Infant Feedings at Night and Food Insecurity

by

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ABSTRACT

Food insecurity affects more than 10 million households in the United States and has been shown to impact what and how a child is fed. Additionally, there is some evidence to suggest that food insecurity may affect how an infant is soothed (either with food or another mechanism), but no study has examined the possible relationship between soothing techniques and the incidence of food insecurity. To evaluate whether food security status and nighttime soothing techniques have a relationship, surveys were administered to a sample of mothers from various racial and socioeconomic backgrounds at 3-weeks, 8-weeks, and 3-months postpartum. Of the 69 participants sampled, 61 had data that could contribute to evaluations of food security status and soothing techniques used at night. A chi-square model was utilized to determine what, if any, relationship existed between the two variables. The chi-square model did not yield statistically significant results (Pearson Chi-Square= .506, p=.477) and descriptive statistics showed that just six of the 61 participants sampled did not use food to soothe at the time their baby was 3-weeks-old. Further examination of descriptive statistics revealed that, between breastfeeding and bottle-feeding as a means to soothe an infant, breastfeeding was used twice as much as bottle-feeding. For participants enrolled in the Special Supplemental Nutrition Program for Women, Infants, Children (WIC), the use of food to soothe increased at each of the three time points. Among participants found to be food-insecure, the use of breastfeeding and bottle-feeding as means to soothe varied from time point to time point. The physical and mental toll of the postpartum period may contribute to the high use of food-to-soothe among mothers seen in this study. Future research

efforts in this area should examine whether the observations reported in this study are similar among larger samples, and if more mental health support for mothers has any effect on whether food is used to soothe.

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INTRODUCTION

Over 10 million households in the United States experience food insecurity.[1] When one experiences food security, it means that they have access to food that is nutritious and supports healthy living.[2] Food insecurity would then be the opposite and the prevalence of food insecurity is high.[1] Around 10.5% of all households in the U.S. are reportedly food-insecure, and this percentage of food insecurity increases when looking specifically at households with children (to about 14%).[1] Food insecurity has been related to a variety of risk factors[3] and can be problematic for children.[4–6]

Some of the ways that food security can be problematic for children include its association with anemia and impact on breastfeeding.[7–10] In a recent meta-analysis of studies that assessed food insecurity and anemia risk, researchers found that food insecurity did increase one's risk of developing anemia. Furthermore, this increased risk grew when looking specifically at infants.[7]

Along with the risk of anemia, food insecurity can impact whether a child is breastfed. Breastmilk is known to be the standard form of nutrition for infants.[11] However, it has also been shown that mothers who experience food insecurity are less likely to initiate and persist in breastfeeding.[8–10] Thus, food insecurity can negatively affect a child's nutrition status.

Across the globe, risk factors that are most commonly associated with food insecurity include low levels of education, fewer social connections, experiencing unemployment, and low household income.[3] Other factors that may impact one's risk of experiencing food insecurity include whether they live in an urban or rural area, their age,

their marital status, and how many children reside in their household.[3] While these risk factors are often not a direct experience of children, children who live in food-insecure households do face greater likelihood of experiencing negative health consequences than children who live in food-secure house. Examples of these negative health consequences include being forced to limit food intake, displaying disordered eating and developing eating disorders, and even (in the case of male toddlers) being expelled from preschool.[4,6,12,13]

Food insecurity is not only a reflection of the foods that a child has access to, but it has also been linked to how a child is fed.[4,5,14,15] For example, the number of parents who report that they use pressuring and restrictive feeding styles is greater in food-insecure households than in food-secure households.[4,14] Food insecurity has also been shown to have a negative correlation with desirable parenting practices (including proper responses to an infant's cues) which in turn were associated with infant feeding practices.[5] Similarly, food may be used to soothe a distressed infant and physical hunger/satiety cues of infants may be ignored more often by food-insecure parents.[15] Thus food insecurity may have an impact on infant feeding practices.

