

Infant Mortality Surveillance and Safe Sleep Review

Division of Family Health



Executive Summary

Chapter 46 of the Laws of 2018 required the Department of Health to conduct a study on the efficacy of existing safe sleep practices to determine safe sleep practices that reduce infant mortality rates. This review is the result of the Department of Health's surveillance for infant mortality and a comprehensive literature review to explore the variety of infant sleep-related practices to find evidence based interventions for reducing sleep-related deaths.

Definition of Terms

Sudden Unexpected Infant Death (SUID) is defined as a sudden and unexpected death, whether explained or unexplained, occurring in infancy, up to one year of age.⁸ SUIDs may be attributed to various causes, including: suffocation, asphyxia, entrapment, infection, ingestions, metabolic diseases, arrhythmia-associated cardiac channelopathies, and both unintentional and nonaccidental trauma, as well as sudden infant death syndrome (SIDS) or may be of unknown cause.⁸ SIDS is one subgroup of SUID. SIDS is defined as "...sudden death of an infant under one year of age which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history."⁸ Both terms are used extensively in this review.

In the most recently published statistics from the Center for Disease Control and Prevention's National Center for Health Statistics, from 2013-2015, New York State (NYS) ranks 5th among 17 states with the lowest infant mortality (IM) rates in the nation.³ While NYS has seen a sharp decrease in IM over the past decade, decreases in the rate of IM in the United States have slowed. A 26% decrease in IM was seen in NYS between the years of 2002 and 2016 compared to a 15% decrease nationally; this translates into a rate of approximately 4.5 deaths per 1,000 live births in 2016 in NYS, exceeding the United States Healthy People 2020 goal of 6.0 deaths per 1,000 live births.⁶ Correspondingly, the total Sudden Unexplained Infant Death (SUID) rate dropped from 54.6 deaths per 100,000 live births in 2002 to 38.25 deaths per 100,000 live births in 2016 in NYS. Despite these improvements, there are marked, persistent, racial disparities in IM in NYS. Black, non-Hispanic mothers have consistently experienced the highest rate of IM in NYS. In 2016, the SUID rate among black, non-Hispanic mothers (7.0 deaths per 1,000 live births) was almost two times as high as that of white, non-Hispanic mothers (3.6 deaths per 1,000 live births), and over two times as high as that of Hispanic mothers (3.1 deaths per 1,000 live births). Infant safe sleep practices recommended by the American Academy of Pediatrics (AAP),⁸ including placing infants to sleep on their backs, room sharing but not bed sharing, and keeping soft objects and loose bedding out of the infant's sleep environment, can help reduce sleep-related infant deaths; however, these recommendations are not being implemented by all caregivers. Some caregivers, including parents, grandparents, healthcare providers and daycare providers, have resisted the adoption of safe infant sleep practices.³

To address these issues, the New York State Department of Health (NYSDOH) has conducted surveillance for IM and a comprehensive literature review to find evidence-based interventions for reducing the risk of sleep-related deaths.

The most efficacious and well-known intervention was the National Institute of Child Health and Human Development's (NICHD) "Back to Sleep" public awareness campaign of 1994, now called the "Safe to Sleep" campaign, which decreased rates of prone infant sleeping leading to reductions in mortality rates from SIDS by more than 50%.³ Legislation has also had a big impact on safe infant sleep practices. Currently, 43 states, including NYS, have legislation relating to infant sleep position and 17, including NYS, require SIDS risk reduction training for providers at licensed child care centers. Legislation has been targeted at hospitals as well. In July 2016, Governor Andrew M. Cuomo signed legislation that requires all hospitals and birthing facilities in NYS to give every new parent information on safe sleep upon admission to the birth hospitalization (Public Health Law §2803-j). At the provider level, education and modeling interventions have had the most success. Medical personnel are critical role models for parents, and the way they position infants in the hospital strongly influences parental practices at home. Education and modeling interventions not only change provider practices, but the modeling of safe sleep practices by providers influences the behavior of caregivers, who tend to adopt the practices they see modeled after discharge.

In this literature review, racial/ethnic disparities in infant sleep-related practices are explored. The reasons for variations in race/ethnicity-specific SUID rates over the past two decades are mainly related to non-supine infant sleep position, infant bedding use and continued bedsharing despite known risks. In 2015, one in four caregivers in NYS was sharing an adult bed with an infant. Of the caregivers who were bedsharing, 32.4% of them were non-Hispanic, black mothers while 22% were non-Hispanic, white mothers. From the data, we know more work needs to be done to address bedsharing. Young maternal age, low socioeconomic or educational status, maternal smoking, not breastfeeding or short breastfeeding duration, lack of prenatal care and unmarried status are other factors that may contribute to the disparities in SUID.¹¹⁶

In a randomized, controlled clinical trial of black mothers of infants by Mathews et al. in 2017, 29% of mothers believed that having their infant sleep with an adult helped prevent SIDS and only 43% believed that SIDS is related to sleeping position. In that study, black mothers who received an enhanced message about SIDS risk reduction and suffocation prevention were less likely to use soft bedding in their infant's sleep environment.¹²⁰ A similar study of black parents by Moon et al., emphasized the need for health care professionals to discuss both SIDS risk reduction and prevention of accidental suffocation when advising parents about safe sleep practices.¹²¹

Finally, some have suggested the use of baby boxes to curb bedsharing especially among low-income families who may not be able to afford a crib; however, there is no evidence to link a reduction in IM with the use of baby boxes. Moreover, the safety of baby boxes needs further review. Contrary to the baby box, the wahakura, a similar alternative, has been shown to provide a safe sleep environment comparable to the bassinette, and studies have shown reductions in infant mortality with their use.¹²⁴

In addition to baby boxes, a variety of other sleep environments were explored for safety. Studies have shown significant safety hazards of sleep positioners, crib bumpers, air mattresses and carrying devices (car seats, bouncers, swings, strollers and slings).⁸⁶ These are unsafe for infant sleep and their inappropriate use could result in strangulation, positional asphyxia and death.

Finally, current safe sleep efforts underway at the NYSDOH are reviewed, and future efforts are highlighted. The NYSDOH is working with families across the state to improve safe sleep practices in the home environment with the use of home visitors through the continuation of the Infant Mortality Collaborative Improvement and Innovation Network (IM CoIIN). The focus is on educating caregivers on safe sleep practices after they return home from the hospital, to reinforce the education they received at the hospital. Five community-based organizations around the state have joined the project. Additionally, through the National Action Partnership to Promote Safe Sleep – Improvement Innovation Network Collaborative (NAPPSS-IIN) project, the NYSDOH is piloting a safe sleep and breastfeeding intervention at NY-Presbyterian Lawrence Hospital in Westchester County. This initiative aims to identify best practices to make safe sleep and breastfeeding the norm. Through this initiative, NY-Presbyterian Lawrence Hospital is implementing a safe infant sleep and breastfeeding safety bundle to improve the processes of care and patient outcomes. A major component of this initiative is the development and implementation of a hospital policy that supports and promotes safe sleep and breastfeeding. Both projects aim to reduce racial disparities in safe sleep practices.

Maternal and Infant Community Health Collaboratives (MICHCs) employ community health workers, individuals from the communities they serve, to engage women in prenatal care and on-going primary and preventive health care. Maternal, Infant and Early Childhood Home Visiting (MIECHV) programs support pregnant women and families and help at-risk parents of children from birth to kindergarten entry hone the skills and tap the resources they need to raise children who are physically, socially and emotionally healthy and ready to learn. Home visitors in both programs will continue to educate pregnant women and new mothers on safe infant sleep practices; assist caregivers in obtaining safe sleep equipment (i.e. crib, bassinette or pack and play) if necessary; and reinforce safe sleep practices at every visit.

Based on the findings from this literature review, the NYSDOH plans to implement enhanced messaging in both the IM CoIIN and NAPPSS-IIN projects that encompasses SIDS risk reduction and the prevention of accidental suffocation when educating caregivers on safe infant sleep practices. Furthermore, an anatomical diagram/teaching tool has been developed by the NYSDOH to address aspiration concerns in the target populations since a common misconception among caregivers is that the infant will choke if placed to sleep on his/her back. Through the IM CoIIN project, data will be collected on some of the barriers to safe sleep. Through this collaborative project with organizations that conduct home visits, the NYSDOH hopes to gather more insight and information on the reasons why some caregivers co-sleep with their infant. Moreover, the NYSDOH is continuing to collect data at birthing hospitals in NYS to sustain the education and modeling of safe sleep practices at these birthing facilities, a follow-up to a NYS Perinatal Quality Collaborative (NYSPQC) initiative which took place from September 2015 through July 2017. Hospitals conduct random crib audits monthly and evaluate the sleep environment according to the ABCs of safe sleep to determine whether the infant is ALONE in an environment free of objects; is on its BACK; and is in a safety approved CRIB, bassinette or pack n' play. These crib audits are recorded and submitted to the NYSDOH monthly to continue to ensure the on-going success of this education and modeling intervention.

The NYSDOH will continue to promote the updated 2016 American Academy of Pediatrics (AAP) Safe Sleep Recommendations⁸ through the promotion of an educational board book entitled, Sleep Baby Safe and Snug, which has been shown to be an effective teaching tool.⁸¹ Board books have been delivered to all neonatal intensive care units (NICUs) in healthcare facilities in NYS. Parents of each infant in the NICU will be given one of these board books to take home in 2019. IM CoIIN pilot sites, MICHs and MIECHV's will also be given these books to use as a teaching tool with caregivers.

The NYSDOH will continue the "Safe to Sleep" campaign in NY through the use of Facebook and Twitter messages on safe infant sleep, YouTube videos on safe sleep in English and Spanish which are being used to educate caregivers in the hospital, public service announcements with the Office of Children and Family Services (OCFS), posters in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) offices, safe sleep brochures given to all new parents in the hospital, as well as further promotion of the ABCs of safe sleep through the distribution of mirror clings, magnets, crib cards and videos on flash drives. Lastly, the NYSDOH will continue to collaborate with OCFS on various other safe sleep initiatives throughout the state, which will include co-branding all educational materials developed through this joint effort.

Introduction

In the most recently published statistics from the Center for Disease Control and Prevention's National Center for Health Statistics, from 2013-2015, NYS ranks 5th among 17 states with the lowest IM rates in the nation.³ However, there are marked racial disparities in IM in NYS. While the overall IM rate in the United States has declined over the past decade from 6.86 infant deaths per 1,000 live births in 2005 to 5.90 in 2015, the decline has been slower than it was in the 1990s. In the United States, there are approximately 3,500 sleep-related deaths reported among infants each year, including those from sudden infant death syndrome (SIDS), accidental suffocation or strangulation in bed, and unknown causes.¹ The rate of infant sleep-related deaths declined from 154.6 deaths per 100,000 live births in 1990 to 93.9 per 100,000 live births in 1999.¹⁻³ Most researchers attribute the sharp decline to the "Back to Sleep" public awareness campaign that was launched in 1994.⁴ Today, this campaign is called "Safe to Sleep"; however, the messages are similar among the two campaigns: 1) place infants to bed in the supine position (on their backs) on a firm sleep surface such as a mattress in a safety-approved crib or bassinet; 2) infants and caregivers should share a room, but not the same sleep surface; and 3) avoid the use of soft bedding (blankets, pillows and soft objects). Both campaigns have been successful at decreasing rates of prone infant sleeping, leading to reductions in IM.⁴

Infant safe sleep practices recommended by the AAP, including placing infants to sleep on their backs, room sharing but not bed sharing, and keeping soft objects and loose bedding out of the infant's sleep environment, can help reduce sleep-related infant deaths; however, implementation of these recommendations remains suboptimal. Some caregivers, including parents, grandparents, healthcare providers and daycare providers, have resisted the adoption of safe infant sleep practices.³

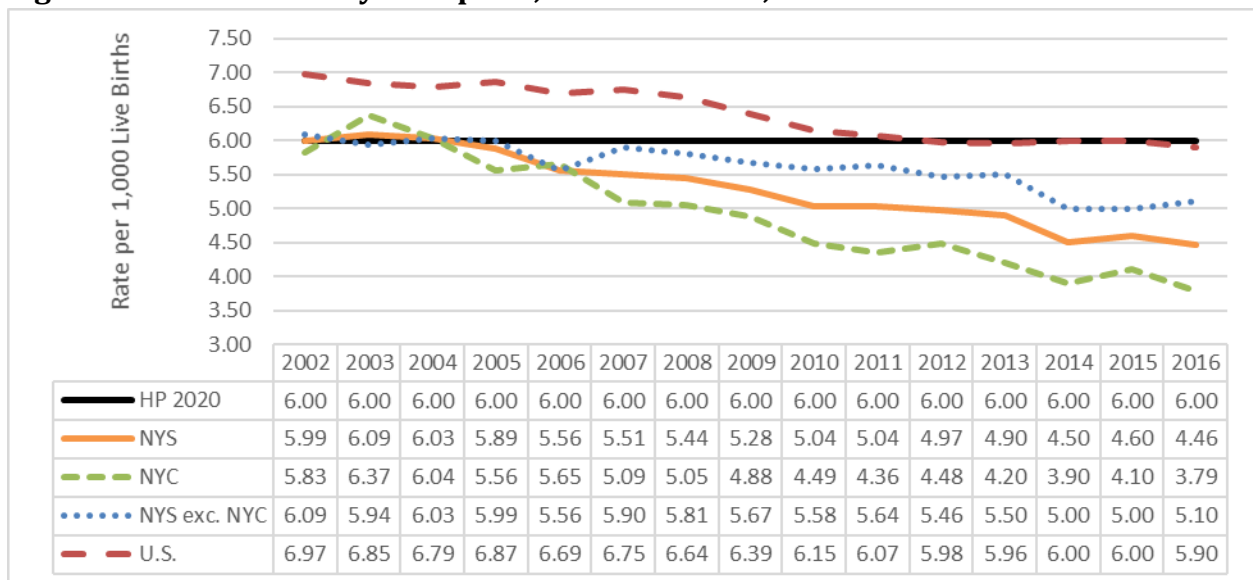
To address these issues, the NYSDOH has conducted surveillance for IM and a comprehensive literature review to explore the variety of interventions that have been implemented to change infant sleep-related practices to find evidence-based interventions for reducing the risk of sleep-related deaths. These efforts have been issued as guidance in some instances and mandated through legislation in others. In this literature review, the AAP Recommendations for a safe sleep environment are presented as currently these are the evidence-based guidelines for safe infant sleep. Subsequently, we present a review of interventions aimed at increasing caregiver adoption of the AAP Recommendations. The interventions have been divided into five broad categories: 1) health messaging; 2) safe sleep environments; 3) education and modeling; 4) legislation and regulation; and 5) disparities. Examples of evidence-based interventions in each category are explored, as well as the strength of their effectiveness. The section on safe sleep environments presents

evidence on the safety of various sleep environments such as swings, car seats and baby boxes, in addition to exploring interventions.

