomes

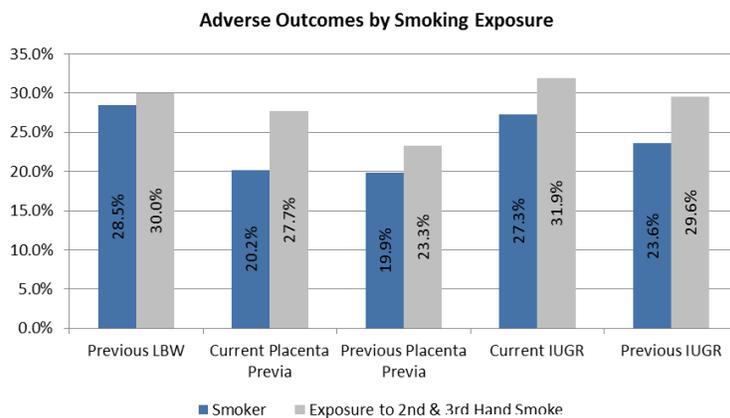
Consistent with national data, babies born to mothers who smoke during pregnancy have worse birth outcomes than babies born to non-smokers in New Jersey. The PRA asks women about adverse outcomes in the current and prior pregnancies. The results of the 2009-2011 data suggest that women, who smoke or have exposure to second or third hand smoke, have higher rates of adverse outcomes than normal outcomes. For women who have low birth weight babies in prior pregnancies, 28.5 percent smoked in the month prior and 30 percent experienced second or third hand smoke. Of women experiencing placenta previa in current pregnancy, 20.2 percent smoked in the month prior and 27.7 percent were exposed to second and third hand smoke. Nearly 20 percent of women experiencing placenta previa in prior pregnancies smoked in the month prior to current pregnancy and 23.3 percent experienced second or third hand smoke exposure.



## Births to Multiples

Women who give birth to multiples and also smoked during pregnancy also have disproportionately worse outcomes.

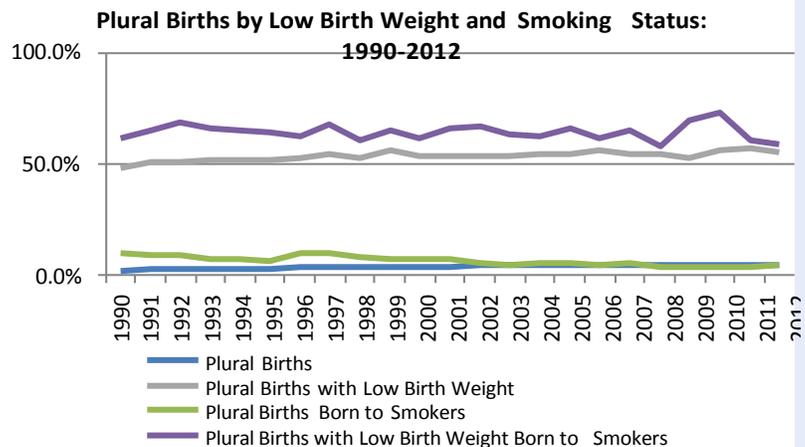
- In New Jersey multiple births have increased by 72 (1990-2012)
- Multiples account for 4.5 percent of births in New Jersey (2009-12)
- Multiples have an increased risk of adverse outcomes
- Smoking increases risk of adverse outcome
- Smokers account for 17 percent of low birth weight multiples but only 4.5 percent of multiple births.



Source: Perinatal Risk Assessment descriptive analysis from forms submitted statewide. Analysis provided by the Southern New Jersey Perinatal Cooperative.

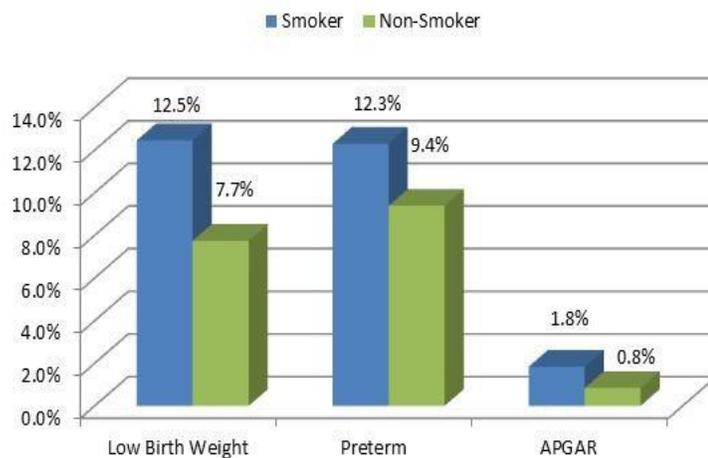
For women experiencing intrauterine growth restriction in the current pregnancy, 27.3 percent were smokers in the month prior and 31.9 percent were exposed to second and third hand smoke. Nearly 24 percent of intrauterine growth restriction in prior pregnancies smoked in the month prior and nearly 30 percent were exposed to second and third hand smoke.

Results from the PRA suggest that women who are exposed to second and third hand smoke are actually at an elevated risk for adverse outcomes compared to those who smoke. This may be the combined influence of the mother smoking and exposure to second and third hand smoke that exacerbates adverse outcomes; however, the data available do not allow for this level of analysis.



Source: New Jersey Birth Certificate Database. Retrieved on March 2, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data: <http://nj.gov/health/shad>.

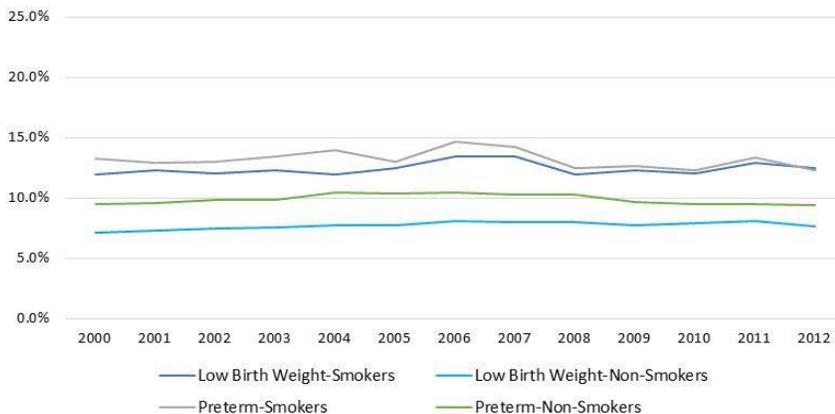
### Adverse Outcomes by Smoking Status for 2012



Source: Perinatal Risk Assessment descriptive analysis from forms submitted statewide. Analysis provided by the Southern New Jersey Perinatal Cooperative.

According to data from the EBC, between 2008 and 2012 women smoking during pregnancy account for 5.5 percent of the births. Among women who smoke, 12.5 percent delivered a low birth weight baby in 2012 while only 7.7 percent of non-smokers delivered a low birth weight baby. Preterm birth rates were also higher among smokers such that 12.3 percent of smokers had babies born preterm while only 9.4 percent of non-smokers had preterm births. Finally, women who smoked had an elevated risk of having babies born with low 5-minute APGAR scores (1.8 percent of births to smokers and 0.8 percent of births to non-smokers).

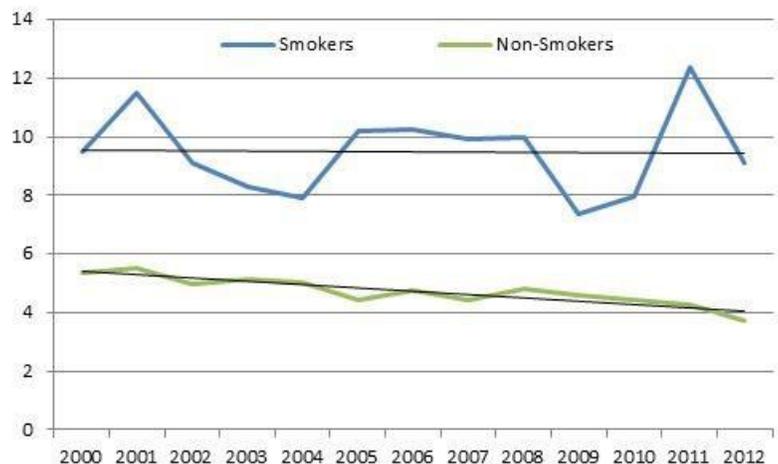
### Low Birthweight and Preterm Birth by Maternal Smoking Status: 2000-2012



The percent of babies born either preterm or with low birth weight has remained relatively stable between 2000 and 2012, regardless of smoking status. The gap between smokers and non-smokers has also remained stable with women who smoke being 1.3 times more likely to have a preterm birth and 1.6 times more likely to have a low birth weight baby.