In addition to the possible effects of food insecurity on how parents feed their children, a child's sleep may also be impacted by food insecurity.[16–18] Among toddlers experiencing food insecurity, it has been shown that a greater number of parents reported that their child had poor sleep quality than those that did not experience food insecurity.[16] Likewise, other research has shown that preschool-age children who have experienced food insecurity and poor sleeping practices as an infant were more likely to continue

experiencing poor sleeping practices than children who were food-secure.[17] Lastly, implementation of a bedtime routine (which may improve sleep) has been demonstrated as less likely among food-insecure children than among food-secure children.[18]

Based on the evidence described above, it is clear that food insecurity may affect how a parent soothes their child and how the child is put to sleep.[15,18] However, to our knowledge, no research has been conducted to examine the relationship between food insecurity and sleep among infants. Even more importantly, how food insecure and food secure parents differ in their coping skills (e.g., using food as a soothing strategy) with possible sleep disruptions with their infants is unknown. To date, cross-sectional studies of food-insecure families have only focused on the prevalence of sleep problems, feeding styles, and soothing techniques separately.[5,6,14–20] Because of the possible interactions between a child's food insecurity, sleep, and eating behaviors, this study aims to explore whether food insecurity is related to soothing infants to sleep with food.

PURPOSE OF THE STUDY

The purpose of this study is to explore the prevalence of food insecurity and the use of various nighttime soothing techniques among a diverse sample of mothers that live in the greater Phoenix area. Surveys of infant sleep and a food insecurity screener were utilized to collect data on the incidence of food insecurity and nighttime soothing techniques.

HYPOTHESES

- Research Question 1: How is a mother's food insecurity status associated with nighttime feedings intended to soothe her infant back to sleep?

    - Hypothesis: Mothers who experience food insecurity at the 3-week visit will use food more often to console a child back to sleep than those who do not experience food insecurity at the 3-week visit.
- Research Question 2: What (if any) factors set apart mothers who are food insecure but do not use food to console their child back to sleep from those that are food insecure and do use food to console their child back to sleep?
    - Hypothesis: Mothers who are food insecure but do not use food to console their child back to sleep (as observed in questionnaires filled out at the 3-week visit) are more likely to be enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) than food-insecure mothers who do use food to console their child back to sleep.
- Research Question 3: Does food security status predict soothing behaviors over time?
    - Hypothesis: Mothers who experience food insecurity during the first 3 weeks of their child's life will be more likely to utilize food in their nighttime soothing techniques when their child is 3-weeks-old and 8-weeks-old.

DEFINITION OF TERMS

- Food insecure: Definitions vary,[21,22] but for the purpose of this study, participants who report that they could not afford to eat balanced meals within a specified period of time are considered food insecure.

- Food secure: For the purpose of this study, participants who do not report any financial struggles in obtaining food for a balanced meal are considered food secure.
- Soothing technique: Any practice reportedly used by a participant to console an upset infant.
- Authoritative parenting style: Manner of parenting in which a parent is likely to display a lot of affection and responsiveness towards their child as well as set healthy boundaries.[23]
- Authoritarian parenting style: Manner of parenting in which a parent is likely to utilize severe discipline and display little responsiveness to their child's emotions.[23]
- Permissive parenting style: Manner of parenting in which a parent is likely to *not* set healthy boundaries and will lack expectations regarding their child's expression of emotions.[23]
- Sleep-wake pattern: One's changeable cycle of sleeping and waking during a 24-hour period.[24]

LITERATURE REVIEW

FOOD INSECURITY

Food insecurity has been defined as uncertain or limited access to foods that are nutritious and safe to consume.[2] In the United States Department of Agriculture (USDA) Household Food Security report from 2019, it was estimated that 10.5 percent of households in the United States were food insecure. For households in which a child (aged 0-17 years) lived, approximately 13.6 percent were food insecure. Food insecurity was also higher than the national average in households of Hispanic persons at 15.6 percent.[1]