Infant Mortality Surveillance 2002-2015

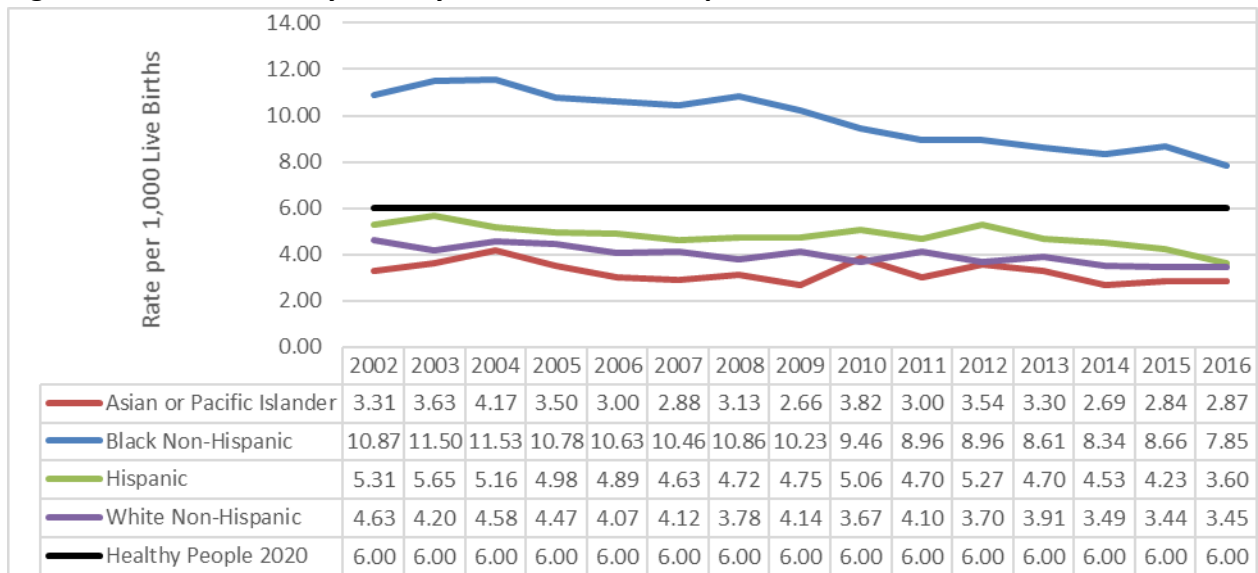
While NYS has seen a sharp decrease in IM over the past decade, decreases in the rate of IM in the U.S. have slowed. A 26% decrease in IM was seen in NYS between the years of 2002 and 2016 compared to a 15% decrease nationally; this translates into a rate of approximately 6.0 deaths per 1,000 live births in 2002 and 4.5 deaths per 1,000 live births in 2016 in NYS. While the overall rate of IM in NYS has declined, large racial and ethnic disparities persist. New York City (NYC) has consistently experienced a lower rate of IM than the rest of the state at 3.8 deaths per 1,000 live births in 2016, compared to 5.1 deaths per 1,000 live births in NYS excluding NYC during the same period. Despite this regional disparity, both regions of NYS (Figure 1) consistently had IM rates well below the national rate of 5.9 deaths per 1,000 live births and exceeding the U.S. HP 2020 goal of 6.0 deaths per 1,000 live births.⁶

Figure 1. Infant Mortality Rate per 1,000 Live births, 2002-2016



Source: 2002-2016 NYS Death Data; CDC/National Center for Health Statistics. NYS death data include all infants who died as New York State residents regardless of residency at birth.

Figure 2. Infant Mortality Rate by Racial/Ethnic Group, New York State, 2002-2016

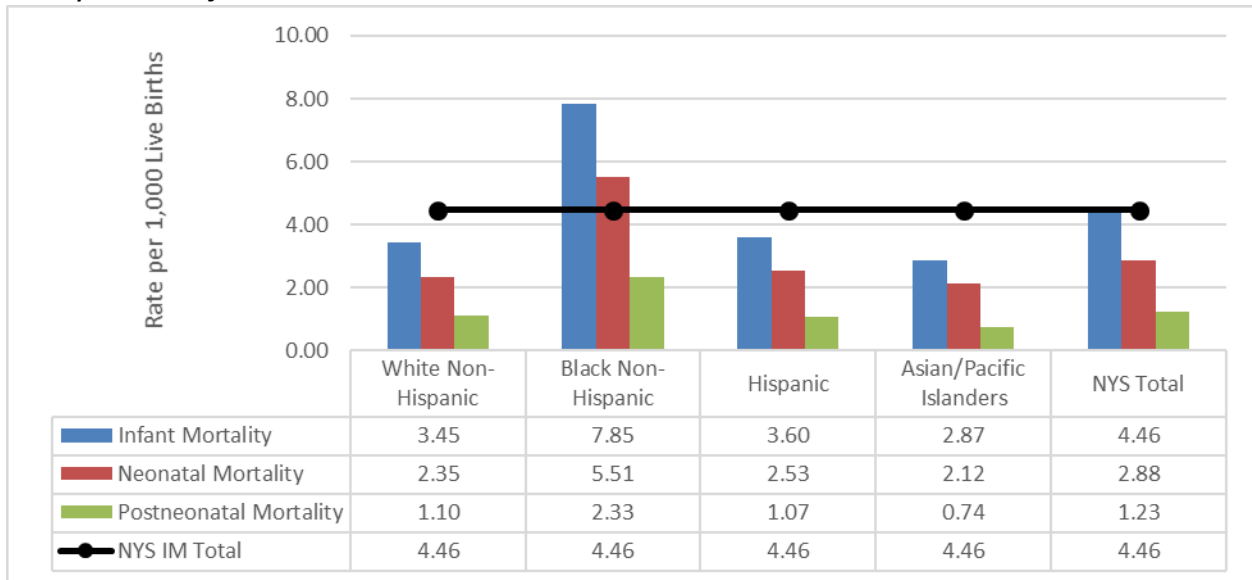


Source: 2002-2016 NYS Linked Birth-Death Data. Restricted to infants who were born and died as New York State residents.

Black, non-Hispanic mothers have consistently experienced the highest rate of IM in NYS during this time period. In 2016, the IM rate among black, non-Hispanic mothers (7.9 deaths per 1,000 live births) was two times as high as that of white, non-Hispanic mothers (3.5 deaths per 1,000 live births), and Hispanic mothers (3.6 deaths per 1,000 live births). While the IM rate among black, non-Hispanic mothers has decreased from 10.9 deaths per 1,000 live births in 2002, the IM rate among black, non-Hispanic mothers remained consistently higher than the HP 2020 goal across the period. In contrast, the rate of IM among Asian/Pacific Islander mothers remained lower than that of white, non-Hispanic mothers for most of the period (Figure 2).

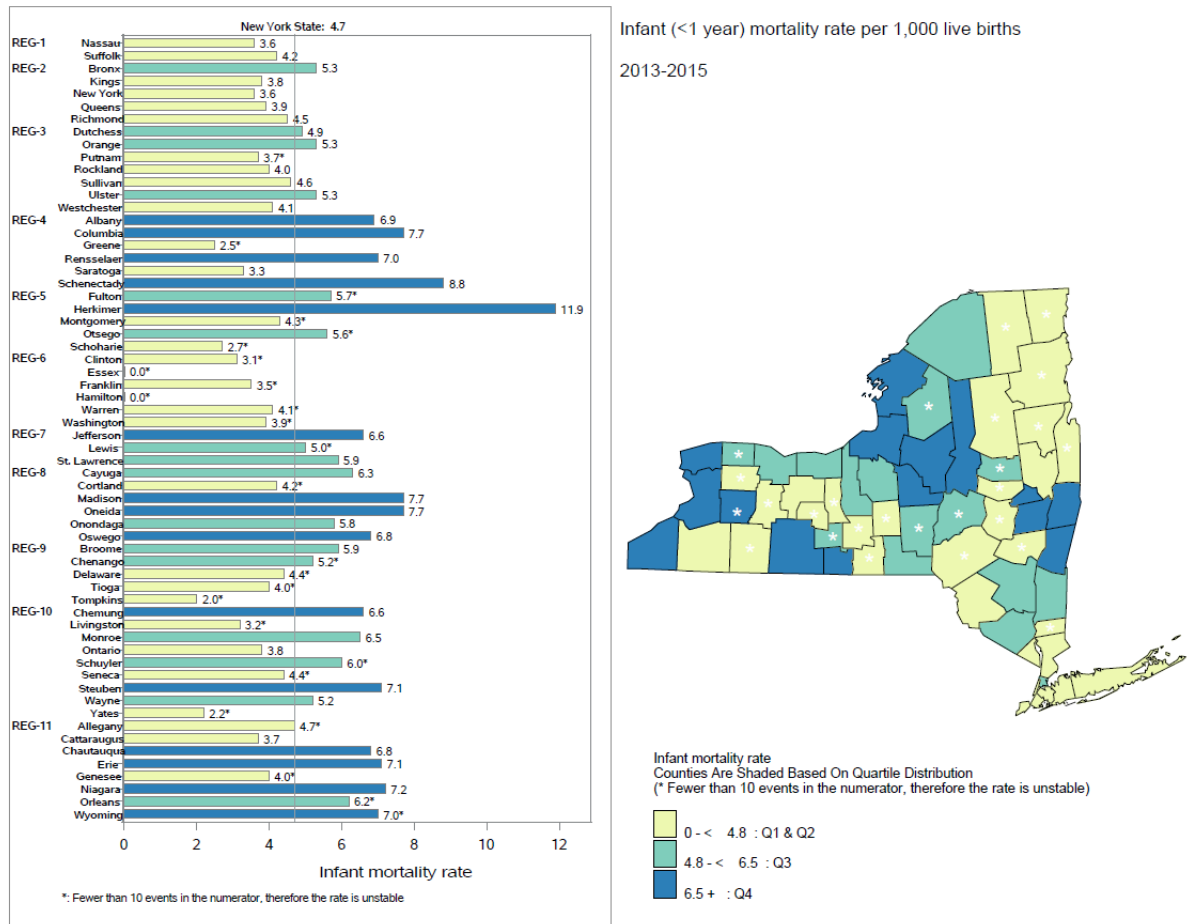
Racial and ethnic disparities in mortality also exist among infants in the neonatal (under 28 days of age) and post-neonatal (28 days and older but less than 1 year) age groups, as seen in Figure 3. In 2016, the mortality rate among infants born to black, non-Hispanic mothers was more than two times as high as that of white, non-Hispanic mothers in the neonatal period (5.5 and 2.4 deaths per 1,000 live births, respectively), and more than two times as high in the post-neonatal (2.3 and 1.1 deaths per 1,000 live births, respectively). Similarly, the mortality rate among infants born to black, non-Hispanic mothers was over two times that of Hispanic mothers in the neonatal period (2.1 deaths per 1,000 live births) and more than two times in the post-neonatal periods (1.1 deaths per 1,000 live births). The mortality rate among Infants born to Asian/Pacific Islander mothers was lower than that of white, non-Hispanic mothers in both the neonatal period (2.1 deaths per 1,000 live births) and the post-neonatal period (<1.0 deaths per 1,000 live births).

Figure 3. Infant, Neonatal, Post-neonatal Mortality Rates* by Maternal Race/Ethnicity, New York State, 2016



Source: 2002-2016 NYS Linked Birth-Death Data. Restricted to infants who were born and died as New York State residents.