Infant mortality is also higher among women who smoke. Between 2000 and 2012, 7,065 infants died within the first year of life. The infant death rate is 4.5 deaths per 1,000 births while for smokers the death rate is 9.5 infant deaths per 1,000 live births. Women who smoked experienced an infant death rate that was between 1.4 and 2.9 times higher than women who did not smoke. The overall trend of infant mortality for non-smokers has been decreasing, while the trend for smokers has remained stable over time. This suggests that babies born to smokers may not benefit from medical advances that sustain the lives of preterm and low birth weight babies.

### Infant Deaths per 1,000 Live Births by Smoking Status: 2000-2012



Source for charts on this page: New Jersey Birth Certificate Database. Retrieved on February 10, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data: <http://nj.gov/health/shad>.

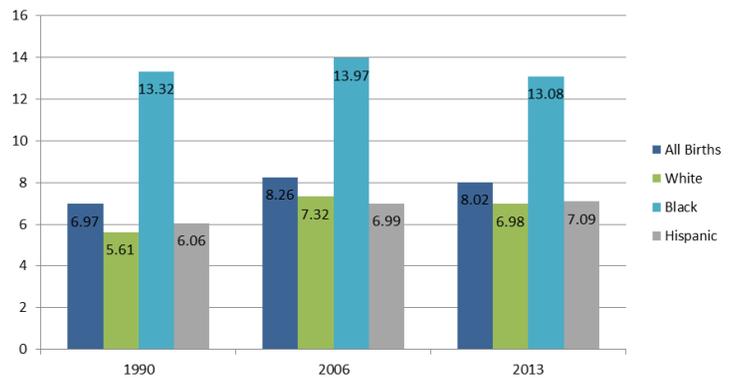
# Health Disparities

Racial disparities in infant outcomes remain a persistent issue in the United States. Although the U.S. is one of the wealthiest countries in the world, this wealth does not translate to equal health outcomes for all Americans. The disparities in low birth weight, preterm birth and infant mortality remain a stark feature of the national landscape. Although these disparities have been spotlighted for nearly three decades, little has been accomplished in decreasing these disparities.

In the U.S. blacks experience a low birth weight rate of more than two times that of whites and a preterm birth rate of 1.5 times that of whites. This trend is also present among New Jersey blacks and the disparities are exacerbated by smoking.

Studies also suggest that exposure to smoking impacts white and black women differently, black women who smoke are more likely to have adverse pregnancy

Low Birth Weight per 1,000 Births by Race for the United States



outcomes compared to white women who smoke, this differential impact can be explained by the fact that black women are more vulnerable to the interactive effect of smoking and life course stressors (Berg, Wilcox, & d’Almada 2001). Tobacco smoke and psychological stresses could produce multiplicative effects on the vascular system and placental blood vessels, which could compromise the fetal blood flow which may increase the risks for intrauterine growth restriction, preterm birth, and fetal death (Salavia & Shiverick 1999).

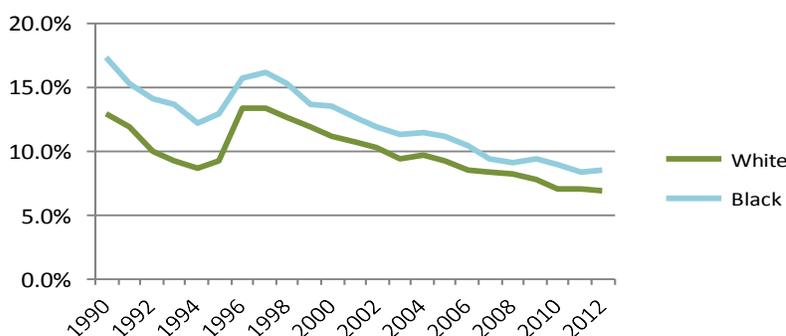


## Health Disparities and Infant Outcomes in New Jersey

Disparities in smoking rates are also present by race. Based on data from 2009-2012, black, non-Hispanic women comprised the highest racial demographic at 8.9 percent who smoke during their pregnancy, followed by 7.3 percent White Non-Hispanics, 3.4 percent Hispanic, and 1 percent Asian. Although black, non-Hispanic women report higher rates of smoking during pregnancy than their white counterparts, the gap has been decreasing since 1990. According to

PRAMS, white women had overall higher rates of smoking (22.7 percent) and higher rates of quitting late in pregnancy (12.3 percent) while 18 percent of black women smoked and 8 percent quit late in pregnancy. White women and black women had similar rates of smoking throughout pregnancy (8.2 percent vs. 8.4 percent, respectively). Nearly 14 percent of white women smoke after birth and slightly more than 14 percent of black women smoke after birth. Racial disparities in birth outcomes are exacerbated by smoking.

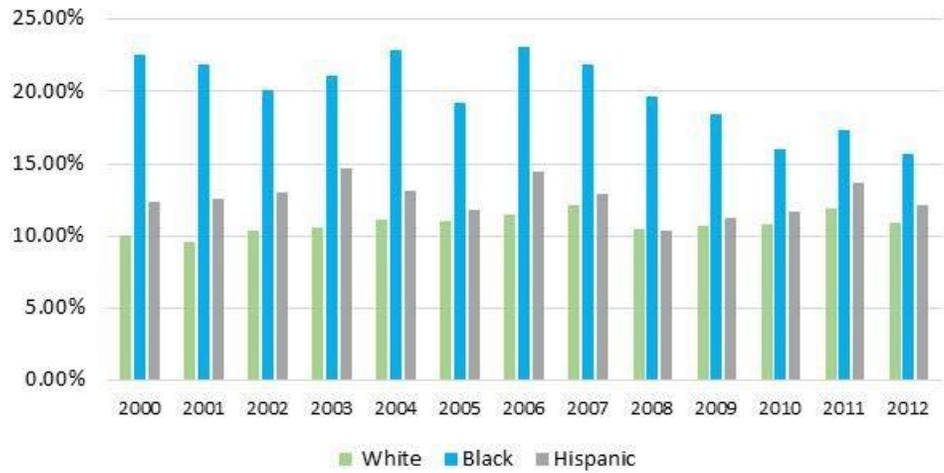
Smoking Rates during Pregnancy by Race: 1990-2012



Source for charts on this page: New Jersey Birth Certificate Database. Retrieved on February 10, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State

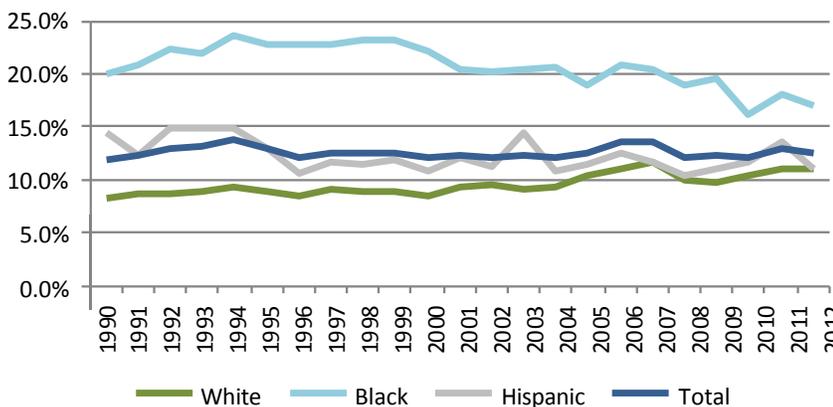
Not only do black women have higher rates of smoking during pregnancy than their white counterparts, the data show that racial disparities in adverse outcomes persist in smokers. The negative outcomes associated with smoking do not diminish the impact of race on birth outcomes. For example, babies born to black women who smoke are 1.45 times more likely to be preterm birth than their white counterparts, such that in 2012 white women experienced a preterm birth rate of 10.9 percent compared to 15.7 percent for blacks.

**Preterm Birth Rate for Smokers by Race 2000-2012**



*Racial disparities in birth outcomes disadvantages an entire race of people before they are born and those disadvantages are only exacerbated by smoking during pregnancy*

**Percent Low Birth Weight by Race for Women who Smoke During Pregnancy: 1990-2012**



Blacks who smoke experience a low birth weight rate of 1.54 times that of their white counterparts. Such that in 2012, 17 percent of babies born to black women who smoke were considered low birth weight and only 11.0 percent of white smokers delivered low birth weight babies.