There are several factors that may increase one's risk of being food insecure. Utilizing data from a world report that measured food insecurity with the Food and Agriculture Organization's Food Insecurity Experience Scale, researchers have been able to identify risk factors for food insecurity that are common among the populations of 134 countries.[3] Two of the risk factors that are most strongly associated with food insecurity include household income and one's education level. The researchers also found that individuals that reported having an elementary education were nearly 15% more likely to be food insecure than those who reported having more than a high school education. Additionally, an increase (of about 10%) in one's household income was found to be associated with a lesser likelihood of being food insecure.[3] The other three of five major identified risk factors were having a low social capital, poor social network, and being unemployed.[3]

In addition to the five common risk of factors of food insecurity across many nations, smoking and depression seem to be risk factors of food insecurity in the United States (U.S.).[25,26] In a recent study, households with a current smoker (as shown by a response of smoking at least "some days") were shown to have a greater increase in experiencing food insecurity than households without a current smoker.[25] A different study that looked at the occurrence of depression among mothers who live in a low-income household with children (2 years old and younger) found a statistically significant increase of food insecurity among moms who reported having depression than those who did not.[26] As both of these studies were conducted in the United States, it is possible that smoking and depression are risk factors specific to the U.S.

To address the issue of food insecurity in the nation, the United States government has implemented programs such as The Special Supplemental Nutrition program for Women, Infants, and Children, or WIC.[27] Researcher Elizabeth Matallinos-Katsaras and her team looked at the incidence of food insecurity and families' participation in WIC and found promising results. For pregnant women that experienced hunger and food insecurity and enrolled in WIC during the first two trimesters of their pregnancy, they were more likely to be food secure after having their baby than those who enrolled in WIC during their third trimester.[27] In a different study, researchers found similar positive outcomes for children in households receiving assistance from WIC. Based on data collected through NHANES, it has been estimated that WIC may decrease the incidence of food insecurity among children by at least 20%.[28] These results indicate

that receiving help through a government program such as WIC may be a cause for change in one's food security status, but food insecurity remains a problem.

Several negative health outcomes have been linked to food insecurity including cardiometabolic disease which is used as an umbrella term for diseases such as diabetes, obesity, and cardiovascular disease (CVD).[29] Two of these diseases are in the top ten leading causes of death in the United States.[30] One current study that explored obesity incidence among adults found that even when controlling for a lesser income, a higher percentage of women living with obesity experienced food insecurity rather than food security.[31] Another analysis of NHANES data has shown that food insecurity occurs at higher rates among individuals living with obesity, diabetes and CVD, with around 15% of people with those conditions reporting that they experience food insecurity. Interestingly, the report of experiencing food insecurity among individuals with untreated diabetes was also greater than among individuals with treated diabetes.[29] Therefore, food insecurity may not only play a role in the prevalence of cardiometabolic disease, but the treatment as well.

Food insecurity has also been linked to many undesirable health outcomes in children, but one of major concern is disordered eating. A focus-group study published in 2016 explored the eating behaviors of children who live with obesity and are either food-secure or food-insecure.[12] During the focus group sessions, the parents of the children participated in discussions about their children's eating behaviors. In the groups of parents whose children were food-insecure, participants shared that their children engaged in disordered eating behaviors such as hiding food, eating food secretly at night,

and eating too much (two particular descriptions may have referenced binging).[12] Another study, published more recently, examined the possible relationship between eating disorders and one's experience with food neglect (sometimes in the form of food insecurity).[13] In a representative U.S. sample, researchers found that those who reported experiencing food neglect as a child also reported higher rates of being diagnosed with binge eating disorder and anorexia nervosa.[13] Disordered eating and eating disorders have therefore been linked to food insecurity.