Figure 4. Infant Mortality Rate by County



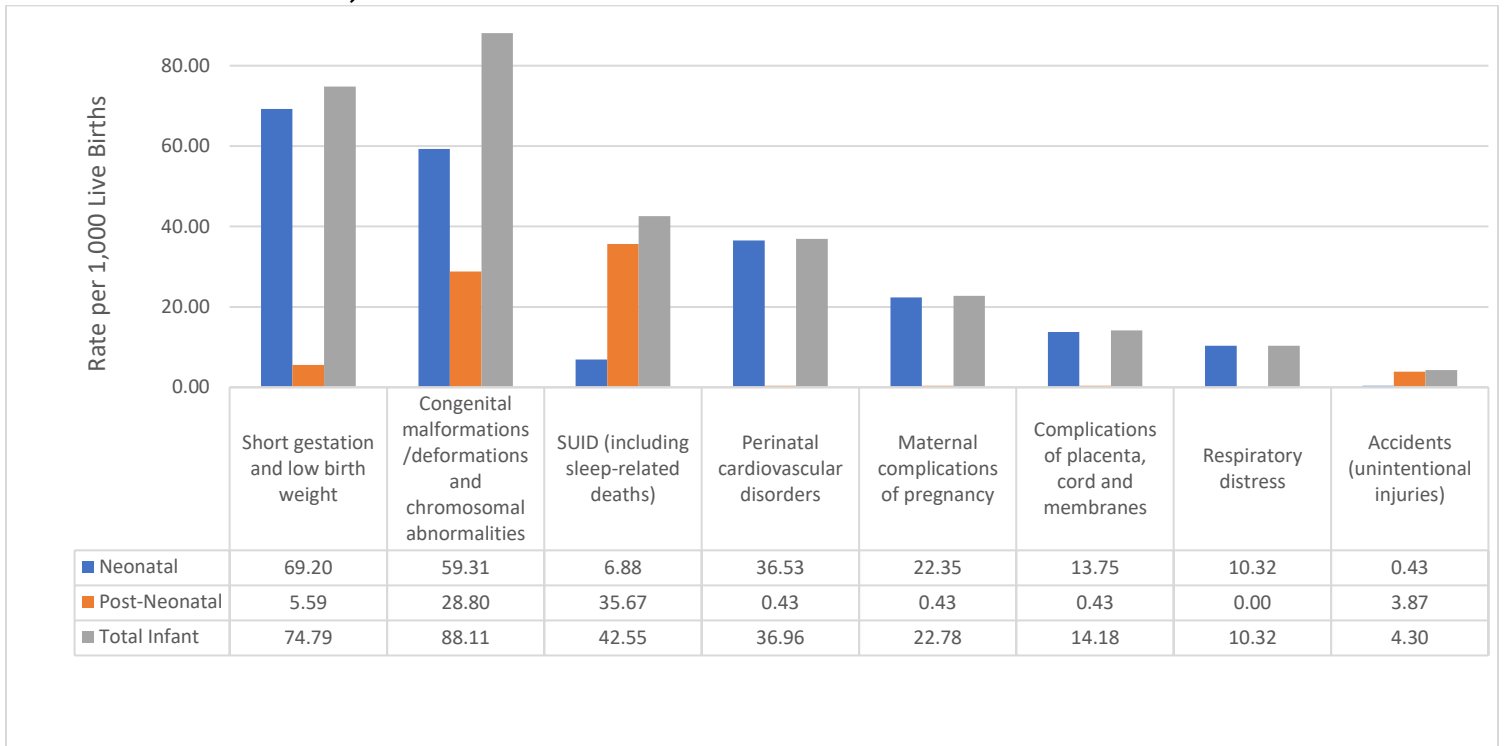
Between 2012 and 2015, the rate of IM varied greatly throughout 62 counties of NYS. (Figure 4) The highest rates of IM, more than 6.4 deaths per 1,000 live births (shown in blue), were seen in 15 counties located throughout the Western region of NYS, the North Country region, the Southern Tier, the Capital District, and the Hudson Valley Region.⁷

Leading Causes of Infant Death

In 2016, approximately 17% of all infant deaths in NYS were due to disorders related to short gestation and low birth weight, 20% were due to congenital malformations, deformations and chromosomal abnormalities, and 10% were sudden unexpected infant deaths, including sleep-related causes. The highest rates of IM were seen among infants born with congenital malformations, with death most frequently occurring in the neonatal period, followed by short gestation in the neonatal period, Sudden Unexpected Infant Death (SUID), including sleep-related causes in the post-neonatal period, and perinatal cardiovascular disorders in the neonatal period. (Figure 5). The top seven causes of IM contributed to 67% of all infant deaths in NYS in 2016. While complications related to short

gestation and low birth weight were the main causes of mortality among neonates, SUID, which includes sleep-related causes, was the top cause of mortality among infants in the post-neonatal period.

Figure 5. Leading Causes of Neonatal, Post-neonatal, and Total Infant Mortality in New York State, 2016



Trends in Sudden Unexpected Infant Deaths

SUID is defined as a sudden and unexpected death, whether explained or unexplained, occurring in infancy, up to one year of age.⁸ SUIDs may be attributed to various causes, including: suffocation, asphyxia, entrapment, infection, ingestions, metabolic diseases, arrhythmia-associated cardiac channelopathies, and both unintentional and nonaccidental trauma, as well as SIDS or may be of unknown cause.⁸ Sleep-related deaths represent the subset of SUIDs that occurred during an unobserved sleep period.⁸ SUIDs are reported under one of the following ICD-10 cause of death codes: 1) R95: (SIDS), 2) W75: Accidental Suffocation and Strangulation in Bed (ASSB) or 3) R99: unknown cause.⁹ In 2016, 89 infants who were born in NYS died suddenly and unexpectedly, due to SUID; this is more than four kindergarten classrooms of children. The rate of SUID in NYS decreased by 37% from 54.6 deaths per 100,000 live births to 34.6 deaths per 100,000 live births between the years 2002 and 2011, but increased by 37% between the 2011 and 2015 to 47.5 deaths per 100,000 live births. In 2016, the rate of SUID dropped to a rate of 38.3 deaths per 100,000

live births, with most cases being of an unknown cause (61%), followed by ASSB (24%) and SIDS (16%) (Figure 6). Between the years of 2002 and 2016, the number of infant deaths of an unknown cause that were reported using the R99 code increased. Prior to this shift, most infant deaths of an unknown cause were reported using codes not included in the SUID definition. As such, these cases were not being counted toward the number of SUID deaths in NYS. This shift occurred primarily in NYC, which caused an increase in the number of SUID cases both regionally and statewide. This shift represents an improvement in SUID reporting practices rather than a true increase in the number of SUID deaths in the state.

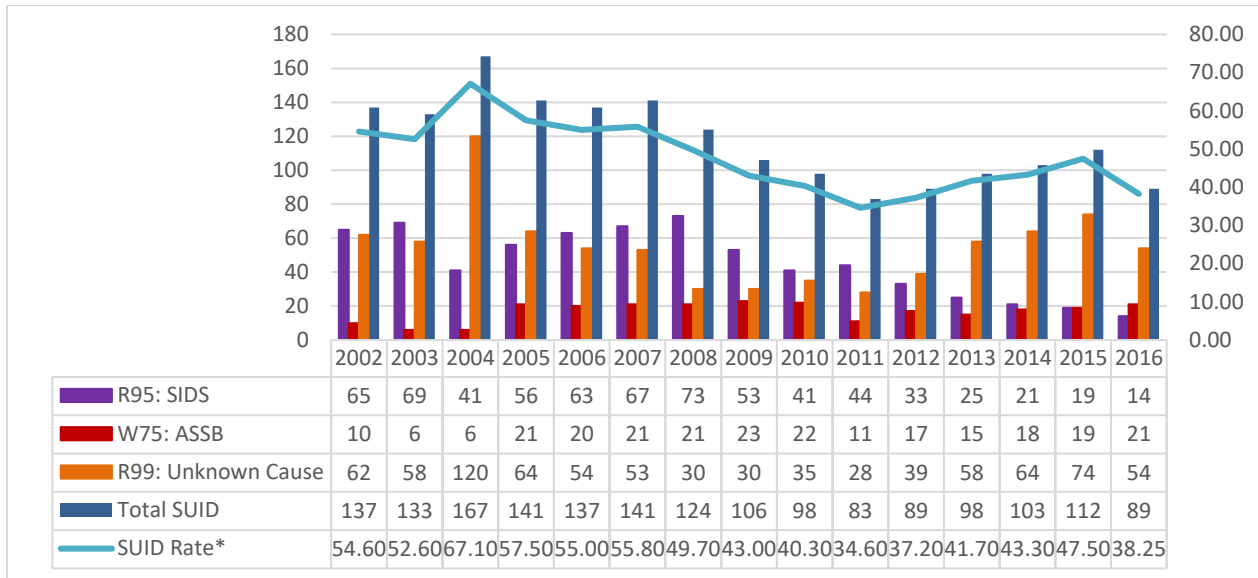
In fact, the OCFS 2016 Child Fatality Report shows an 18.6% decrease, from 49% to 39%, in the number of fatalities involving an unsafe sleep environment from 2014-2016.

<https://ocfs.ny.gov/main/reports/2016-Child-Fatality-Report.pdf>

SIDS is one subgroup of SUID. SIDS is defined as “...sudden death of an infant under one year of age which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history.” There is inconsistency in coding SUID/SIDS deaths on death certificates. Some medical examiners are calling fewer deaths SIDS, and instead coding them as “accidental suffocation” or “unknown cause.”

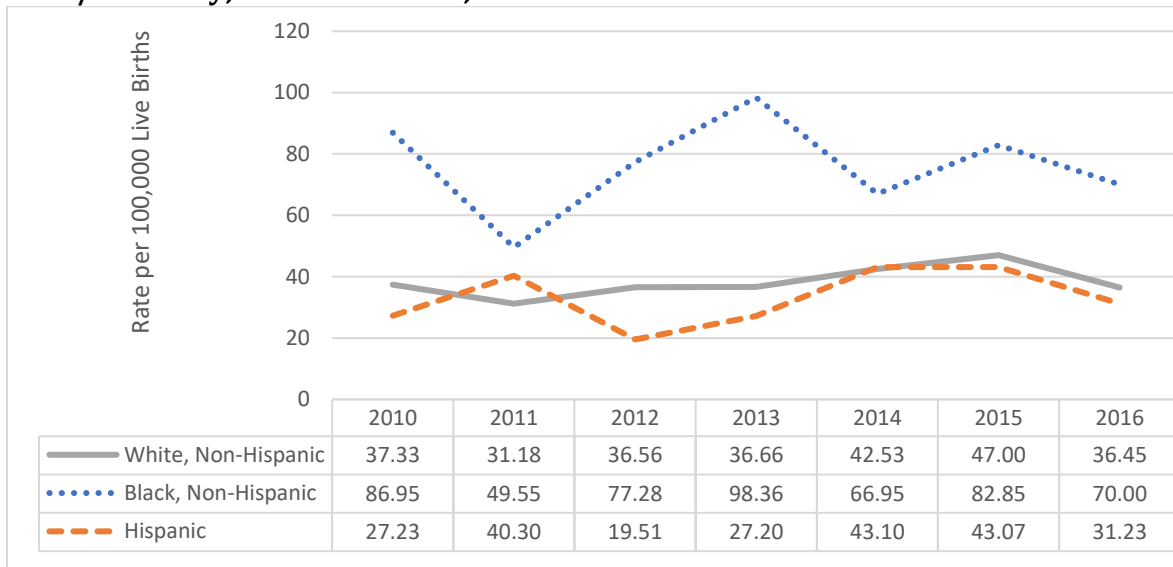
Figure 6 shows the rate of SIDS decreasing while infant deaths due to Unknown Causes have increased.

Figure 6. Frequency+ of Sudden Infant Death Syndrome (SIDS), Accidental Suffocation or Strangulation in Bed (ASSB), Unknown Cause, and Total Sudden Unexpected Infant Deaths (SUID) Cases and Total SUID Rate per 100,000 Live Births in New York State, 2002-2016



Source: 2010-2016 NYS Death Certificate Data. Restricted to infants who were born and died as New York State residents. *SUID rate calculated per 100,000 live births. + Number of cases in calendar year.

Figure 7. Sudden Unexpected Infant Death Rate per 100,000 Live Births by Maternal Race/Ethnicity, New York State, 2010-2016



Source: 2010-2016 NYS Death Certificate Data. Restricted to infants who were born and died as New York State residents.

SUID rates have been consistently higher among infants born to black non-Hispanic mothers. In recent years, the rate of sleep-related infant deaths has increased among white

non-Hispanics and Hispanics, which has reduced the disparity in SUID rates for infants born to mothers in these racial/ethnic groups and black non-Hispanics; however, in 2016 the SUID rate for black, non-Hispanic mothers was twice that of white, non-Hispanic mothers and more than twice that of Hispanic mothers (Figure 7).

New York State Pregnancy Risk Assessment Monitoring System

The New York State Pregnancy Risk Assessment Monitoring System (PRAMS) is an on-going mail/telephone survey of mothers who have recently given birth to a live born infant. PRAMS collects information from mothers about behaviors and experiences before, during and after pregnancy to learn more about how to reduce infant deaths and low birth weight births. The PRAMS project was developed by the Centers for Disease Control and Prevention (CDC) in 1987 with the goal of improving the health of mothers and infants by reducing adverse outcomes such as low birth weight, infant mortality and morbidity, and maternal morbidity. PRAMS provides state-specific data for planning and assessing health programs and for describing maternal experiences that may contribute to maternal and infant health. PRAMS collects information on two behaviors related to safe sleep – the percent of infants being placed on their backs to sleep and the percent of mothers who are co-sleeping with their infant. The latest PRAMS trend reports on sleeping practices are shown in Figures 8, 9 and 10.