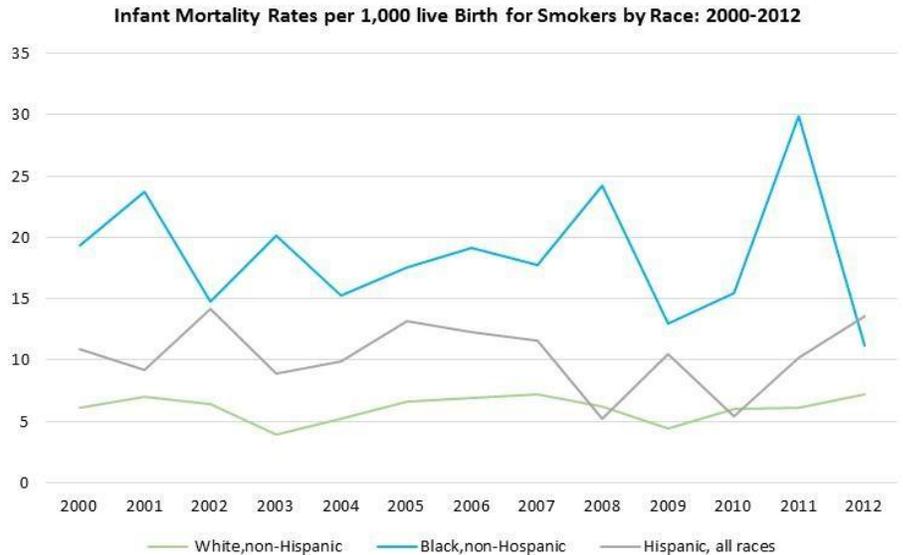
The racial gap in preterm birth and low birth weight has diminished between 2000 and 2012 when black smokers experienced 2.6 times greater rates of preterm birth and 2.3 times higher rates of low birth weight than white smokers; however, the racial gap continues. Racial disparities in preterm and low birth weight put black children at an elevated risk for a host of long-term health impacts that white children do not experience. These disparities in birth outcomes disadvantages blacks before they are born and continue throughout their life.

Source for charts on this page: New Jersey Birth Certificate Database. Retrieved on February 10, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data: <http://nj.gov/health/shad>.

## Racial Disparities and Infant Mortality

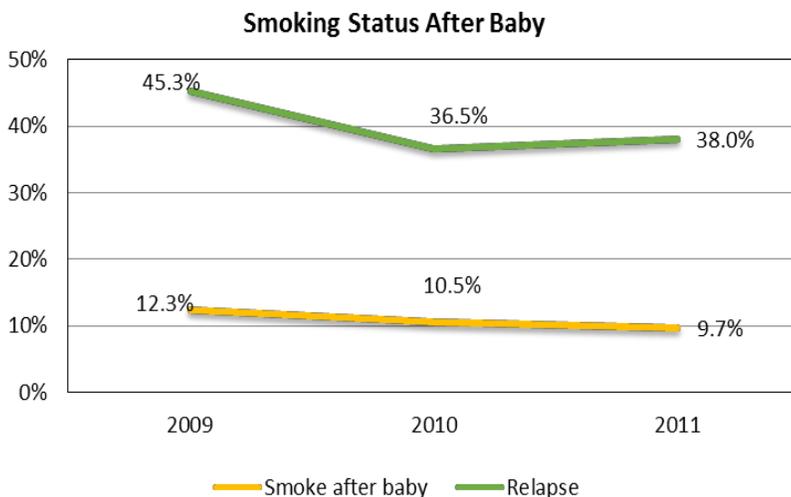
The leading cause of infant mortality in New Jersey is complications associated with prematurity. Black infants are at greater risk of being born premature and this risk translates to infant mortality rates that are substantially higher for blacks compared to whites. In New Jersey, the black infant mortality rate is three times higher than that of whites (11.1 per 1,000 births compared with 2.7 per 1,000 births). The percent of infant deaths to women who smoked during pregnancy is also higher among blacks. Infants who are born to black smokers experience a mortality rate of 11.2 per 1,000 live births while white infants die at a rate of 7.6 infant deaths per 1,000 live births.

For Hispanic women who smoke, the infant mortality rate has generally fallen in between the rate for whites and blacks, with 2008 and 2010 being the only years in which Hispanics had a lower infant mortality rate than whites. In 2012, Hispanics witnessed an infant mortality rate greater than that of blacks among the smoking population (13.5 per 1,000 live births); however, with low numbers of actual deaths (12 deaths among 887 births to Hispanic smokers), the numbers should be interpreted with caution.



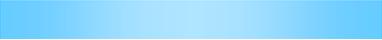
Source: New Jersey Birth Certificate Database. Retrieved on February 10, 2016 from the New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data: <http://nj.gov/health/shad>.

## Smoking Postnatally



Source: NJ-PRAMS Chart Book Tables. Retrieved on September 19, 2015 from the New Jersey Department of Health, Family Health Services: <http://www.nj.gov/health/fhs/professional/prams.shtml#chart>

As reported earlier, smoking in the postnatal period also has health implications. PRAMS collects information on smoking after birth and finds that smoking rates in the postnatal period are higher than in the prenatal period. According to 2011 PRAMS data, 9.7 percent of the women surveyed had reported they smoked after the baby was born, this category includes any mom who smoked after delivery who quit during pregnancy, who did not quit during pregnancy, or who started smoking after delivery. Of those who did quit, greater than a third reported relapsing and smoking after the baby was born. The relapse rate of 38 percent highlights the need for on-going postpartum support even once the baby is born to reduce SHS exposure to infants.



## Summary and Conclusions

Multiple sources of data were investigated to understand rates of smoking before, during and after pregnancy in New Jersey, as well as determine the characteristics of those who smoke. Women who smoke before, during and after pregnancy are more likely to be younger, unmarried, and have lower levels of education. Although blacks and whites have similar smoking rates, the negative impact of smoking may be exacerbated for blacks who are significantly more likely to have poorer birth outcomes than their white counterparts. Tobacco use is a risk factor for low birth weight and preterm birth, by decreasing tobacco use a decrease in low birth weight and preterm births can result. Therefore, smoking cessation may decrease the infant mortality rate in Black non-Hispanics. Smoking is also attributable to SIDS related deaths. There is also a considerable disparity in SIDS rate between Black non-Hispanics and White non-Hispanics. Black non-Hispanic women who continue to smoke in the post-partum period expose infants to tobacco smoke thus increasing their risk for SIDS. Women who smoke are also less likely to access prenatal care and are more likely to have publically funded health insurance. Late access to care and being on Medicaid are also associated with increased adverse birth outcomes. Increasing smoking cessation efforts to these populations could help decrease poor birth outcomes as well as infant mortality rates.

Women need the education and support services to help them understand the importance of quitting not only for their own health but also for their babies. Currently providers are aware of asking about smoking status and advising on the harmful effects of smoking, however, this data demonstrates a gap where providers not only need to ask or advise, but to complete the intervention protocol by assisting their patients with referrals to appropriate smoking interventions when the patient shares she is a smoker who wants to quit. According to the CDC, New Jersey Medicaid provides funding for prescription treatment of tobacco dependence, and individual counseling, but does not provide funding for group or telephone counseling. Women who are on Medicaid would benefit greatly from such counseling during pregnancy.

## Strategies

Pregnancy provides a unique window of opportunity to reinforce the negative health impacts of exposure to tobacco smoke and may make the woman more receptive to a smoking cessation program (PRAMS 2007). The pressure a pregnant woman feels from society to quit could motivate her by evoking a sense of guilt and responsibility to her child's health, but at the same time can make quitting very challenging. To increase the likelihood of successfully quitting, programs need to be accessible and appropriate for pregnant women. There are also programs using best practices and various other resources aimed at smoking cessation of pregnant women. In addition to professional organizations such as the American College of Obstetrics and Gynecology (ACOG), other organizations have reached out to women and families about the dangers of smoking and the link to poor birth outcomes. The Center for Disease Control and Prevention (CDC) and March of Dimes are two prominent national organizations that have publicized the dangers of smoking for a pregnant woman. Their

anti-smoking campaigns not only include information on the harmful effects of smoking to one's baby, but also provide tools and resources to help quit smoking for both the patient and the health care provider. There are a number of evidenced-based tobacco cessation programs available to the community and healthcare professionals. While it is difficult to ascertain all programs specific to NJ to address women's smoking habits during pregnancy, there are a number of programs that are generally used and recognized in the state as being available to this population.