INFANT FEEDING

Infants are fed in a variety of ways, and a key component of infant feeding practices is the recognition and response of the parent to an infant's hunger and satiety cues.[11,32,33] Hunger and satiety cues have also been called engagement and disengagement cues respectively.[33] An engagement or hunger cue may look like a baby babbling with a caregiver, whereas a disengagement or satiety cue may look like a baby spitting up during a feeding session.[33] Responsive feeding is often characterized by recognition and response to an infant's feeding cues and is considered an ideal way of feeding an infant.[34]

In a recent study, researchers filmed feeding sessions of twenty-seven mother-infant dyads in an attempt to further characterize patterns of hunger/satiety signaling during a feed.[33] The amount of observed cues was recorded along with the timing of each cue. One interesting finding of the study included those infants who were breastfed during the feeding session exhibited increased levels of displaying hunger/satiety cues than their formula-fed counterparts. Another finding that may have been expected, but is worthy to note is that cues overall decreased throughout a meal.[33] The same head

researcher found in a different, but similar study that more hunger cues have been demonstrated by an infant over time, and this appeared to be true regardless of whether an infant was fed with formula or breastmilk.[35] This development and more frequent use of cues may allow for easier communication between the infant and caregiver.

Despite the literature that establishes the types and importance of infant feeding cues, knowledge of such cues seems to be lacking among caregivers.[33,35,36] In a study published this year on the knowledge of 30 expectant mothers, researchers conducted interviews and administered surveys to assess the knowledge of responsive feeding among the soon-to-be mothers.[36] Some common, early cues of hunger include baby waking up and/or becoming more alert, as well as sucking on their fist. The main cue of hunger mentioned by the moms in their interviews was crying, which is actually considered a late sign of hunger. On the other hand, disinterest or cessation of feeding was often noted as a cue of satiety and both cues are considered normal signs of satiety.[36] Additionally, while most mothers seemed to have an idea of what responsive feeding meant, they couldn't recall ever hearing the term previously.[36] This demonstrates that educating parents on responsive parenting and feeding practices is a current gap between researchers and lay people.

Fortunately, studies that focus on teaching parents about hunger cues and responsiveness have proven successful. For example, a study known as the Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) Study randomized participants to receive instruction on either responsive parenting (intervention) or child safety (control) and then obtained data on the use of unresponsive feeding practices.[37]

The researchers found that those who were taught about infant feeding based on hunger cues and how to soothe an infant without food were less likely to report using food to soothe and pressure feeding their infant.[37] Another study's results from a survey given to over 600 mothers, revealed that simple gestures such as greater amounts of physical touch with a child may result in higher rates of responsive feeding.[38] Thus educating expectant parents on what responsive feeding looks like and encouraging greater amounts of physical touch between mom and baby may be helpful in promoting responsive feeding.

Now that hunger and satiety cues has been described, the types of infant feeding will be discussed. Breastfeeding has been established as the ideal way of feeding an infant,[11] but formula feeding is also utilized.[32] About one-quarter of the infants in the U.S. are breastfed exclusively for the first six months of life as recommended by the American Academy of Pediatrics.[32,39] The benefits of breastfeeding are extensive. To name a few, infant benefits of breastfeeding include lesser risk of mortality, greater levels of cognitive function, and a smaller number of dental caries.[11] Despite these benefits, exclusive breastfeeding rates are poor.[32]

Many barriers to exclusive breastfeeding exist, not the least of which may be food insecurity.[8–10,40] A recent qualitative study of Hispanic mothers looked at how mothers fed their children (ages 2 years or younger) and how food insecurity may have affected their feeding patterns.[40] In asking the mothers about their experience with food insecurity and feeding their families, some mothers noted that they had felt concerned about consuming enough vegetables and fruit and that this concern contributed to the

assumption that their breastmilk would not contain all of the nutrients their babies needed. Some moms also reported that family members expressed that stress could be passed from mom to baby through breastmilk and that when they felt stressed, they were discouraged from breastfeeding.[40] While these beliefs may be specific to this sample, they provide insight for what a mother may face when deciding to breastfeed while food-insecure.