**Figure 8. Percentage of Infants Being Placed on their Backs to Sleep
Pregnancy Risk Assessment Monitoring System (PRAMS) Report
New York State by Region, 2004-2015**

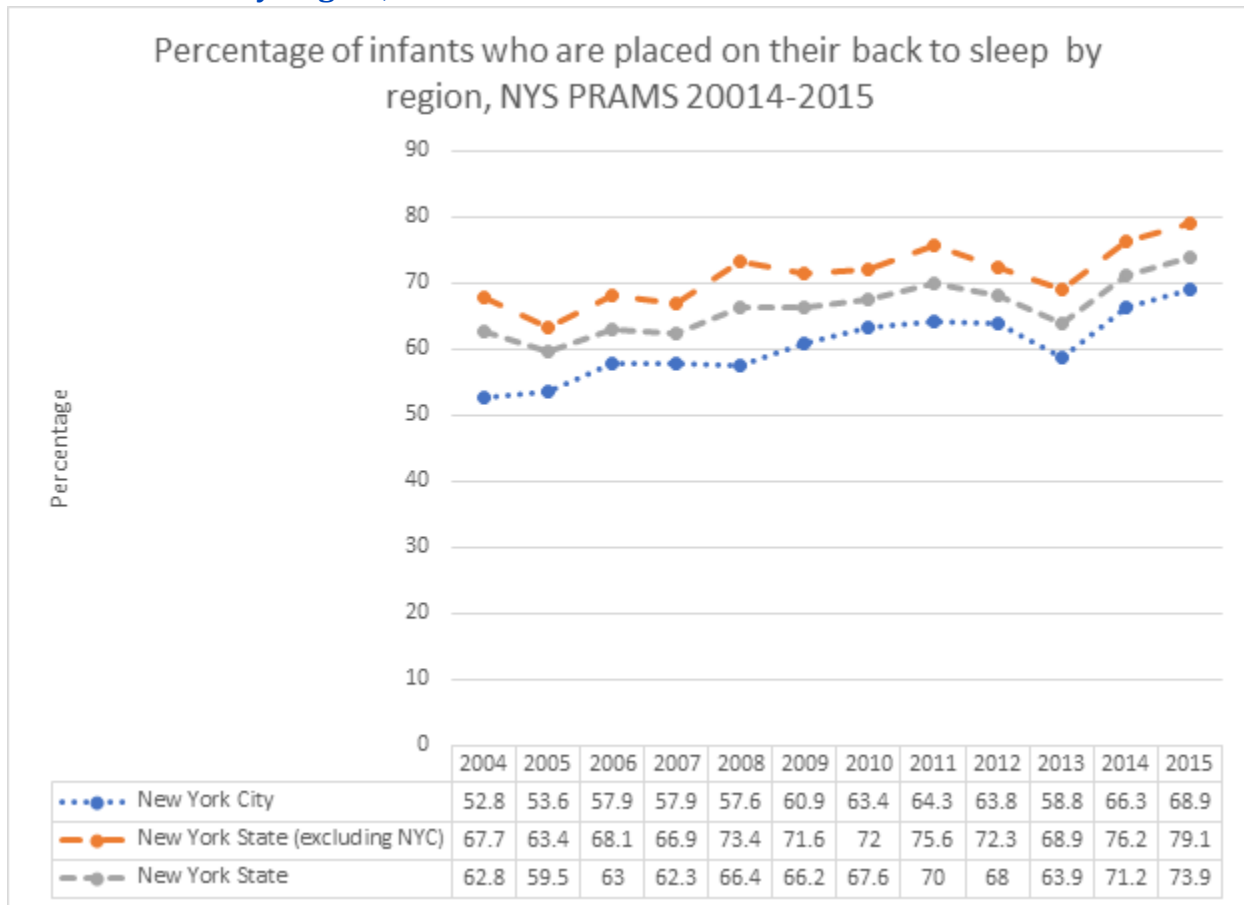


Figure 8 shows that the percent of infants being placed on their backs to sleep has been improving in NYS. From 2013 to 2015, the percent of infants placed on their backs to sleep increased from 58.8% to 68.9% in NYC; 63.9% to 73.9% in NYS; and 68.9% to 79.1% in NYS, excluding NYC. NYS is making progress towards meeting the Healthy People 2020 objective (MICH-20), which calls for 75.8% of infants to be placed to sleep on their backs.

**Figure 9. Percentage of Mothers Who Report Co-Sleeping with their Infant
Pregnancy Risk Assessment Monitoring System (PRAMS) Report
New York State by Region, 2012-2015**

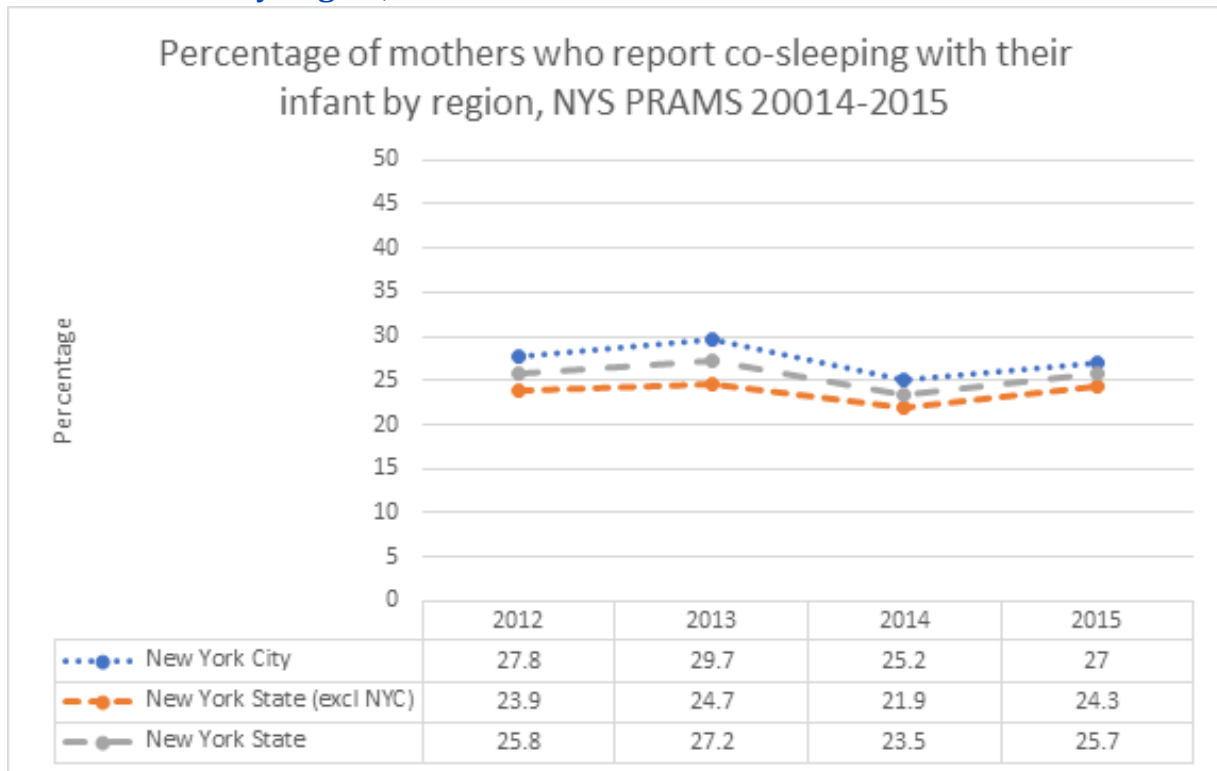


Figure 9 shows that the percent of infants co-sleeping with caregivers is remaining stable in NYS. From 2012 to 2015, the percent of infants co-sleeping slightly decreased from 27.8% to 27% in NYC; remained the same in NYS; and slightly increased from 23.9% to 24.3% in NYS, excluding NYC. More than one in four infants is sharing a bed with a caregiver in NYS.

Figure 10. Co-sleeping Demographics

Percentage of women who report co-sleeping with their infant

New York State, 2015

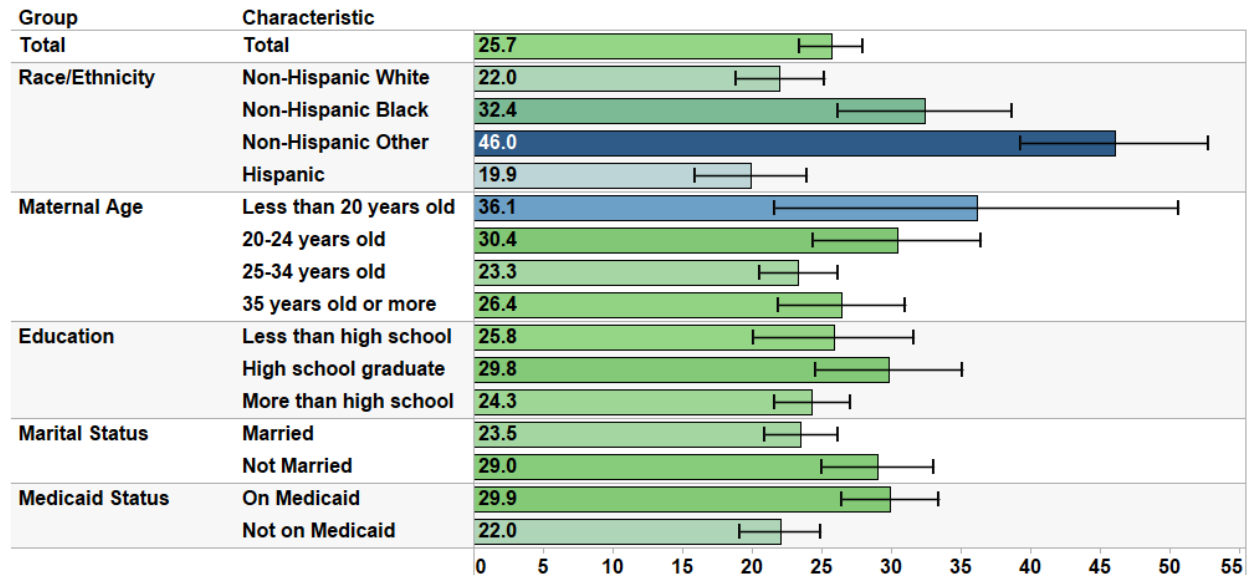


Figure 10 illustrates disparities in co-sleeping in NYS. In 2015, 32.4% of non-Hispanic, black mothers were sleeping with their infant compared to 22% of non-Hispanic, white mothers. The rate of co-sleeping is the lowest among Hispanic mothers at a rate of 19.9%, while the rate is highest among non-Hispanic others at 46%. In addition, 36.1% of mothers less than 20 years of age, 29.8% of mothers with a high school education and 29.9% of mothers on Medicaid are co-sleeping with their infants in NYS.

SIDS and Other Sleep-Related Infant Deaths: Updated 2016 Recommendations for a Safe Infant Sleeping Environment - American Academy of Pediatrics

The latest technical report and policy statement on infant safe sleep from the AAP was released in 2016.⁸ The recommendations are the result of a comprehensive literature review on safe infant sleep, focusing mainly on studies published since 2011 (when the previous technical report and policy statement were released).¹⁰ A total of 63 new studies were judged to be of sufficient quality to be included in the technical report. Since the data regarding bedsharing have been conflicting, the AAP Task Force solicited the independent judgment of a biostatistician with special expertise in perinatal epidemiology to review the evidence. Task force members used the Strength-of-Recommendation Taxonomy to review strength of evidence for recommendations. In 2016, the AAP released an updated set of guidelines to promote a safe sleep environment that can reduce the risk of *all* sleep-related infant deaths.⁸ Recommendations for a safe sleep environment include supine positioning, use of a firm sleep surface, room-sharing without bedsharing, and avoidance of soft bedding and overheating. Additional recommendations for SIDS risk reduction include encouraging breastfeeding; performing routine immunizations; using a pacifier once breastfeeding is established; and avoiding exposure to smoke, alcohol and illicit drugs. Moreover, new evidence and rationale for recommendations are presented for skin-to-skin care for newborn infants, bedside and in-bed sleepers, sleeping on couches/armchairs and in sitting devices, and the use of soft bedding after four months of age. In addition, expanded recommendations for infant sleep location are included. These recommendations are not only intended for all caregivers, they are also directed toward health policy makers, researchers and professionals who care for or work on behalf of infants. Because certain behaviors, such as smoking, can increase risk for the infant, some recommendations are directed toward women who are pregnant or may become pregnant.

RECOMMENDATIONS TO REDUCE THE RISK OF SIDS AND OTHER SLEEP-RELATED INFANT DEATHS

1. Back to sleep for every sleep.

To reduce the risk of SIDS, infants should be placed for sleep in a supine position (wholly on the back) for every sleep by every caregiver until the child reaches 1 year of age.¹¹⁻¹⁵ Side sleeping is not safe and is not advised.^{12,14}

2. Use a firm sleep surface.

Infants should be placed on a firm sleep surface (eg, mattress in a safety-approved crib) covered by a fitted sheet with no other bedding or soft objects to reduce the risk of SIDS and suffocation.

3. Breastfeeding is recommended.

Breastfeeding is associated with a reduced risk of SIDS.¹⁶⁻¹⁸ Unless contraindicated, mothers should breastfeed exclusively or feed with expressed milk (i.e., not offer any formula or other nonhuman milk-based supplements) for 6 months, in alignment with recommendations of the AAP.¹⁹

4. It is recommended that infants sleep in the parents' room, close to the parents' bed, but on a separate surface designed for infants, ideally for the first year of life, but at least for the first 6 months.

There is evidence that sleeping in the parents' room but on a separate surface decreases the risk of SIDS by as much as 50%.^{13, 15, 20-21} In addition, this arrangement is most likely to prevent suffocation, strangulation, and entrapment that may occur when the infant is sleeping in the adult bed.

5. Keep soft objects and loose bedding away from the infant's sleep area to reduce the risk of SIDS, suffocation, entrapment, and strangulation.

Soft objects,^{16-17, 22-25} such as pillows and pillow-like toys, quilts, comforters, sheepskins, and loose bedding,^{14, 26-31} such as blankets and nonfitted sheets, can obstruct an infant's nose and mouth. An obstructed airway can pose a risk of suffocation, entrapment, or SIDS.