Significant research has been conducted to determine which programs work best at increasing smoking cessation. The research suggests that there are six evidence-based strategies that purport positive results: brief interventions and the 5 A's, quitlines, psychosocial interventions, medications-pharmacotherapy, and nicotine replacement therapy. The following section outlines some of those programs.

## Evidence-Based Programs

ACOG offers an office based intervention called the 5A's (Ask, Advise, Assess, Assist, Arrange) which provides the much needed support to help a pregnant mom quit smoking. The 5A's is an ACOG protocol which can be completed in under 10 minutes where the provider first "asks" the patient about her smoking status, second "advises" the patient to quit with a personalized message as to how smoking will affect her and her baby, next "assesses" the patient's willingness to quit, followed with "assisting" the patient by providing methods for quitting, and last "arranging" an intervention with the patient. Health care providers are the main "point person" to assess a woman's smoking habits, discuss with her the risks of smoking during pregnancy, the important benefits of staying smoke free in the postpartum period, and/or refer her to appropriate interventions such as smoking cessation groups or telephone support. Evidence suggests that practitioners that follow the 5As in an office setting have significantly higher cessation rates than practitioners who do not (Williams *et al.* 2014). Therefore, it is imperative that clinicians are trained in a smoking cessation methodology. Recognizing that the 5A's may be time consuming for a clinician to administer, the Comprehensive Tobacco Control

Program (CTCP), operated by the New Jersey Department of Health, called on healthcare providers to help patients quit smoking by utilizing 2A's + R (Ask, Advise, Refer) a 30 second modified version of the 5A's with the intention to be less time consuming for the clinician. The CTCP provides services, information, and funding to help decrease morbidity rates associated with tobacco use and secondhand smoke in NJ.



The second evidence-based program that shows success is the Quitline. Research suggests that



those accessing a Quitline are 60 percent more likely to quit smoking than those who attempt to quit on their own (Zhu *et al.* 2002). The *New Jersey Quitline* is a general telephone counseling service which has counselors who offer individualized coaching and support and who can coach a pregnant woman to discuss her smoking habits

with her providers. This multilingual telephone counseling service discusses with patients their desire to quit, barriers, smoking history, triggers, a plan to quit, and avoiding relapse. The New Jersey Quitline is not specifically aimed at pregnant women, but rather the general population of smokers. It can be initiated by a pregnant woman anytime and telephone coaching, support, and enrollment continues several months after the

## NEW JERSEY QUITLINE

initial call to ensure progress and satisfaction, with the ability to call a Quit Coach anytime. A Quit Coach is available throughout the week from 8am-3pm EST, and after hours there is access to voice mail and quit tips. Although the Quitline uses evidence-based strategies to improve cessation rates, the utilization of the Quitline is quite low. In 2010 5,525 calls were received by the Quitline and approximately 0.2 percent of all smokers in New

Jersey received telephone counseling, cessation medication, or both from the Quitline.

Psychosocial interventions have also shown promise in reducing smoking. These interventions can be provided by smoking cessation specialists, practicing clinicians, and healthcare administrators. The purpose of these interventions are to reduce the impact of stressful events, decrease distress and disability, minimize symptoms, improve quality of life, reduce risk, improve communication and coping skills; and/or enhance treatment adherence (Skaar *et al.* 1997). Many of these therapies have been most successful in the form of group counseling, a more effective method than self-help materials. Group therapies are based on the stages of change model to assist smokers in developing skills to quit smoking. New Jersey offers several Quit Centers throughout the state that offer face-to-face counseling using the evidence-based methods introduced through psychosocial models. The sessions offered by the Quit Centers in New Jersey have associated fees ranging between no cost up to \$15 per session. However, these programs are not aimed at pregnant women.

If behavioral interventions prove to be unsuccessful, nicotine replacement therapy could be considered, but ACOG cautions patients to be closely supervised and clinicians consider the risk of smoking and the use of nicotine replacement therapy (ACOG 2012). In 2014 a report was provided regarding a randomized placebo-controlled clinical trial and its safety and efficacy on infant development two years after delivery. The study found those infants whose mothers used NRT during their pregnancy survived without developmental impairments compared to the placebo group. However, there were no differences in the frequency of respiratory problems between the two study groups.

Unfortunately, the study also concluded there was not a long term effect of smoking cessation after delivery (Cooper, Lewis, Thornton, Marlow *et al.* 2014). There does not appear to be standard guidelines on NRT use during pregnancy which may be due to studies like these lacking consistent reports.

## Other Programs

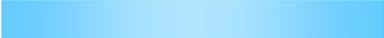
Besides national campaigns and health care provider interventions, other methods of tobacco cessation that have been utilized include self-help materials, telephone hotlines, internet websites, individual counseling, and smoking cessation groups (see Appendix 1).

Currently in New Jersey, there are two resources specific to pregnant women that can be used to help support their efforts to quit smoking (see Appendix 1). *Mom's Quit Connection* (MQC) of the Southern New Jersey Perinatal Cooperative and the *Perinatal Addiction Prevention Program* (PAPP) of the Central Jersey Family Health Consortium (CJFHC). Each offer a different delivery model for tobacco cessation but they are similar in that each tailors their tobacco cessation message specifically to pregnant or parenting women.



Mom's Quit Connection's primary focus is to provide smoking cessation support for women who are pregnant or are in the postpartum period. The goals of MQC include increasing the number of pregnant women who quit smoking during pregnancy, increasing the number of women who do not relapse after delivery, and increasing number of mothers, caregivers, family members of young children to quit or reduce smoking thus reducing the child's exposure to second hand smoke. This comprehensive program includes a perinatal case management system providing individual counseling in the client's community, provider education regarding assessment and referral for the pregnant smoker, and community prevention education and outreach. Beginning in 2001, trained MQC staff initially conducted intervention training using the ACOG 5A's protocol and then adopted the modified 2A's + R intervention at individual providers' offices which continues today. MQC staff also offer prenatal providers resource information, counseling tools, patient education materials as well as a two and six month post training follow up. MQC has developed a Provider Toolkit with tools and resources such as patient education sheets, web banner ads, and posters for healthcare

professionals to use in their practice setting. This program will follow a mom until the child is six years old. In New Jersey, Mom's Quit Connection (MQC) has been an integral strategy in addressing pregnant women as a high risk group in need of specialized cessation services. In an effort to reduce an infant's exposure to second hand smoke MQC also refers family members to the New Jersey Quitline. In 2010 MQC created a database to specifically track both MQC client activity and outcomes as well as provider contacts, networking, and education. In July 2015, the Perinatal Risk Assessment (PRA) was automated to electronically refer to MQC. Each new referral from a PRA provider who has not had a training is then contacted by MQC staff to schedule an intervention training. From 2009-2011 MQC has trained over 1200 clinicians on tobacco cessation, and has the professional networks to continually increase its reach statewide. During the same time period approximately 1300 clients received self-help materials and slightly over 200 clients entered case management. At 2 and 6 month providers' post training assessment, outcomes have remained consistent with a reported 75-85 percent increase in the use of the brief intervention model. Data indicates that increasing awareness and referral skills among providers drives referrals to MQC, from 2014-mid August 2015 over 90 percent of referrals to MQC were made by trained providers. The MQC database supports MQC program goals by being data driven, an example includes sending providers status updates on referred clients. In terms of client outcomes data, from 2011-2014 the average quit rate among MQC clients was 23 percent, while another 49 percent significantly reduced smoking during their pregnancy. In addition on average, MQC's Fax to Quit program receives annually between 400 and 500 referrals from its clinician partners. Once primarily based in the southern region of the state, MQC now provides its services statewide with a counselor in the north, central, and southern part of New Jersey who are assisted by two health educators all of which are Certified Trained Tobacco Specialists (CTTS). MQC has been successful in marketing their program through social media, and cable television, but realizes the importance of testing advertisements through digital markets such as Pandora, Spotify, and Hulu.



## Perinatal Addictions Prevention Project

As part of the statewide Perinatal Addictions Prevention Project, the Central Jersey Family Health Consortium provides education for professionals and consumers regarding substance use before, during, and after pregnancy. Education focuses on prevention and risk reduction to improve the health of women and children and their families. The Perinatal Addiction Prevention Project (PAPP) has also established a 6 week smoking cessation curriculum for women in their child bearing years. The content is supportive and didactic. In conjunction with the consumer groups, Nicotine Replacement Therapies (NRTs) will be prescribed as needed by qualified health care professionals. PAPP also promotes the use of a prenatal screening tool, called 4Ps Plus, for alcohol, tobacco, other drugs and domestic violence. The tool also offers appropriate intervention to address these maternal and fetal risk factors. PAPP receives requests from a facility which wishes to hold a smoking cessation group, and offers a \$100 stipend to any agency that hosts the six week program. In addition, through their professional networks PAPP personnel outreach to various community and outpatient facilities to determine their interest in hosting the six week smoking cessation program. The Perinatal Addiction Prevention Program of CJFHC which is pregnancy focused is limited to the central Jersey region and only takes place in a group setting as part of an established intensive outpatient program. During July 2014 thru March 2015, 3 groups were conducted where 48 women participated, of which 24 reported cutting down and 7 quit smoking. Currently there are PAPP programs available through other consortia; however, they do not offer smoking cessation programs.

Other programs offered to the general public include programs at Shore Medical Center in Somers Point, Atlantic Health in Morristown, Rutgers School of Public Health in New Brunswick, the Tobacco Quit Center, HiTops and Barnabas Health. Shore Medical Center and Rutgers School of Public Health both offer individual counseling while Atlantic Health holds a “Quit Smoking Program” group. All programs will enroll pregnant mothers if they wish but to provide tailored pregnancy support all programs refer pregnant women to MQC.

The *Tobacco Quit Center* offers either individual or group counseling as part of a four to six week program which meets once per week. This program takes place on site at the Robert Wood Johnson Somerset Hospital and is a service offered to the general public. Pregnant Moms are referred to MQC for pregnancy focused support. Additional services available in New Jersey include HiTops, Inc and Barnabas Health. HiTops is a counseling program offered to individuals aged 13-27 that also offers NRT. Barnabas Health does not provide tobacco cessation programs for the general public, their program is hospital focused and provided as part of the patient care for those admitted to the hospital. For pregnant women who are admitted or identified as high risk through the clinic and documented smokers, they will be referred to respiratory therapists who will assist them with a treatment plan and follow up phone calls.

In addition to the New Jersey-based programs, there are also national programs that address smoking cessation. *SmokeFreeMom* is a 24/7 text messaging service designed with tips, advice, and encouragement to help pregnant women quit smoking. This service can be accessed from the *SmokeFreeWomen* website which is created by Tobacco Control Research Branch, Behavioral Research Program, Division of Cancer Control and Population Sciences of the National Cancer Institute. *SmokeFreeMom* specifically addresses pregnant women and is a texting service which lends well to younger women who are more technology driven as an accessible, fast, and convenient way to provide support and follow up to six months after a quit date. In addition to receiving texts the patient can text back when a craving hits, threat of relapse, or simply needing extra support as well as email or call a counselor. However, there is a cost associated with this service; individual’s text and data rates from their mobile carrier would apply. It should also be noted that there are two different *SmokeFreeMom* websites (.org and .com). The later promotes the use of glycol based cigarettes. The American Lung Association (ALA) offers telephone counseling and can check availability of group counseling in one’s area by contacting them on their toll-free telephone line. The ALA also offers their online *Freedom from Smoking* program, which consists of eight sessions featuring a step-by-step plan for quitting smoking.

## Gaps in Services

There are several gaps identified in smoking cessation services for pregnant women in New Jersey. These gaps include: limited availability of programming focused on pregnant woman, program initiation being physician-based or within the medical setting, referral-based programming, lack of focus on second and third hand smoke, and limited service locations.

The health consequences of smoking on a fetus are well documented; however, there is limited availability of programs that directly support pregnant women in their need to quit smoking. Currently in New Jersey there are only two programs that directly address smoking among pregnant women (MQC and PAPP). The programs have limited scope when addressing smoking among pregnant women. Between 2009 and 2011, 18,342 women reported smoking during pregnancy. The MQC only served approximately seven percent of this population while the PAPP program served less than one percent. This leaves nearly 17,000 women without services tailored to them.

Tobacco cessation programs are generally initiated by medical professionals. This is true for both pregnant women and the general public.

Additionally, many of the programs available in New Jersey are based out of hospitals or other medical settings. Initiating and providing services within a medical setting is problematic. There are higher rates of smoking among women who are socially and economically disadvantaged. These groups are also more likely to delay initiation of prenatal care. Women who are disadvantaged may not get the cessation message until well into their pregnancy if they receive the message at all. In addition, black populations have historically distrusted the medical

system (Gamble 1993). This distrust may inhibit the rapport with their physician to admit to smoking or take cessation advice. Finally, many smokers believe that the health consequences are exaggerated and may see physicians and medical professionals as promoting those exaggerated consequences therefore not trusting the message. Community-based, peer-to-peer or culturally tailored programs are not readily available in New Jersey. The group-based counseling available is generally provided at a hospital or clinic and facilitated by a medical professional.

Barriers to quitting vary by person and subgroup; therefore, programs should also vary in delivery in order to reach the broadest range of people. By only providing limited types of programs (telephone support, text support, individual counseling with a medical professional or group counseling in a medical setting), opportunities are missed to provide culturally relevant programming where the women who are in the greatest need. By coordinating services between healthcare providers, hospitals, and community non-profits, women who are less likely to be reached through traditional forms, can be reached within the community. Many times community organizations are the first resource accessed and providing services through these agencies can further the reach of cessation messaging.

### Bridging the Gaps

There are several gaps that have been identified including:

- Limited availability of programming for pregnant women
- Physician-based initiation of services
- Referral-based programming
- Second and third hand smoke largely ignored
- Limited service locations



Currently, there are limited programs that do not require a referral. The individual and group counseling for smoking cessation generally require a referral from a medical professional. Of the programs available, only five provide individual counseling at the patient's request (Tobacco Center, Shore Medical Center, MQC, Rutgers School of Public Health, and PAPP). Women who are at greatest risk of smoking during pregnancy also have low levels of access to care and utilization of care; therefore, referrals are an inefficient way of reaching this population.

The focus of the smoking cessation program is for the current smoker; however, the negative health consequences of second-hand smoke exposure are well documented. Although there is a need for programs, current programs do not provide opportunities for women who experience second-hand smoke the opportunity to obtain skills to empower them to set boundaries and limit or eliminate exposure to second hand smoke. Additionally, the evidence-based programs like the 5 A's does not ask about second hand smoke or provide referrals for the woman's family members who smoke.

Another limitation to current service availability in New Jersey is limitations on locations of services. Currently, only two programs offer counseling that is available in multiple locations (PAPP, MQC). Other programs that offer individual or group counseling only have one service location and it is generally the hospital or clinic. *New Jersey Quit Line*, *American Lung Association* and *SmokeFreeMom* are phone counseling and texting services for those who do not want to meet in person or have time restrictions in making an individual or group appointment. The American Lung Association provides telephone support through their *Freedom from Smoking (FFS)* program. The FFS program can either be done through a group or online, however, groups are limited based on location availability. However, for women who do want the group support or individual counseling, they are limited to seeking out services through a hospital or medical center/clinic. The gaps outlined above create barriers to women quitting smoking, thus putting an entire cohort of children at greater risk for lifelong health and cognitive difficulties. By providing a greater variety of services available to women that are culturally and socially diverse, pregnant women may have a greater chance of quitting.

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*In 2012 women who smoked had an infant death rate 2.4 times higher than women who did not smoke.*

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## Recommendations

There are two main directions in recommendations to address prenatal smoking cessation: prevention of smoking initiation and interventions for smoking cessation. In order to adequately address both prevention and intervention, funding for tobacco related programs is needed. Currently, New Jersey spends approximately \$2.5 million on tobacco related programs. There has been a decline in resources dedicated to smoking cessation in New Jersey and nationally since 2009. In order to address prevention and intervention strategies, resources could be allocated to programs that are proven effective at preventing smoking initiation and treating current smokers. The recommendations focus on seven main areas within the prevention and intervention milieu.

### Prevention

The first step in addressing the issue of prenatal tobacco exposure is through prevention. Prevention is critical. Although initiation of smoking among high school students has decreased substantially in New Jersey over the last 20 years, New Jersey still ranks 20<sup>th</sup> out of 44 states in smoking rates among high school students (CDC 2012). Additionally, New Jersey ranks 46<sup>th</sup> among all states in counter marketing against smoking to the general population and 45<sup>th</sup> in anti-tobacco media campaigns targeted to children (CDC 2012). These marketing strategies are considered best practice according to the CDC in prevention of smoking initiation. In order to prevent smoking initiation, we provide two recommendations.