6. Consider offering a pacifier at nap time and bedtime.

Although the mechanism is yet unclear, studies have reported a protective effect of pacifiers on the incidence of SIDS.³²⁻³³ The protective effect of the pacifier is observed even if the pacifier falls out of the infant's mouth.³⁴⁻³⁵

7. Avoid smoke exposure during pregnancy and after birth.

Both maternal smoking during pregnancy and smoke in the infant's environment after birth are major risk factors for SIDS. Mothers should not smoke during pregnancy or after the infant's birth.³⁶⁻³⁹

There should be no smoking near pregnant women or infants. Encourage families to set strict rules for smoke-free homes and cars and to eliminate secondhand tobacco smoke from all places in which children and other nonsmokers spend time.⁴⁰⁻⁴¹

The risk of SIDS is particularly high when the infant bed-shares with an adult smoker, even when the adult does not smoke in bed.^{13-14, 42-44, 111}

8. Avoid alcohol and illicit drug use during pregnancy and after birth.

There is an increased risk of SIDS with prenatal and postnatal exposure to alcohol or illicit drug use. Mothers should avoid alcohol and illicit drugs before getting pregnant and during pregnancy.⁴⁵⁻⁵²

9. Avoid overheating and head covering in infants.

Although studies have shown an increased risk of SIDS with overheating,⁵³⁻⁵⁷ the definition of overheating in these studies varies. Therefore, it is difficult to provide specific room temperature guidelines to avoid overheating.

10. Pregnant women should obtain regular prenatal care.

There is substantial epidemiologic evidence showing a lower risk of SIDS for infants whose mothers obtain regular prenatal care.⁵⁸⁻⁶⁰ Pregnant women should follow guidelines for frequency of prenatal visits.⁶¹

11. Infants should be immunized in accordance with recommendations of the AAP and Centers for Disease Control and Prevention.

Recent evidence suggests that vaccination may have a protective effect against SIDS.⁶²⁻⁶⁵

12. Avoid the use of commercial devices that are inconsistent with safe sleep recommendations.

Be particularly wary of devices that claim to reduce the risk of SIDS. Examples include, but are not limited to, wedges and positioners and other devices placed in the adult bed for the purpose of positioning or separating the infant from others in the bed.

13. Do not use home cardiorespiratory monitors as a strategy to reduce the risk of SIDS.

The use of cardiorespiratory monitors has not been documented to decrease the incidence of SIDS.⁶⁶⁻⁶⁹

14. Supervised, awake tummy time is recommended to facilitate development and to minimize development of positional plagiocephaly.

Although there are no data to make specific recommendations as to how often and how long it should be undertaken, the AAP Task Force concurs with the AAP Committee on Practice and Ambulatory Medicine and Section on Neurologic Surgery that “a certain amount of prone positioning, or ‘tummy time,’ while the infant is awake and being observed is recommended to help prevent the development of flattening of the occiput and to facilitate development of the upper shoulder girdle strength necessary for timely attainment of certain motor milestones.”⁷⁰

15. There is no evidence to recommend swaddling as a strategy to reduce the risk of SIDS.

Swaddling, or wrapping the infant in a light blanket, is often used as a strategy to calm the infant and encourage the use of the supine position. There is a high risk of death if a swaddled infant is placed in or rolls to the prone position.⁷¹⁻⁷³ If infants are

swaddled, they should always be placed on the back. Swaddling should be snug around the chest but allow for ample room at the hips and knees to avoid exacerbation of hip dysplasia. When an infant exhibits signs of attempting to roll, swaddling should no longer be used.⁷¹⁻⁷³

16. Health care professionals, staff in newborn nurseries and NICUs, and child care providers should endorse and model the SIDS risk reduction recommendations from birth.⁷⁴⁻⁷⁶

Staff in NICUs should model and implement all SIDS risk-reduction recommendations as soon as the infant is medically stable and well before anticipated discharge. Staff in newborn nurseries should model and implement these recommendations beginning at birth and well before anticipated discharge. All physicians, nurses, and other health care providers should receive education on safe infant sleep. Healthcare providers should screen for and recommend safe sleep practices at each visit for infants up to 1 year old. Families who do not have a safe sleep space for their infant should be provided with information about low-cost or free cribs or pack n' plays.

17. Media and manufacturers should follow safe sleep guidelines in their messaging and advertising.

Media exposures (including movie, television, magazines, newspapers, and Web sites), manufacturer advertisements, and store displays affect individual behavior by influencing beliefs and attitudes.^{74, 76} Media and advertising messages contrary to safe sleep recommendations may create misinformation about safe sleep practices.⁷⁷

18. Continue the “Safe to Sleep” campaign, focusing on ways to reduce the risk of all sleep-related infant deaths, including SIDS, suffocation, and other unintentional deaths. Pediatricians and other primary care providers should actively participate in this campaign.

Public education should continue for all who care for infants, including parents, child care providers, grandparents, foster parents, and babysitters, and should include strategies for overcoming barriers to behavior change. The campaign should continue to have a special focus on the black and American Indian/Alaskan Native populations because of the higher incidence of SIDS and other sleep-related infant deaths in these groups.

19. Continue research and surveillance on the risk factors, causes, and pathophysiologic mechanisms of SIDS and other sleep-related infant deaths, with the ultimate goal of eliminating these deaths altogether.

Education campaigns need to be evaluated, and innovative intervention methods need to be encouraged and funded.⁸

The AAP Guidelines are the evidence-based recommendations for safe infant sleep.

There are no other recommendations for safe infant sleep in the literature that have been shown to significantly reduce IM. For the remainder of this literature review, interventions aimed at influencing healthcare providers, daycare providers and infant caregivers to practice these safe sleep recommendations will be explored. The interventions will be divided into five broad categories: 1) health messaging; 2) safe sleep environments; 3) education and modelling; 4) legislation and regulation; and 5) reducing disparities.

To begin with, it is important to understand how difficult it can be to determine the effectiveness of an intervention. The strongest, most reliable evidence of effectiveness comes from a randomized control trial (RCT). In a RCT, a group of participants is randomly assigned to either the intervention or a control/comparison group. Randomization minimizes selection bias (when the group being studied is not representative of the population). The control group allows the researchers to determine whether the intervention caused the desired effect when compared with the no intervention (control) group, while ensuring both groups are analogous to one another in all other aspects. However, there are limitations to RCTs. They are time-consuming and expensive to conduct. There are also ethical constraints. For example, one cannot randomize infants to sleep either prone or supine and then measure outcomes.

Due to these challenges, most SIDS/SUID interventions are observational studies. An observational study uses a sample to draw conclusions about the population. These conclusions come from implementing an intervention and then observing the results. In most SIDS/SUID observational studies, an intervention is implemented and then the outcomes are measured and often compared to the outcomes before the intervention. A difficulty with observational studies is that the two events being studied may simply be associated (or correlated) with one another due to coincidence or some other common factor.

The goal of the interventions described in this literature review are to reduce SIDS/SUID. To determine whether an intervention was successful at reducing IM, the sample size needs to be sufficiently large, and sleep-related infant deaths are rare occurrences. Most of the studies in this literature review do not have a sample size large enough to determine the impact on IM. So instead, the goal of most of these interventions is to increase the proportion of the population adhering to safe infant sleep practices. Unfortunately, there are limitations to this approach as well. To assess behavior change, the preferred approach would be to covertly observe participants' behavior after an intervention, however, this is impractical and challenging to accomplish. Conversely, when participants are directly observed, this can influence their behavior. This is known as the Hawthorne effect (or the observer effect). It is a type of reactivity in which individuals modify their behavior in response to their awareness of being observed. It is a well-documented phenomenon. For

these reasons, proxy measures are often used, such as surveys in which participants report their knowledge, attitudes, intentions and behavior. Many safe infant sleep studies have pre- and post- tests to determine the effectiveness of the intervention, but surveys can be problematic too. If the post- survey is administered too soon after the intervention and not repeated later, the researchers will not know if the behavior modifications were sustained. Additionally, participants may not be forthcoming about their true feelings and intentions on a survey because they know what the researcher would like them to say. With these challenges in mind, a comprehensive literature review will follow, to examine interventions designed to influence caregivers' behavior with regard to safe infant sleep.

HEALTH MESSAGING

The “Back to Sleep” public awareness campaign of 1994 (now called the “Safe to Sleep” campaign) encouraged caregivers to place infants on their backs (supine position) for sleep to reduce the risk of SIDS. This campaign was very successful at decreasing rates of prone infant sleeping leading to reductions in mortality rates from SIDS by more than 50%.⁷⁸ In 1992, the first National Infant Sleep Position (NISP) Household Survey was conducted to determine the usual position in which U.S. mothers placed their babies to sleep: lateral (side), prone (stomach), supine (back), other, or no usual position. According to the 1992 NISP survey, 13.0% of U.S. infants were positioned in the supine position for sleep. According to the 2006 NISP survey, 75.7% of infants were positioned in the supine position for sleep.⁷⁹ Although the “Back to Sleep” campaign was effective at reducing IM by more than 50%, the rate of decline in SIDS deaths has plateaued in the past decade nationally, even with the ongoing educational efforts that promote safe sleep and other risk reduction measures.⁷⁸ In the U.S., the rate of infant sleep-related deaths declined from 154.6 deaths per 100,000 live births in 1990 to 93.9 per 100,000 live births in 1999; in 2015, the rate of infant sleep-related deaths was 92.6 deaths per 100,000 live births.⁸⁰ In NYS, the IM rate continues to decline steadily, although at a slower rate than it did in the 1990s.

Conveying the Message

In a study by Hutton et al. where home visitors used specially designed children's books to deliver the safe sleep message, results showed better adherence to exclusive crib use and avoidance of bedsharing. The books enhanced dialogue between the caregivers and the home visitors. Children's books may be a promising mode of conveying health messaging.⁸¹

In another study by Moon et al., mothers received a mobile health intervention in which they received frequent emails or text messages containing short videos with educational content about infant safe sleep practices. Mothers who received a mobile health

intervention reported statistically significantly higher rates of placing their infants supine for sleep.⁸²

In summary, health messaging can be an effective way to promote safe infant sleep practices, if the message includes an educational component. People need to understand the rationale behind the message for the message to be accepted. The “Back to Sleep” health message campaign promoted the realization that all infants are at risk for SIDS, and by placing infants supine, one can avoid a risk factor for SIDS.

SAFE SLEEP ENVIRONMENTS

There are many factors that contribute to the confusion around safe sleep and infant sleep products. In a 2017 comparison of advertisements by Kreth et al., the researchers found that 35% of advertisers do not follow safe sleep guidelines when advertising their products.⁸³ Crib bumper pads were the biggest safe sleep violation with 70% of ads featuring them. Other common violations included loose bedding, stuffed animals or infants sleeping on their stomachs or sides. The more caregivers see unsafe sleep environments the more normalized it becomes, and the harder it is to know what is safe.

Since 1938, every expectant mother in Finland has been given a baby box as a gift from the government. A baby box is a cardboard box with a tightly fitted mattress and fitted sheet. The Finnish baby box also contains onesies, a sleep sack, outer wear for winter, bathing products for the baby and diapers. To be eligible to receive a baby box, the expectant mother must begin prenatal care visits by the fourth month of pregnancy. The intent of the maternity package, a gift from the government, is to give all children born in Finland an equal start in life.

In the 1930's Finland was a poor country and IM was high (65 out of 1,000 babies died). In the decades to follow, the IM rate improved dramatically. There are several possible reasons for this – prenatal care for all women was established in the 1940's, followed by a national health insurance system and a central hospital network in the 1960's. The decline in the IM rate was not unique to Finland. It was seen in all industrialized countries across the globe during this same time period. Since Finland never formally evaluated their baby box program, there is no direct evidence to link improvements in IM with the use of baby boxes. In fact, no formal research has been done to determine how frequently the boxes are used as a sleep surface.

Baby boxes have made their way to the U.S. and have been marketed as a safe place for baby to sleep. They are meant to protect against sleep-related deaths. The problem is baby boxes have not been extensively tested for safety yet. However, there is currently work underway to address safety and testing concerns. A task group of the independent standards organization, the American Society for Testing and Materials (ASTM) International is looking at expanding the standards for bassinets to cover baby boxes. The current ASTM bassinet standards already address issues such as sharp edges, small parts, finger entrapment and mattress suffocation hazards. The task group is considering the development of requirements for additional hazards associated with baby boxes, such as the box's stability, handle strength and product integrity, among others. It will likely take another year before testing is complete, and these standards are finalized and formally adopted. Furthermore, there is no evidence to link a reduction in IM with the use of baby boxes. Moreover, the safety of baby boxes needs further review.

Sleep-Related Products

Cribs for Kids provides free or reduced-cost cribs to families. There are over 500 Cribs for Kids partners in the U.S. Since its inception in 1998, Cribs for Kids has distributed more than 300,000 safe sleep environments. In addition to a crib, families receive a fitted sheet with an embossed safe sleep message, a wearable blanket, pacifier and safe sleep educational materials including brochures, a safe sleep refrigerator magnet, Safe Sleep for Your Baby DVD and a copy of the baby board book, Sleep Baby Safe and Snug. A survey of crib recipients found that 38% of infants would have slept in an adult bed with the parents if a crib had not been given to them.⁸⁴

The Food and Drug Administration (FDA) has received reports about babies who have died from suffocation associated with sleep positioners. In most of the cases, the babies suffocated after rolling from their sides to their stomachs. The federal government also received reports about babies who were placed on their backs or sides to sleep in positioners, but were later found in other, dangerous positions within or next to the positioners. The FDA warns parents and other caregivers not to put babies in sleep positioning products.⁸⁵

A retrospective review of deaths involving sitting and carrying devices (car seats, bouncers, swings, strollers and slings), reported to the U.S. Consumer Product Safety Commission between 2004 and 2008, was conducted. Of the 47 deaths analyzed, 31 occurred in car seats, 5 in slings, 4 each in swings and bouncers, and 3 in strollers. The reported elapsed time between the last time a child was seen by a caregiver and found deceased varied greatly, with a mean of 26 minutes in slings; 32 minutes in strollers; 140 minutes in car seats; 150 minutes in bouncers; and 300 minutes in swings. The cause of death was asphyxiation in all cases except one. Fifty-two percent of deaths in car seats were

attributed to strangulation from straps; the others were attributed to positional asphyxia.⁸⁶ In conclusion, infants and children 2 years of age and younger should be properly restrained and not be left unsupervised in sitting and carrying devices. Car seats should never be used as sleeping environments outside of the vehicle, and children should never be in a car seat with unbuckled or partially buckled straps. Infants in slings should have their faces visible and above the edge of the sling, should not have their faces covered by fabric, and their chins should not be compressed into their chests.