### Counter Marketing Campaigns

To decrease the likelihood of smoking initiation, New Jersey needs to increase their media foot print against smoking. The CDC provides multiple types of advertising that can be used for television and print. These advertisements are targeted to groups at highest risk of initiation. By providing funding to purchase advertising time/space and increase the saturation of advertising against smoking New Jersey can decrease the uptake of smoking among young women during their child bearing years.

### Evidence-Based School Programs

To prevent tobacco use among children and teens, New Jersey should work with school districts to offer evidence-based curricula. The CDC has developed Guidelines for School Health Programs to Prevent Tobacco Use and Addiction, which call for tobacco-free policies, teacher training, parental involvement, cessation services and the implementation of curricula shown to be effective by CDC's Research to Classroom Project. The coordination of school-based tobacco control efforts with those of local community coalitions and statewide media and educational campaigns have also proven to be effective. Currently, there are two programs aimed at children and teens that are considered evidence-based programs for preventing smoking initiation. These programs are: Project SMART (Self management and resistance training) and Project Towards No Tobacco Use (TNT).

## Intervention

### School Based Youth Services Programs

Groups with a higher percentage of smokers during pregnancy fell into either a younger age group (18-19 or 20 to 24 years) or a lower education level identifying high schools, technical schools, and/or junior colleges as a site for intervention. Identifying high schools with teen pregnancy groups to deliver the message of smoking cessation helps reinforce the message of a healthy pregnancy to a group that may otherwise not have the access to prenatal care or health promotion. Institutions with higher percentage of Black Non-Hispanic or White Non-Hispanic also should be identified in and effort to reduce racial disparities in receiving health promotion messages. During a recent New Jersey State Collaborative Improvement and Innovation to

Reduce Infant Mortality (ColIN) meeting, increased requests from schools for materials from Mom's Quit Connection was discussed and this demonstrated a need in school based settings for healthy pregnancy messages. Another topic ColIN is addressing is increasing tobacco free zones outside of schools, by establishing these smoke free sites this would deter teen smoking near schools. Data substantiates that teens smoke more than other age cohorts and addressing it before pregnancy for general health purposes would be optimal as well. Adolescence is the risk period for smoking initiation, and there is evidence to support the strategies of school based smoking prevention programs as a means for strengthening tobacco control (Chen & Jacques-Tiura 2014).

### WIC – Program Intervention Site

WIC (Women, Infants, and Children) is a federally funded program, operating at state and local levels, which provides nutritious foods, nutrition education (including breastfeeding promotion and support), and referrals to health and other social services to participants at no charge. According to the Pregnancy Nutrition Surveillance System (PNSS), smoking cessation is a focus of WIC, considering WIC participants have a higher prevalence of smoking than the average patient (CDC 2011). In addition, there is data from the PNSS to support enrollment in WIC is associated with a decline in smoking as the pregnancy progresses (Masho *et al.* 2013).

Utilizing WIC sites for intervention gives an opportunity to reach certain demographics that may not otherwise have been reached. For instance, a pregnant mother, regardless of her number of pregnancies, would be more likely to enroll in WIC in order to attain assistance even if she did not initiate prenatal care. Therefore, this provides an opportunity to the considerable percentage of women who did not receive PNC or entered PNC late in the third trimester to benefit from a smoking intervention program earlier in their pregnancy. WIC sites have the potential to reach lower socio-economic status and unmarried participants as this is the demographics their program serves.

### Prenatal Care Provider Training

Health care providers also have an opportunity to address women in the preconception or interconception (time between a woman's pregnancies) stage on the risks of smoking to both a pregnant woman and her

fetus. This is an important time to prevent the negative outcomes of smoking, and women should refrain from smoking prior to conception, particularly during the months before becoming pregnant (Masho Bishop, Keyser-Marcus, Varner et al. 2013). Prior to pregnancy it may be easier for a woman to disclose that she is a smoker than when she is pregnant. Tobacco use has negative social and health contexts associated with it, when coupled with being pregnant and understanding the negative health effects not only on one's self but also on a carrying fetus, a pregnant woman may not be forthcoming about her smoking status as well as the number of cigarettes she smokes.

Patients entering prenatal care late could benefit from focused education regarding tobacco cessation as research shows even if a mom quits late in pregnancy that effort can have a positive effect on birth outcome (Bailey, McCook, Clements & McGrady 2011). In addition, if a pregnant woman quits late it can positively influence her continuing to not smoke in the postpartum period as well. A focused effort is needed to increase pregnant women's understanding of the benefits of smoking cessation, to increase their access to smoking cessation programs, and to provide follow up smoking cessation support. Data from the Perinatal Risk Assessment Monitoring System, the Electronic Birth Certificate and the Perinatal Risk Assessment can provide information to direct public health and policy planners in developing targeted interventions to help increase smoking cessation in pregnant women. The ultimate goal is to increase positive birth outcomes which can be achieved by increasing smoking cessation.

The results of the PRAMS survey demonstrates the need for Prenatal Care Providers (PCP) to help a patient quit and more importantly "assist" or "refer" a pregnant woman to tobacco cessation resources. PCPs may regard the area of smoking cessation involves addressing psychosocial risks and may not feel adequately trained and therefore challenged in how to "assist" with resources which can lead to inconsistent practice and care. A valuable resource for providers is the *Mom's Quit Connection Provider Toolkit*. This toolkit provides tools and resources necessary to promote tobacco cessation at the office level. It includes information regarding on-site training (specifically the 2As + R; Ask, Advise, Refer), referral forms, patient education, web banner ads, social media tools, posters, and a Mom's Quit Connection link to download public service announcements to office waiting rooms' TVs. This is a comprehensive, well-established program that should be promoted to

prenatal care providers and be staffed accordingly statewide to fulfill the need of PCP training. In addition to prenatal care providers, training Pediatricians should also be considered as they have the potential to be asked by a second-time mother how to quit smoking. Meeting with a Pediatrician would enable them to be educated on health issues that could affect their child, such as second or third hand smoke. Obstetricians and Pediatricians collaborating could ensure there is education provided on tobacco use both before delivery and afterwards (Kum-Nji, Meloy & Herrod 2006).

Given that healthcare reimbursement trends are turning to prevention rather than illness, providing clinicians with guidance regarding billing and reimbursement provides incentive for clinicians to incorporate tobacco cessation counseling into an office visit. The American Academy of Family Physicians (AAFP) has developed guidelines for physicians to bill for tobacco cessation counseling.

### Engaging Public Health Professionals

Smoking cessation programs targeted for pregnant women is limited in New Jersey. There is a need to address the major determinants that coincide with pregnant women who smoke and target interventions accordingly. While doing so it is important to consider cultural, socio-economic and racial differences when developing the message or augmenting a message to a well-established program. For example, Masho *et al.* notes in their study that underserved minority women enter prenatal care late and therefore the window of opportunity to prevent adverse outcomes of smoking is shorter. Their research stresses the importance of public health professionals designing smoking-cessation programs that target women before they conceive with a life course model for intervention (Masho *et al.* 2013). Community outreach and home based programs such as Nurse Family Partnership, Healthy Families (HF), Parents as Teachers (PAT), and Community Health Workers (CHW) all provide a means to deliver target these women by providing a tobacco cessation message to pregnant women who otherwise may not be connected to prenatal care services. The HF and PAT are home visitation programs which service pregnant women and families with young children. CHWs provide outreach to the community, focusing on women and their families, to help them gain access to health and social services. Training these staff on delivering the tobacco cessation message to their clientele will increase reach of this public health message.

The public health community plays a vital role in this process, particularly the promotion and education of tobacco cessation programs whether it be to the patient population or health care providers. Establishing a program and ensuring access are only one part of successful program implementation. Public health programs need to be promoted as well as evaluated. Promotion ensures reach and engagement, evaluation ensures continuous quality improvement and meaningful use of the data. New topics relative to smoking are also emerging that warrant discussion and strategies to educate on, such as electronic cigarettes and second hand smoke. Electronic cigarettes come in many forms (e-hookah, e-pens, vape pens, or tanks) and along with continuing research, pregnant women need to be educated regarding the safety of these products. Pregnant women also need resources on second and third hand smoke, addressing its exposure, its effects and ways it can be avoided. Engaging public health professionals will be key to designing, implementing, evaluating, and modifying tobacco cessation programs for the pregnant population so that less negative birth outcomes will result.