Scheers et al. collected data from the U.S. Consumer Product Safety Commission about deaths from January 1, 1985 and injuries from January 1, 1990 to October 31, 2012. There were 48 deaths, of which 42 were due to crib bumpers. There were 182 injuries related to crib bumpers during the same time period. Between 2006-2012, 26 infants died due to crib bumpers, as compared to an average of 8 deaths in the three earlier 6-year periods. Of these 48 deaths, 67% were preventable and were deemed to be caused by the bumper itself. There were no other objects in the crib. Of these infants, 13 were wedged, 12 had their face against the bumper, 3 had an arm caught and their face against the bumper, 1 was caught between the crib and a dresser and 3 were strangled from strings. At the time of the study, there were no federal regulations addressing crib bumpers. In 2012, the industry revised standards to distinguish and regulate pillow-like crib bumpers from non-hazardous traditional crib bumpers. Between this time, crib bumpers caused 56 near suffocations, 27 choking/ingestions, 23 strangulation/entrapments, 24 limb entrapments, 8 falls and 11 miscellaneous injuries. Of all these injuries, 11 were life-threatening.⁸⁷

Doering and Ward conducted a study on the interface between poverty, air mattresses, policy and infant safety. According to their hypothesis, the interfacing issues of poverty, the bedbug epidemic and changes in the design and marketing of air mattresses may be increasing consumer use of air mattresses as primary sleep environments and thus increasing the potential for infant death. To test their hypothesis, they used data from the National Child Death Review Case Reporting System and found that between 2004 and 2015, across 24 states, an air mattress was the incident sleep surface for 108 infants whose deaths were either during sleep or in a sleep environment. Despite recent changes to improve air mattress safety labeling, air mattresses are being used as sleep surfaces for infants, which is alarming as infants can suffocate on air mattresses, even when the mattress is fully inflated.⁸⁸

The wahakura, which is a low-sided (6 inches tall) infant bed woven from flax, was traditionally used in the indigenous Maori communities in New Zealand. The pepi-pod is similar to the wahakura, but it is a plastic box with a mattress. Both the wahakura and pepi-pod have been re-introduced by several communities in New Zealand recently as a strategy to improve safety while bedsharing, a common practice in New Zealand, where the SUID rate is more than four times those of European countries. Wahakuras and pepi-pods

are meant to be placed in the adult bed next to the parent as a separate infant sleep space within the adult bed. Contrary to the baby box, recent studies have found the wahakura basket itself to be as safe as the recommended bassinette.⁸⁹ Preliminary results from a randomized controlled trial suggest that rates of use, quality and quantity of maternal sleep and breastfeeding are similar for the wahakura and a standard bassinette placed in the parents' room and/or next to the parents' bed. According to the researchers, this study suggests wahakura are relatively safe, can be promoted as an alternative to infant-adult bedsharing and are likely to be helpful in high-risk populations.⁸⁴ However, risk reduction may only be obtained when caregivers always lay the baby down to sleep on its back; do not allow pillows, blankets or soft objects in the basket; make sure there are no gaps between the baby's mattress and the side of the basket; and do not bring the basket into the bed of an adult who is exhausted or intoxicated.

Studies have shown significant safety hazards of sleep positioners, crib bumpers, air mattresses and carrying devices (car seats, bouncers, swings, strollers and slings). These are unsafe for infant sleep and their inappropriate use could result in strangulation, positional asphyxia and death.

EDUCATION AND MODELING

Several interventions have focused on educating healthcare professionals to provide safe sleep messages and appropriate role modeling for families.⁸⁹⁻⁹⁸ Professional educational interventions have most commonly, but not exclusively, targeted healthcare professionals; however, others have targeted child care providers and first responders.⁹⁹⁻¹⁰¹ Education and modeling interventions are aimed at facilitating behavior change at the individual provider level (nurse/physician/child care worker) and the organizational context level (hospital/child care center). They increase knowledge and awareness among providers, while also creating a culture of infant sleep safety, with a consistent standard of care expected of all staff members. To increase medical staff compliance with and role-modeling of safe sleep guidelines, it is necessary to identify and understand the barriers to evidence-based practice. Healthcare professionals and child care providers have concerns similar to those expressed by parents, including concerns about the risk of aspiration or diminished sleep quality while supine^{98-99, 102-103} and may lack confidence when speaking to parents about these issues. Reinforcing the education and implementing an organizational safe sleep policy can help overcome such barriers. Medical personnel are critical role models for parents, and the way they position infants in the hospital strongly influences parental practices at home. Education and modeling interventions have been some of the most successful safe sleep interventions. Not only do they change provider practices, but

the modeling of safe sleep practices by providers influences the behavior of caregivers, who tend to adopt the practices they see modeled after discharge.

In 2012, Moon et al. launched a program entitled DOSE: Direct On-Scene Education. The program trains first responders for 911 emergency calls in infant safe sleep, so they can provide infant safe sleep education to families in the homes. First responders assess every home that is entered after any 911 call to see if there is an infant in the home, where the sleep environment is and provide caregivers with a “Safe Sleep Survival Kit”. In Broward County, Florida in 2013, 15 families with no crib in the home were identified, and 14 accepted a portable crib from the local Cribs for Kids program. Although the number of sleep-related deaths has decreased in Broward County, it is not known whether this program has had an impact on the reduction in IM.⁷⁸

Finally, even when caregivers are educated on safe sleep practices, co-sleeping still occurs despite knowing the risks. In 2016, Cullen et al. found that the lack of dialogue between providers and caregivers around co-sleeping teaching often deters caregivers and families from seeking further education or consultation. According to the researchers, providers need to ensure that safe sleep practices are taught and that the material provided pertains to the caregiver’s specific cultural and familial situation. In effect, the researchers are saying that some caregivers are going to co-sleep despite knowing the risks, and therefore, teaching them about safe infant sleep practices should include more dialogue on how to do this safely.¹⁰⁴ According to the AAP Policy Statement,⁸ the following situations should be avoided at all times: (1) Bed-sharing with a term normal weight infant younger than 4 months^{12, 14, 105-108} and infants born preterm and/or with low birth weight,¹⁰⁹ regardless of parental smoking status; (2) Bed-sharing with a current smoker (even if he or she does not smoke in bed) or if the mother smoked during pregnancy;^{12, 108, 110-111} (3) Bed-sharing with someone who is impaired in his or her alertness or ability to arouse because of fatigue or use of sedating medications (e.g., certain antidepressants, pain medications) or substances (e.g., alcohol, illicit drugs);^{14, 113-114} (4) Bed-sharing with anyone who is not the infant’s parent, including nonparental caregivers and other children;¹¹⁰ (5) Bed-sharing on a soft surface, such as a waterbed, old mattress, sofa, couch, or armchair;^{12, 105-106, 110-111} (6) Bed-sharing with soft bedding accessories, such as pillows or blankets;¹¹¹⁻¹¹² (7) The safety and benefits of co-bedding for twins and higher order multiples have not been established. It is prudent to provide separate sleep surfaces and avoid co-bedding for twins and higher order multiples in the hospital and at home.¹¹³

In summary, hospitals have the ability to become a leader in protecting infants and reducing preventable infant sleep-related deaths. They can reach just about every new parent within the community. Physicians, nurses and other healthcare providers are crucial role models for parents and caregivers. Parents and caregivers who see their baby placed supine in the hospital are almost twice as likely to continue this practice at home.

When the correct behavior is modeled and followed with a conversation on safe sleep recommendations, adoption of safe behaviors is increased even more significantly. Studies show that educating hospital staff and daycare providers on infant safe sleep practices is a worthwhile effort.⁹¹⁻¹⁰¹ Quality improvement projects that incorporate education and modeling of safe sleep practices have been shown to significantly increase providers' adoption of safe sleep recommendations, and this in turn, influences caregivers' adoption of safe sleep practices.^{91, 94-95, 97}

LEGISLATION AND REGULATION

Legislation and regulation refer to the organization of care processes, staff, capacities, resources, structures, financial arrangements and policies. The underlying concept for legislation and regulation, which targets the organizational, economic and political context, is that adherence to guidelines is more likely if mandated. To date, most safe infant sleep legislation and regulation have focused on child care professionals. After studies in the 1990's demonstrated that 75% of child care providers were placing infants prone for sleep,¹¹⁴⁻¹¹⁵ many states began implementing child care regulations regarding infant sleep position, infant sleep location, use of bedding, and prohibition of smoking.¹¹⁵ Currently, 43 states regulate infant sleep position and 17 require SIDS risk reduction training for providers at licensed child care centers; however, there is much variability in these requirements. NYS regulates infant sleep position (must place infants supine, unless there is a physician waiver stating that the infant should be placed otherwise) (18 NYCRR § 418-1.7), prohibits objects in the crib (18 NYCRR § 418-1.7), and bans smoking in licensed child care centers and family child care homes (18 NYCRR § 418-1.11). Additionally, there are training requirements for licensed and registered daycare providers. Child care providers in NYS must complete 30 hours of training every two years, which includes "prevention techniques in sudden infant death syndrome". Unfortunately, 30% of child care providers are not licensed, and these regulations are not applicable to unlicensed family daycare providers, nor are they applicable to all the friends, relatives and nannies who provide informal child care. To date, no states have analyzed whether these regulations have been effective at decreasing the proportion of infants who die in child care settings.

Legislation has also been targeted at hospitals. Several states, including New York, have passed legislation which mandates consistent infant safe sleep education in all birthing hospitals. In July 2016, Governor Andrew M. Cuomo signed legislation that requires all hospitals and birthing facilities in NYS to give new parents information on safe sleep upon admission (Public Health Law § 2803-j). The way the information is presented to new parents is left to the discretion of the hospitals. They may opt to give parents a brochure on safe infant sleep or have them watch a video on safe sleep during the birth hospitalization.

At least seven other states including California, Nebraska, Illinois, Michigan, Texas, Florida and Pennsylvania have passed similar legislation.

In this literature review, strong evidence was presented on the safety hazards of crib bumpers. These are unsafe for infant sleep and their use could result in strangulation, positional asphyxia or death. So far, two states have banned the sale of bumper pads. Maryland was the first state to do this, and now Ohio has implemented a similar ban. Ohio lawmakers passed Senate Bill 332 in October 2017, which bans the sale of non-mesh crib bumpers. The ban also includes online sales and delivery of bumper pads in Ohio (<https://www.wkbn.com/local-news/ohio-and-maryland-only-states-to-ban-baby-bumpers/1097718212>).

DISPARITIES

PRAMS surveillance currently covers about 83% of all U.S. births. The CDC used data from PRAMS to examine the prevalence of unsafe infant sleep practices. In 2015, 21.6% of respondents from 32 states and NYC reported placing their infant in a non-supine sleep position. Infant non-supine sleep positioning was highest among respondents who were non-Hispanic blacks. In fact, SUID rates per 100,000 live births for American Indian/Alaska Native (196.9) and non-Hispanic black infants (177.3) were more than twice those of non-Hispanic white infants (84.5). SUID rates per 100,000 live births were lowest among Hispanic (51.7) and Asian/Pacific Islander infants (32.7).¹¹⁶ In 2015, more than half (61.4%) of respondents reported any bed sharing with their infant. Bed sharing prevalence was higher among respondents who were American Indians/Alaska Natives, non-Hispanic blacks, or Asians/Pacific Islanders compared with non-Hispanic whites or Hispanics, aged <25 years compared with ≥25 years, who had completed ≤12 years compared with >12 years of education, who were WIC participants, and who reported any breastfeeding at 8 weeks postpartum.⁵ Use of at least one type of soft bedding was reported by 38.5% of respondents, ranging from 28.7% in Illinois to 52.6% in NYC. The most frequently reported types of soft bedding were bumper pads (19.1%) and plush or thick blankets (17.5%), followed by pillows (7.1%), infant positioners (6.2%), and stuffed toys (3.1%). The prevalence of soft bedding use was higher among respondents who were Asians/Pacific Islanders or Hispanics compared with members of other racial/ethnic groups, aged <25 years compared with ≥25 years, who had completed ≤12 compared with >12 years of education, who were WIC participants, and who were not breastfeeding at 8 weeks postpartum.

The reasons for variations in race/ethnicity-specific SUID rates over the past two decades are multifactorial and driven by changes in known SIDS risk factors (e.g., non-supine infant sleep position, infant bedding use and bedsharing). Young maternal age, low socioeconomic or educational status, maternal smoking, not breastfeeding or short breastfeeding duration, lack of prenatal care and unmarried status are other factors that may influence the disparities in SUID.¹¹⁷ When promoting safe infant sleep practices, it is important to consider these trends in targeting populations for prevention and developing culturally appropriate approaches for racial/ethnic communities.

A study was conducted by Colson et al. among mothers at four centers for the WIC program in Boston, Massachusetts, Dallas, Texas, Los Angeles, California, and New Haven, Connecticut to identify barriers to following the supine sleep recommendation. The researchers identified specific barriers to placing infants in the supine position for sleep in low-income, primarily black mothers. The main reasons for not placing infants supine were lack of or wrong advice, lack of trust in providers, lack of knowledge, and concerns about safety and comfort. Also noteworthy, 29% of mothers believed that having their infant sleep with an adult helped prevent SIDS, and only 43% believed that SIDS is related to sleeping position. These findings should be considered when designing interventions.¹¹⁸

Gaydos et al. conducted focus groups with 60 black, low-income, first-time mothers and telephone interviews with 20 providers serving these populations in 2015 to explore provider counselling and patient decision making. Most mothers reported understanding, but not following, the safe sleep recommendations. Key reasons for non-compliance included perceived safety, convenience, quality of infant sleep and conflicting information from family members. Providers recognize that many mothers are non-compliant and attribute non-compliance largely to cultural and familial influence. However, few provider attempts are made to mitigate these SIDS risks. The researchers suggest that strategies should be adapted to: (1) provide greater detailed rationale for SIDS prevention recommendations; and (2) incorporate or acknowledge family and cultural preferences in safe infant sleep education. Ignoring the reasons for sleep decisions by black parents may perpetuate ongoing racial/ethnic disparities in SIDS.¹¹⁹

In a randomized, controlled clinical trial of black mothers of infants by Mathews et al., the control group received standard messaging emphasizing safe sleep practices recommended by the AAP for the purposes of SIDS risk reduction. The intervention group received enhanced messaging emphasizing safe sleep practices for both SIDS risk reduction and suffocation prevention. Participants completed interviews at 2-3 weeks, 2-3 months, and 5-6 months after the infant's birth. Infants in the intervention group had a lower rate of soft bedding use. Mothers who received the enhanced message were more likely to state that they avoided soft bedding to protect their infant from suffocation. Black mothers who received an enhanced message about SIDS risk reduction and suffocation prevention were

less likely to use soft bedding in their infant's sleep environment.¹²⁰ A similar study by Moon et al., emphasized the need for health care professionals to discuss both SIDS risk reduction and prevention of accidental suffocation when advising black parents about safe sleep practices¹¹⁹ as the majority of black caregivers do not believe SIDS risk is related to sleep position.¹²¹

Thinking outside the box to reduce disparities, the Kansas Infant Death and SIDS (KIDS) Network and Wichita Black Nurses Association have implemented Community Baby Showers in high-risk (usually African-American) communities. Pregnant women are invited to these baby showers by churches, clinics, physicians' offices and media. The theme of the baby shower is safe sleep. The expectant mother receives safe sleep education, along with products to promote a safe sleep environment, including portable cribs and wearable blankets. Preliminary results show that attendance at a Community Baby Shower improves knowledge of safe sleep practices and intention to provide a safe sleep environment.¹²²

To reduce disparities in infant safe sleep practices, we first must understand the barriers faced by different sociodemographic groups. The studies presented here were focused on understanding the barriers faced primarily by black caregivers. Studies show that black caregivers have beliefs unique to their culture, and they need more detailed rationale for safe sleep practices, including knowledge of the risk of suffocation. A key component of developing effective, evidence-based strategies is to understand caregivers' barriers to adopting recommendations. Examples of barriers are caregivers' fear of choking if the infant is placed supine for sleep or perceived discomfort if the infant does not have blankets and pillows. With an understanding of the barriers, interventions can be developed to counteract them.¹²³

CURRENT EFFORTS

Hospital Safe Sleep Project

Since September 2015, the NYSDOH's NYSPQC and the IM Collaborative Improvement and Innovation Network (CoIIN) have focused on improving infant safe sleep practices to reduce IM. From September 2015 to July 2017, the NYSDOH implemented the NYSPQC/IM-CoIIN Hospital Safe Sleep Project which included: educating health care professionals so they understand, actively endorse and model safe sleep practices and providing infant caregivers with education and opportunities so they have the knowledge, skills and self-efficacy to practice safe sleep for every sleep. The AIM of the Hospital Safe

Sleep project was to reduce infant sleep-related deaths in NYS by improving safe sleep practices for infants. To accomplish this, a multidisciplinary team (with members from obstetrics and neonatal care units) was formed and worked to implement evidence based IM reduction strategies with the following goals: $\geq 10\%$ increase in infants placed to sleep in a safe sleep environment during the delivery hospitalization; documented education for $>95\%$ of caregivers prior to discharge; and $>95\%$ of caregivers reporting prior to discharge that they understood safe sleep educational messages. Eighty-one of 123 birthing facilities participated in this quality improvement project.

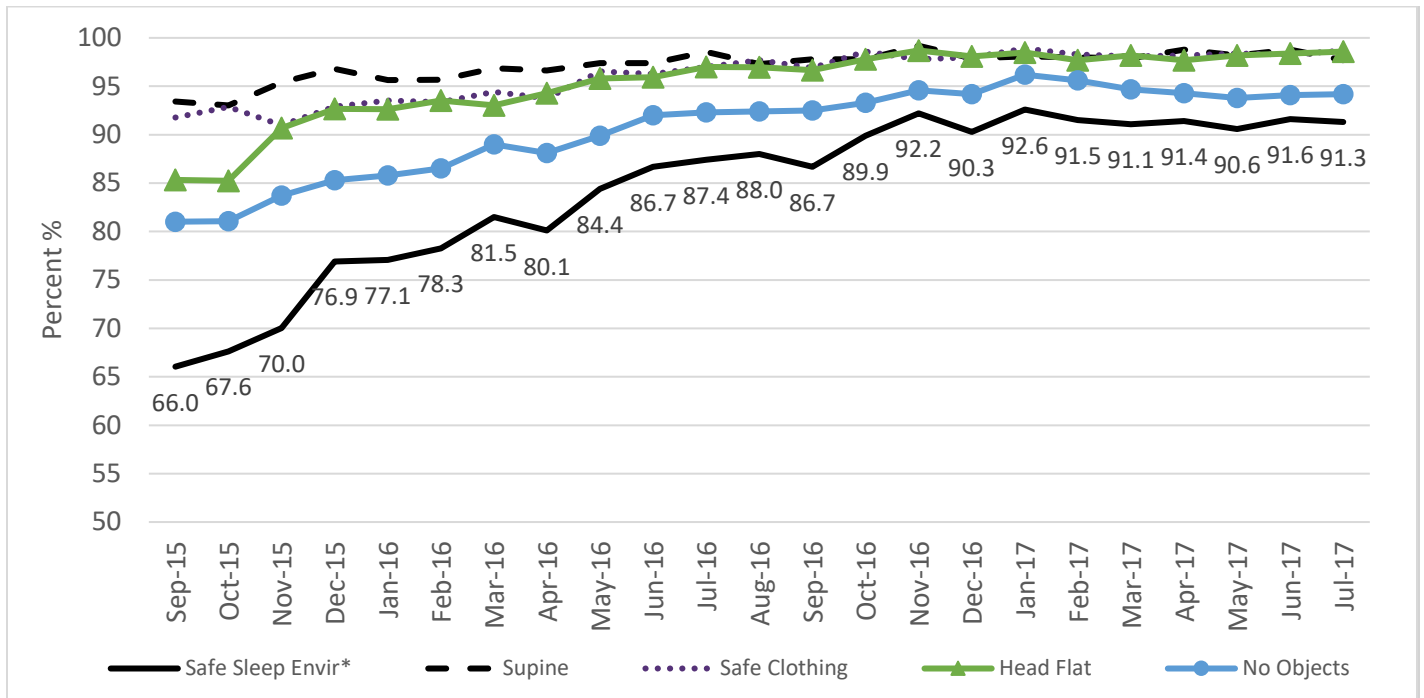
This Collaborative used the Institute for Healthcare Improvement's Breakthrough Series (BTS) learning model (www.ihl.org), modified to meet the requirements and unique needs of this topic and context, and a quality improvement change model, the Model for Improvement (www.apweb.org/API_home_page.htm), both of which had demonstrated effectiveness in previous NYSPQC quality improvement projects. (A BTS Collaborative is a vehicle for identifying, testing, and spreading changes that are effective for improving care and outcomes for defined populations.) In addition, the Collaborative assisted participating teams in embedding strategies to measure and address disparities in care and outcomes throughout the process.

Teams were offered in-person Learning Sessions, monthly Coaching Call webinars, educational webinars, data collection and feedback and access to expert clinical and quality improvement faculty.

The project evaluated key performance measures including: percent of medical records with documentation of safe sleep education; percent of infants, sleeping or awake and unattended in a crib, positioned supine, in safe clothing, with head of crib flat and crib free of objects; percent of caregivers who reported they received information on how to put their baby to sleep safely and indicating they understand safe sleep practices (indicating infant should be alone, on back, in crib, without items in the crib).

Project data showed continuous improvement. From September 2015, to March 2017, the percent of medical records with documentation of safe sleep education increased from 90.0% to 98.0%; the percent of infants, sleeping or awake-and-unattended, in a safe sleep environment increased from 66.0% to 91.3%; the percent of caregivers who reported they received information on how to put their baby to sleep safely increased from 90% to 99%; and the percent of primary caregivers indicating they are very likely or somewhat likely to practice safe sleep with their infant increased from 97.4% to 98.3%.

Percent of infants, sleeping or awake-and-unattended, in a safe sleep environment



Improvement was observed in all project measures. In summary, between September 2015 and July 2017, the percent of medical records with documentation of education increased 9%; the percent of infants in a safe sleep environment increased by 38%; and the percent of caregivers who understand safe sleep practices increased by 22%.

Modeling safe sleep for infants during the birth hospitalization is vital to educating parents on the behaviors that should be practiced in the home environment. As a means of assessing ongoing improvement and sustainment of infant safe sleep practices, the NYSPQC/IM-CoIIN safe sleep project is continuing to collect monthly data from birthing facilities on the percent of infants, sleeping or awake and unattended in a crib, in a safe sleep environment.

Community-Based Organization Safe Sleep Project

During September 2015 to July 2017, the NYSDOH coordinated a second IM-CoIIN safe sleep project as a structured, statewide quality improvement initiative to promote safe sleep practices in select community based organizations (CBO). Through this project, NYSDOH engaged local health departments and community-based organizations (all of which were MICHG grantees) in Orange, Onondaga, and Suffolk Counties to develop and implement safe sleep practices by providing safe sleep education to caregivers, 98% of whom were mothers. Facilitated by the NYSDOH, community-based home visiting

organizations worked with new mothers to educate them on infant safe sleep, and later, surveyed them on their knowledge/practice of safe sleep, and identified areas for improvement in practices. Seven CBOs participated from across the state. As with all NYSDOH quality improvement initiatives, CBO teams were offered monthly Coaching Call webinars, educational webinars, data collection and feedback, and access to expert clinical and quality improvement faculty. Best practices were distributed to MICHC projects and other partners across NYS.

Ongoing Public Awareness and Media Campaign

Throughout both projects, the NYSDOH collaborated with other state agencies to jointly develop and deliver infant safe sleep messages to individuals served through NYS's respective agencies. This collaboration included co-branded messaging and dissemination strategies that effectively reached their respective populations. In addition, the NYSDOH collaborated with the WIC program to disseminate safe sleep messages to parents. Infant safe sleep posters in English and Spanish were provided to all 400 WIC clinics in NYS. These, along with supplies of the infant safe sleep brochure, will continue to reinforce the safe sleep message that new parents receive during the birth of their infants. Listed below are some of the highlights of the public awareness and media campaign:

- Safe sleep messaging on NYSDOH Facebook and Twitter accounts
- NYSDOH Commissioner letters regarding the importance of infant safe sleep sent to clinicians statewide
- A suite of safe sleep materials, which focused on the ABCs of safe sleep, were developed and co-branded with the NYS OCFS
 - Safe sleep materials distributed in 2015 and 2016 to all NYS birthing hospitals in a quantity matching the hospital's annual birth volume
 - Safe sleep materials available on the NYSDOH website and through the NYSDOH distribution warehouse, including posters, brochures, magnets, mirror clings, crib cards and videos
 - Messaging displayed across the state in various public locations such as public bus system shelters, malls, etc.
 - Materials were provided for distribution and display at WIC offices statewide
- NYSDOH developed a video available on the NYSDOH YouTube site in English and Spanish (also available on flash drives and DVDs): [Safe Sleep Videos](#)
- NYS OCFS developed, and NYSDOH co-branded, two public service announcements on YouTube available in English and Spanish:
[Safe Sleep PSA English](#)
[Safe Sleep PSA Spanish](#)
- NYSDOH worked with the NYS Department of Motor Vehicles (DMV) to get NYSDOH safe sleep video playing in DMV waiting rooms across the state
- NYSDOH safe sleep video now playing in OB/GYN, pediatric and primary care offices across the state

- A packet of safe sleep materials was delivered to all local health departments with a letter from the NYSDOH Commissioner to various health care providers (i.e., obstetricians, midwives, etc.) which highlights the importance of safe sleep promotion
- NYSDOH developed, filmed and disseminated a Public Health Live! event focused on infant safe sleep. Originally presented in November 2015, this webinar reviews the current AAP recommendations on infant safe sleep, and discusses the barriers to safe sleep practices and the physiological perspective of safe sleep. The presenter is Dr. Michael Goodstein, a nationally-recognized neonatologist. Statistics on sudden unexplained infant deaths in NYS and the nation are also presented. In addition, the program addresses how providers can initiate safe sleep conversations with caregivers, why hospitals should involve all departments/units that care for infants in safe sleep efforts, and the important role of effective community-based education in reinforcing infant safe sleep messages. This webinar has been archived, and continuing education credits are available for participants. Further details, and a link to the presentation, can be found here: [Public Health Live!](#)
 - Approximately 830 unique participants were logged into the live webinar event, with many sites reporting additional/multiple viewers at their sites.
 - Participants from over 30 states viewed the live webinar, with 52% of participants being from NYS.
- NYSDOH worked in collaboration with the NYS Office of Alcoholism and Substance Abuse Services (OASAS) on a webinar event to educate providers on the importance of safe infant sleep. Education about infant safe sleep practices is important for families, and for those who work with families. The latter group may include caregivers, health care practitioners, public health professionals, substance use disorder treatment providers, and staff from organizations that house and provide services to families, such as those in residential treatment or homeless shelters. This webcast reviews the current AAP recommendations on infant safe sleep, while improving self-efficacy for those who work with families to discuss safe sleep practices with those they are caring for and/or providing services to. The OASAS Learning Thursday webinar can be accessed here: [OASAS Learning Thursday Webinar](#) Can We Prevent Infant Sleep-Related Deaths? What You Need to Know Now!
- NYSDOH purchased [Sleep Baby, Safe and Snug](#) educational board books for all NYS NICUs. These were distributed in October 2017, in a quantity matching the NICU's annual discharge volume.
- Anatomical diagram developed as a teaching aid for providers who encounter caregivers concerned about a baby choking when put to sleep on his/her back

Maternal and Infant Community Health Collaboratives (MICHCs) and Maternal, Infant and Early Childhood Home Visiting (MIECHV) Program

The MICHCs work to implement evidence-based/informed strategies across the reproductive life course. Each MICHC employs community health workers, individuals from the communities they serve, to engage women in prenatal care and ongoing primary and preventive health care. The MICHC is a needs-driven, community-based collaborative approach to improving key birth outcomes, including preterm birth, low birth weight, IM and maternal mortality.