### Expanding New Jersey Smoking Cessation Programs

Mom's Quit Connection as the primary source of tobacco cessation counseling for pregnant women and women in the perinatal period. Mom's Quit Connection has recently expanded its reach statewide with counselors now dedicated to the north and the central regions of the State. In order for MQC to publicize their statewide reach, necessary funds for advertising and media poses a challenge in this costly geographic media market. The range of New Jersey's twenty one counties is situated between the two most active and expensive media markets, New York and Philadelphia, which makes comprehensive campaigns costly. In addition, advertising campaigns must consider the dynamics of digital marketing and how women of reproductive age access information. Impact data on the effectiveness of TV media campaigns has demonstrated it to be outdated and that new platforms such as Hulu and Spotify have expanded into the market. Therefore, media dollars are needed to test innovative channels of reaching young women to ensure media dollars are spent effectively for its intended audiences.

Funding is also needed to develop MQC resources and strategies to address the diverse landscape of New Jersey communities with respect to racial and socio-

demographic profiles. The pregnant smoker in New Jersey tends to be more seriously addicted, often with multiple socio-economic challenges that contribute to her tobacco addiction. A recent MQC stakeholder survey conveyed a consistent theme from providers that MQC needs to be directly promoted to clients and that lack of interest was identified as the biggest barrier when providers promoted use of MQC resources thus providers feeling the frustration of assisting an especially challenging patient.

As MQC promotion increases whether it be by community tobacco cessation groups or MQC's new advertisement efforts the client capacity will increase and warrant multiple counselors in both the north and central regions of the State. This analysis recommends MQC to provide trainings and distribute the MQC Provider Toolkit to all clinicians, both prenatal and pediatric professionals, in order for them to be versed in the 5As or modified 2A's + R protocol in order to better assess a pregnant or postpartum woman's smoking status. A projected increase in MQC clientele as well as additional provider trainings statewide will warrant increasing MQC personnel and resources.

As MQC has expanded statewide, expanding the CJFHC's Perinatal Addiction Prevention Program model would benefit those women statewide who partake in intensive outpatient treatment in the clinic setting. These outpatient programs are focused on women in various clinic settings, such as Federally Qualified Health Centers, women's clinics, and substance abuse clinics. Each one of these clinics brings a demographic (i.e. racial and socioeconomic diversity, pre-existing medical condition, psychosocial issues) which have been demonstrated by literature review and data analysis to be associated with a positive smoking status (Masho *et al.* 2013). Thus, increasing this targeted intervention statewide at all Consortia will reach these populations to promote tobacco cessation during pregnancy and/or the perinatal period.

## Conclusions

Smoking during pregnancy is a significant problem in New Jersey. Nearly 6,000 infants per year are born with tobacco exposure. This cohort of children is at increased risk of adverse birth outcomes and long-term health impacts. A review of New Jersey's demographics and population indicators of pregnant women who smoke offer insight on specific populations who could benefit from smoking cessation programs. Although we have a good picture of the population in greatest need, currently there are only two programs in New Jersey and one national program that are tailored to pregnant women. The Mom's Quit Connection has been successful in addressing prenatal smoking and has worked with thousands of moms throughout New Jersey on achieving abstinence from smoking; however, only a small portion of women who smoke during pregnancy actually access the program. Of those who have been served by the program, more than 70 percent significantly reduced or quit smoking. The second program, the Perinatal Addictions Prevention Project, has also been shown to assist women in reducing or quitting smoking (65 percent of participants). The PAPP program is limited to Central New Jersey; therefore, women in other areas do not benefit from these services.

In addition to the dearth in resources available to pregnant women, several other gaps were identified including physician and medical driven referrals, limited service locations, and others that lead to barriers in quitting successfully. Research emphasizes health care providers are a critical point of contact for pregnant women to discuss their smoking habits and as a resource of where to find assistance to help quit smoking; however, there are additional resources that should be offered in the community for women who have limited access to health care. Based on the work provided in this report, it is clear that funding allocations are needed to expand prevention and intervention programs to fully address the needs of pregnant smokers.

Children born to smokers are at a significant disadvantage from birth. Not only do they experience immediate health effects of tobacco exposure in utero, but also long-term effects associated with adverse birth outcomes and exposure to second and third hand smoke. In order to eliminate lifelong health consequences of smoking, improvements in prenatal smoking prevention and intervention are needed.



## References

- Adams E, Melvin C, Raskind-Hood C, Joski P, et al. (2011) Infant Delivery Costs Related to Maternal Smoking: An Update. *Nicotine Tobacco Research*. 13:627-637.
- Albrecht S, Maloni J, Thomas K, Jones R, Halleran J, et al. (2004) Smoking Cessation Counseling for Pregnant Women Who Smoke: Scientific Basis for Practice for AWHONN's SUCCESS Project. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 33:298-305.
- ACOG. (2012) "Smoking Cessation during Pregnancy: A Clinician's Guide to Helping Pregnant Women Quit Smoking"
- Andriani H, Kuo H. (2014) Adverse effects of Parental Smoking during Pregnancy in Urban and Rural Areas. *BMC Pregnancy & Childbirth*. 14:414.
- Ashford K, Hahn E, Hall L, Rayens M, et al. (2010) The Effects of Prenatal Secondhand Smoke Exposure on Preterm Birth and Neonatal Outcomes. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 39:525-535.
- Ayadi M, Adams E, Melvin C, et al. (2006) Costs of a smoking Cessation Counseling Intervention for Pregnant Women: Comparison of Three Settings. *Public Health Reports*. 121:120-126.
- Bailey B, McCook J, Clements A, McGrady. (2011) Poster Presentation: Quitting Smoking During Pregnancy and Birth Outcomes: Evidence of Gains Following Cessation by Third Trimester. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 40:S85-S119.
- Bailey B. (2011) Quitting Smoking during Pregnancy and Birth Outcomes: Evidence of Gains Following Cessation by Third Trimester. Poster presentation 2011 AWOHNN Convention.
- Baxter S, Everson-Hock E, Messina J, Guillaume L, et al. (2010) Factors relating to the uptake of interventions for smoking cessation among pregnant women: a systematic review and qualitative synthesis. *Nicotine Tobacco Research*, 12:685-94.
- Center for Disease Control. (2011) Pregnancy Nutrition Surveillance.
- Center for Disease Control. (2012) Tobacco Control State Highlights.
- Chen X, Jacques-Tiura A. (2014) Smoking Initiation Associated with Specific Periods in the Life Course from Birth to Young Adulthood: Data from the national Longitudinal Survey of Youth 1997. *American Journal of Public Health*. 104:119-126.
- Cheng D, Salimi S, Terplan M, Chisolm, M. (2015) Intimate Partner Violence and Maternal Cigarette Smoking Before and During Pregnancy. *Obstetrics & Gynecology* 125(2):356-362.
- Cooper S, Lewis S, Thornton J, Marlow N, et al. "The SNAP trial: a Randomised Placebo-controlled trial of Nicotine Replacement Therapy in Pregnancy –Clinical Effectiveness and Safety Until 2 years After Delivery, with Economic Evaluation" (2014) National Institute for Health Research: Health Technology Assessment. Vol. 18 Issue 54.
- Cupul-Uicab, L. A., Skjaerven, R., Haug, K., Melve, K. K., Engel, S. M., & Longnecker, M. P. (2012). In utero exposure to maternal tobacco smoke and subsequent obesity, hypertension, and gestational diabetes among women in the MoBa cohort. *Environmental health perspectives*, 120(3), 355.
- Ebert LM, Fahy K. (2007) Why do women continue to smoke in pregnancy? *Women Birth*. 20:161-8.
- Gamble, V.N. (1993). A legacy of distrust: African Americans and medical research. *American Journal of Preventive Medicine*, Vol 9(6, Suppl), 35-38.
- Geerts, C. C., Bots, M. L., Grobbee, D. E., & Uiterwaal, C. S. (2008). Parental smoking and vascular damage in young adult offspring: is early life exposure critical? The atherosclerosis risk in young adults study. *Arteriosclerosis, thrombosis, and vascular biology*, 28 (12), 2296-2302.
- Gray F, Indurkha A, McCormick M. (2004) Prevalence, Stability, and Predictors of Clinically Significant Behavior Problems in Low Birth Weight Children at 3, 5, and 8 Years of Age. *Pediatrics*. 114:736-743.