The MIECHV Program is designed to improve health and development outcomes for at-risk children and families through evidence-based home visiting programs. It supports pregnant women and families and helps at-risk parents of children from birth to kindergarten entry tap the resources and hone the skills they need to raise children who are physically, socially and emotionally healthy and ready to learn. Families that elect to participate in local, evidence-based home visiting programs receive advice, guidance and other help from health, social service and child development professionals. Through regular planned home visits, parents learn how to improve their family's health and provide better opportunities for their children.

Both MICHC and MIECHV home visitors assist mothers through all stages of pregnancy and beyond, providing support to mothers learning to breastfeed and care for their babies. Home visits may include support for preventive health and prenatal practices such as helping mothers find suitable prenatal care, improve their diets, and reduce use of tobacco, alcohol and illegal substances. Furthermore, home visitors educate pregnant and new mothers about safe sleep practices; examine the home environment to see if the necessary equipment is available (crib, bassinet or pack and play for the infant to sleep in); provide recommendations for alternative safe sleep spaces if recommended equipment are not available; and reinforce safe sleep practices at every visit.

NYS Infant Mortality Collaborative Improvement and Innovation Network (NYS IM-CoIIN 2.0)

Similar to the previous iteration of IM CoIIN, the NYSDOH is currently recruiting community-based organizations, such as Healthy Starts and MICHCs, to participate in the new national IM CoIIN project that aims to reduce IM. IM-CoIIN 2.0 is an initiative to improve caregivers' knowledge of and intentions to practice safe infant sleep, thereby decreasing SUID and reducing racial disparities. NYS is one of four states participating in this project, along with Arkansas, Mississippi and Tennessee. The specific aim of the project is to decrease SUID rates by 10% in NYS by increasing adoption of the ABCs of safe sleep (alone, on back, in crib); and to reduce racial disparities in infant safe sleep practices by ≥5% by 2020.

This NYS initiative will build on the work of the previous IM-CoIIN and will focus on infant safe sleep education, modeling safe sleep practices and increasing caregiver adherence to safe sleep guidelines while reducing disparities. Through this Collaborative, community based organizations (CBOs), the NYSDOH and the National Institute for Children’s Health Quality (NICHQ) will work together for approximately 12 to 18 months to implement evidence-based interventions to improve infant outcomes. Participating organizations will learn and apply the ABCs of Safe Sleep as the primary focus of the work. These core interventions are based on current available scientific evidence. To reduce racial disparities, community health workers will test a variety of different evidence-based messages and teaching strategies to improve safe sleep practices among certain racial groups. As part of the improvement process, CBO teams will learn quality improvement strategies, and collect data that is sensitive to the changes they will be testing and implementing, to track performance and results. Caregivers will complete a survey approximately 30 to 60 days after the initial safe sleep education is provided by their community health worker. Progress towards the aim will be measured through the analysis of data collected from the caregiver surveys.

National Action Partnership to Promote Safe Sleep Improvement and Innovation Network (NAPPSS-IIN): Making Safe Infant Sleep and Breastfeeding a National Norm

In addition to the NYS IM-CoIIN project, the NYSPQC is partnering with NICHQ on the NAPPSS-IIN: Making Safe Infant Sleep and Breastfeeding a National Norm, funded by the Maternal and Child Health Bureau as part of the *National Action Partnership to Promote Safe Sleep Program*. The project is a five-year cooperative agreement from July 2017 to July 2022. The purpose of NAPPSS-IIN is to make safe infant sleep and breastfeeding a national norm. Specifically, the project aims to increase infant caregiver adoption of safe infant sleep practices as recommended by the AAP, as well as breastfeeding, by empowering champions for these protective behaviors within systems that serve families at risk. NAPPSS-IIN is designed to positively influence the proportion of infants who: (1) are placed to sleep on their backs in a safe sleep environment as recommended by the AAP; (2) are ever breastfed; and (3) continue to breastfeed at six months. Ultimately, this program seeks to reduce the rate of infants who die tragically due to SUID. After conducting analysis to determine which NYS hospital met the participation criteria set forth by NICHQ, the NYSDOH recommended New York- Presbyterian Lawrence Hospital to participate, and they were chosen to join in the national project. NICHQ is spearheading this project, and NYSDOH is in more of a supportive role. An important aspect of this project for the NYSDOH involves continued collaboration with stakeholders.

The central goals of all these NYSDOH-led safe sleep projects involve educating health care professionals so they understand, actively endorse and model safe sleep practices, and providing infant caregivers with education and opportunities so they have the knowledge, skills and self-efficacy to practice safe sleep for every sleep. Studies in this literature

review and the results of the hospital safe sleep project demonstrate that education and modeling are effective methods of increasing caregivers' adoption of the ABCs of safe sleep.

Conclusion

Countless interventions aimed at caregivers adopting safe sleep recommendations have been implemented across the country and in NYS. Despite all the challenges and limitations of evaluating these interventions, it is still necessary, as it helps us gain an understanding of the barriers and incentives that caregivers face with regard to adopting safe sleep practices, and it provides the necessary information others need when considering similar interventions.

Intervention campaigns for SIDS have been extremely successful, namely the "Back to Sleep" campaign, especially with regard to the avoidance of prone positioning. However, it has been over 20 years since the "Back to Sleep" campaign began. The gains that were made in improving the IM rate in the 1990's have leveled off. Since 2011, the percent of infants being placed on their backs to sleep in NYS has declined (refer to Figure 7), and there are marked, persistent, racial disparities in safe sleep practices in New York.

Research has shown either inconsistent or no education being provided to parents in the hospital,¹¹⁹ which is why the NYSDOH chose to conduct a safe sleep quality improvement initiative with hospitals across the state as a focus of the NYSPQC from September 2015 to July 2017. The results of the Hospital Safe Sleep Project demonstrate that quality improvement initiatives aimed at educating providers and encouraging them to model safe sleep practices for new parents can be effective at influencing the behavior of parents/caregivers who tend to adopt the practices they see modeled. The results of the literature review support this. When the correct behavior is modeled and followed with a conversation on safe sleep recommendations, adoption of safe sleep behaviors is increased even more significantly.

Legislation can also have an impact, and it is a way of directing providers to consistently follow safe sleep practices. In NYS, safe sleep regulations are in place at licensed child care centers and hospitals. Regulations for licensed child care centers mandate that infants be placed supine for sleep, in a crib without objects, and smoking is prohibited. Additionally, legislation dictates that hospitals must provide safe sleep education to all new parents.

In this literature review, strong evidence was presented on the safety hazards of sleep positioners, crib bumpers, air mattresses and carrying devices (car seats, bouncers, swings, strollers and slings). These are unsafe for infant sleep and their inappropriate use could

result in strangulation, positional asphyxia and death.⁸⁶ NYS might consider implementing a state ban on the sale of bumper pads, as did Maryland and Ohio, to remove one safe sleep hazard in NYS.

Baby boxes have been at the center of debate. Some believe they may provide an alternative to bedsharing, especially for low income families who cannot afford a crib or for certain racial/ethnic groups that have high rates of bedsharing. Yet, little is known about their safety. There are no published studies on the safety of baby boxes, nor is there any evidence to suggest they reduce IM. However, there is currently work underway to address safety and testing concerns. A task group of the independent standards organization, ASTM International, is looking at expanding the standards for bassinets to cover baby boxes. It will likely take another year before testing is complete, and these standards are finalized. On the other hand, the wahakura, a similar alternative, has been shown to provide a safe sleep environment comparable to the bassinet, and studies have shown reductions in infant mortality with their use.¹²⁴

Research should continue to explore factors that lead to disparities in infant safe sleep practices. From the research so far, we know the reasons for variations in race/ethnicity-specific SUID rates over the past two decades are multifactorial and related to SIDS risk factors such as non-supine infant sleep position, infant bedding use and bedsharing. In 2015, one in four caregivers was sharing an adult bed with an infant in NYS. Of the caregivers who were bedsharing, 32.4% of them were non-Hispanic, black mothers while 22% were non-Hispanic, white mothers. From the data, we know more work needs to be done to address bedsharing. Young maternal age, low socioeconomic or educational status, maternal smoking, not breastfeeding or short breastfeeding duration, lack of prenatal care and unmarried status are other factors that may influence the disparities in SUID.¹¹⁷

To combat disparities, we know that different racial/ethnic groups respond to different safe sleep messages. For example, educational interventions aimed at disparate populations must provide greater detailed rationale for SIDS prevention. Since many black caregivers do not believe SIDS is related to sleep position, when addressing black caregivers, it is important to discuss safe sleep practices as they relate to suffocation.¹¹⁸ Furthermore, concerns about aspiration, choking and comfort of the infant must be addressed when discussing the supine sleep position. Moreover, family and cultural preferences must be acknowledged. This might include a discussion about risk reduction strategies specifically around co-sleeping, however, these types of discussions must occur between the provider and caregiver and be individualized and personalized to the caregiver's specific situation. A key component of developing effective, evidence-based strategies is to understand caregivers' barriers to adopting recommendations. With an understanding of the barriers, interventions can be developed to counteract them.

In summary, the NYSDOH is continuing to work with families across the state to improve safe sleep practices in the home environment with the use of home visitors through the second iteration of IM CoIIN as well as through the MICHC and MIECHV programs. Five community-based organizations around the State have joined the IM CoIIN project to date, and more are being recruited. Additionally, through the NAPPSS-IIN project, the NYSDOH is piloting a safe sleep and breastfeeding intervention at NY-Presbyterian Lawrence Hospital. This initiative aims to make safe sleep and breastfeeding a national norm. Through this initiative, NY-Presbyterian Lawrence Hospital is implementing a safe infant sleep and breastfeeding safety bundle to improve the processes of care and patient outcomes. A major component of this initiative is the development and implementation of a hospital policy that supports and promotes safe sleep and breastfeeding. Both projects aim to reduce racial disparities in safe sleep practices.

Based on the findings from this literature review, the NYSDOH plans to implement enhanced messaging in both the IM CoIIN and NAPPSS-IIN projects that encompasses SIDS risk reduction and the prevention of accidental suffocation when educating caregivers on safe infant sleep practices. Furthermore, an anatomical diagram/teaching tool has been developed by the NYSDOH to address aspiration concerns in our target populations since a common misconception among caregivers is that the infant will choke if placed to sleep on his/her back. This anatomical diagram will be given to healthcare providers at NY Presbyterian Lawrence Hospital and to home visitors at the five pilot sites to use as a teaching tool when educating caregivers on the reasons why it is important to place the infant supine for sleep. Through the IM CoIIN project, data will be collected on some of the barriers to safe sleep. Through this collaborative project with organizations that conduct home visits, the NYSDOH hopes to gather more insight and information on the reasons why some caregivers co-sleep with their infant. Additionally, the NYSDOH is continuing to collect data from birthing hospitals in NYS to sustain the education and modeling of safe sleep practices developed through the NYSPQC Hospital Safe Sleep Project. Hospitals conduct random crib audits monthly and evaluate the sleep environment according to the ABCs of safe sleep to determine whether the infant is ALONE in an environment free of objects; is on its BACK; and is in a safety approved CRIB, bassinette or pack n' play. These crib audits are recorded and submitted to the NYSDOH monthly to continue to ensure the on-going success of this education and modeling intervention.

Furthermore, the NYSDOH will continue to promote the updated 2016 AAP Safe Sleep Recommendations⁸ through the promotion of an educational board book entitled, Sleep Baby Safe and Snug, which has been shown to be an effective teaching tool.⁸¹ Board books have been delivered to all NYS NICUs. Each infant in the NICU will be given one of these board books to take home this year. IM CoIIN pilot sites, MICHCs and MIECHVs will also be given these books to use as a teaching tool with caregivers.

Lastly, the NYSDOH will continue the “Safe to Sleep” campaign in New York through the use of Facebook and Twitter messages on safe infant sleep, YouTube videos on safe sleep in English and Spanish being used to educate caregivers in the hospital, public service announcements with OCFS, posters in WIC offices, safe sleep brochures given to all new parents in the hospital, as well as further promotion of the ABCs of safe sleep through the distribution of mirror clings, magnets, crib cards and videos on flash drives. The NYSDOH will continue to collaborate with OCFS on various other safe sleep initiatives throughout the state, which will include co-branding all educational materials developed through this joint effort.

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