Iliodromiti S, Mackay D, Smith G, Pell I. (2014) Apgar score and the risk of cause-specific infant mortality: a population-based cohort study. *Lancet*. 384:1749-1755.

Ingall G, Cropley M. (2010). Exploring the barriers of quitting smoking during pregnancy: a systematic review of qualitative studies. *Women Birth*;23:45–52.

Kiecolt-Glaser, J. K., Preacher, K. J., MacCallum, R. C., Atkinson, C. et al. (2003). Chronic stress and age-related increases in the proinflammatory cytokine IL-6. *Proceedings of the National Academy of Sciences of the United States of America*, 100, 9090 – 9095.

Kulig, M., Luck, W., Lau, S., Niggemann, B., Bergmann, R., Klettke, U., & Wahn, U. (1999). Effect of pre-and postnatal tobacco smoke exposure on specific sensitization to food and inhalant allergens during the first 3 years of life. *Allergy*, 54(3), 220-228.

Kum-Nji P, Meloy L, Herrod H. (2006) Environmental Tobacco Smoke Exposure: Prevalence and Mechanisms of Causation of Infections in Children. *Pediatrics*. 117:1745-1754.

Linnet K, Dalsgaard S, Obel C, Wisborg K, et al. (2003) Maternal Lifestyle Factors in Pregnancy Risk of Attention Deficit Hyperactivity Disorder and Associated Behaviors: Review of the Current Evidence. *The American Journal of Psychiatry*. 160:1028-1040.

Lynch, J., & Smith, G. D. (2005). A life course approach to chronic disease epidemiology. *Annu. Rev. Public Health*, 26, 1-35.

Masho S, Bishop D, Keyser-Marcus L, Varner S, et al. (2013) Least Explored Factors Associated with Prenatal Smoking. *Journal of MCH*. 17:1167-1174.

Misra, D. P., Astone, N., & Lynch, C. D. (2005). Maternal smoking and birth weight: interaction with parity and mother's own in utero exposure to smoking. *Epidemiology*, 16(3), 288-293.

Office on Health Statistics (2006) Publications and Reports of the Surgeon General. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A report of the Surgeon General*. Center for Disease Control and Prevention.

Pollack H, Lantz P, Fohna J. (2000) Maternal Smoking and Adverse Birth Outcomes among Singletons and Twins. *American Journal of Public Health*. 90:395-399.

Power, C., & Jefferis, B. J. (2002). Fetal environment and subsequent obesity: a study of maternal smoking. *International journal of epidemiology*,31(2), 413-419.

PRAMS Brief. (2007) Smoking Cessation in New Jersey.

Caleyachetty, R., Echouffo-Techeugui, J., Stephenson, R., Muennig, P. (2014). Intimate partner violence and current tobacco smoking in low- to middle-income countries: Individual participant meta-analysis of 231,892 women of reproductive age. *Global Public Health*; 9(5).

Rode L, Kjoergaard H, Damm P, et al. (2013) Effect of Smoking Cessation on Gestational and Postpartum Weight Gain and Neonatal Birth Weight. *Obstetrics & Gynecology* 122(3):618-625.

Russell R, Green N, Steiner C, Meikle S, et al. (2007) Cost of Hospitalization for Preterm and LBW Infants in the United States. *Pediatrics*. 120:1-9.

Russell T, Crawford M, Woodby L. (2004) Measurements for active cigarette smoke exposure in prevalence and cessation studies: why simply asking pregnant women isn't enough. *Nicotine Tobacco Research*. 6:S141–51.

Schvartsman C, Farhat SC, Schvartsman S, Saldiva PH. (2013) Parental smoking patterns and their association with wheezing in children. *Clinics*. 68:934-939.

Scott S, Knapp M, Henderson J, Maughan B. (2001) Financial cost of social exclusion: follow up study of antisocial children into adulthood. *BMJ*. 323:1-5.

Singer L, Fulton S, Kirchner H, Eisengart S, et al. (2007) Parenting Very Low Birth Weight Children at School Age: Maternal Stress and Coping. *The Journal of Pediatrics*. 151:463-469.

Shu-Hong Zhu, Ph.D., Anderson, C.M., Tedeschi, G.J., Rosbrook, B., Johnson, C.E., Byrd, M & Gutiérrez-Terrell, E. 2002. Evidence of Real-World Effectiveness of a Telephone Quitline for Smokers. *New England Journal of Medicine*, 347:1087-1093

Singleterry J, Jump Z, Lancet E, Babb S, et al. (2014) State Medicaid Coverage for Tobacco Cessation Treatments and Barriers to Coverage-United States, 2008-2014. *Morbidity and Mortality Weekly Report*. 63:264-269.



Tang, S, "Association Between Stressful Life Events and Change of Maternal Smoking During Pregnancy Using PRAMS 2011-2012" (2015) Theses and Dissertations--Public Health (M.P.H. & Dr.P.H.). Paper 41.

Thompson K, Prahoo K, McCurry N, O'Doherty E, et al. (2004) Women's perceptions of support from partners, family members and close friends for smoking cessation during pregnancy-combining quantitative and qualitative findings. *Health Education Research*. 19:29-39.

Underwood M, Danielsen B, Gilbert W. (2007) Cost, Causes, and Rates for Rehospitalization of Preterm Infants. *Journal of Perinatology*. 27:614-619.

Vardavas C, Chatzi L, Patelrou E, Plana E, et al. (2010) Smoking and Smoking Cessation during Early Pregnancy and its effect on Adverse Pregnancy Outcomes and Fetal Growth. *European Journal of Pediatrics*. 169:741-748.

Varner M, Silver R, Hogue C, et al. (2014) Association between Stillbirth and Illicit Drug use and Smoking during Pregnancy. *Obstetrics & Gynecology* 123 (1):113-125.

Wang, L., & Pinkerton, K. E. (2008). Detrimental effects of tobacco smoke exposure during development on postnatal lung function and asthma. *Birth Defects Research Part C: Embryo Today: Reviews*, 84(1), 54-60.

White House (2013). Trends in Healthcare Costs. Accessed September 2015.

Williams RJ, Masica AL, McBurnie MA, Solberg LI, et al. (2014). Documentation of the 5 as for smoking cessation by PCPs across distinct health systems. *The American Journal of Managed Care*, 20(3):e35-42

## Appendix 1: New Jersey Smoking Cessation Programs

Program Name	Services Rendered	Program Contact	Location	Languages	Pregnancy focused	Providers
NJ Quit-line	Telephone counseling	1-866-NJSTOPS (657-8677)	Statewide	Multilingual (English and Spanish)	No refer to MQC	Coaches are college degreed with training from the Quit Line
Mom's Quit Connection	Individual and telephone counseling for women who are pregnant, postpartum, parenting a child 6 years old and younger, and caregivers of young children	1-856-665-6000	Statewide	English and Spanish	Yes	CTTS
Central Jersey Family Health Consortium Perinatal Addiction Prevention Program	Group counseling as part of intensive outpatient program 6 week curriculum based program	732-937-5437 x135	Central New Jersey sites (i.e. FQHCs, substance abuse clinics, OB/Gyn clinics)	English	Yes	CTTS
Tobacco Quit Center	Individual or group counseling; 4-6 week program which meets once/week. Tracks patient 6 months post treatment	908-595-2633	Somerset	Multilingual (interpreter provided)	No refer to MQC	CTTS, LPC, SW, PhD, MD
Shore Medical Center	Individual counseling 4 week program which meets once/week	609-653-3340	Somers Point	English and Spanish	No refer to MQC	CTTS, Social Service credentialing
Atlantic Health	Group counseling once/week Nicotine replacement therapy products offered free of charge	866-961-8006	Morristown Medical Center Morristown	English	No refer to MQC	CTTS, MSN, LCSW

Program Name	Services Rendered	Program Contact	Location	Languages	Pregnancy focused	Providers
Rutgers School of Public Health	Individual counseling # visits to coincide with OB/GYN appointments within their facility. OTC and Prescription NRT products provided	732-235-8222	New Brunswick	English and Spanish	No, refers to MQC as extra support for pregnant Moms	LCSW, LCAC MD/MPH
SmokeFreeMom	Mobile text messaging service	women.smokefree.gov	Nationwide	English	Yes	NCI staff
American Lung Association	Freedom From Smoking (FFS) online program which includes 8 lesson modules. Telephone counseling and can group counseling based on availability	1-800-LUNGUSA (586-4872)	Nationwide	FFS - English Brochures available in Spanish	No	FFS trained, CTS







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