Other studies that shed light on how food insecurity may affect breastfeeding include a cross-sectional study of NHANES data in which researchers found (prior to statistical adjustments) that there was a lower likelihood of breastfeeding initiation occurring among mothers who were not Hispanic and experiencing food insecurity.[8] Another study's unadjusted analyses of breastfeeding and food insecurity found an inverse relationship between the length of time that a child was breastfed and the experience of food insecurity.[10] Though these findings did not hold up in statistical analyses, at least one study has found statistically significant outcomes.[9] In this study of over 10,000 participants, researchers found that women experiencing even moderate food insecurity had a statistically significant lesser chance of breastfeeding for a duration of at least six months.[9] Thus, food insecurity may have an effect on initiation and duration of breastfeeding.

In addition to breastfeeding and formula feeding, infants are also fed solid foods eventually. The AAP recommends that complementary feeding begins when a child is six months of age, but this recommendation is not always followed.[8,39] In a recent examination of NHANES data, researchers Jovana Orozco et. al. reported that, by the

time they were four months old, around 45% of infants had been introduced to solid foods. This number increased to about 85% when the researchers were calculating how many infants were introduced to complementary foods by the age of six months. The mean age of solid food introduction overall was five months.[8] Because this study utilized data that is nationally representative, it may be deduced that the majority of infants in the United States receive complementary foods prior to the recommended six months of age.

A couple of research studies have examined the timing of complementary food introduction more closely and have made discoveries that may help to explain an early introduction of solid food.[41,42] The first study recruited participants from the national Infant Feeding Practices Study II and the researchers asked participants why they transitioned their baby from breastmilk, formula, or both to solid foods. The data revealed six common reasons among caregivers and included that the caregiver felt the baby was mature enough to eat complementary foods, that the baby seemed to need more food due to hunger levels, and that a healthcare provider had advised the caregiver to start the baby on solids.[41] A different study that collected data from an unrepresentative sample found that the timing of solid food introduction was related to the type of milk that the infant had received (breastmilk, formula, or a combination of the two). Participants who reported formula feeding their child at four months of age were introducing solids significantly earlier than participants who reported breastfeeding at this same time point.[42] Additionally, information on feeding styles was collected and parents who reported that their child needed a type of cereal added to their milk to ensure satiety (a type of pressured feeding style) fed their child complementary foods sooner than parents

who reported that they allow their child to let them know when they were full (a type of responsive feeding style).[42] These findings are similar to those of other studies.

Researcher Amanda Thompson and her team looked at styles of feeding in a specific population: mothers who were both African-American and low-income.[43] When surveyed, mothers who demonstrated the use of a pressured feeding style, also had higher rates of employing feeding practices that have been discouraged by the AAP. Among such feeding practices was the introduction of complementary foods by the time the mother's infant was 3 months of age.[43] Feeding styles and type of milk given to a baby may therefore have an effect on when solid food introduction occurs.

Just as the timing of complementary food introduction varies, the types of foods given to an infant in the weaning process has also been shown to vary.[44–46] In a sample of around 3000 infants in the United States, several trends have been observed.[44] Between the age of four and six months, about 65% of infants consumed some sort of grain food daily. During the same age range, around 40% of infants consumed a vegetable every day. Foods that were less commonly consumed on a daily basis included foods with high concentrations of sugar (like baked goods) and meat.[44] Another study that collected data from the U.S., Germany, and the United Kingdom also reported that rice (a grain food) was a common first complementary food among infants.[45] Finally, research conducted in a sample of 70 infants of Native Hawaiian, Pacific Islander, and Filipino descent examined types of first complementary foods and whether food insecurity had an effect on the types of food consumed.[46] About 25% of the sample was classified as food insecure. Overall, grains again were the most consumed complementary food with about

85% of infants reportedly consuming grains on a daily basis. Researchers also examined the amount of food groups that contributed to an infant's diet. For those infants in households experiencing at least one aspect of food insecurity, the food they consumed daily came from an average number of four food groups while those who were in food secure households consumed food daily that came from an average number of three food groups. Likewise, those who lived in households that utilized WIC or the Supplemental Nutrition Assistance Program (SNAP) consumed foods from an average of 3.5 food groups daily, while those not utilizing WIC or SNAP consumed foods from an average of three food groups daily.[46] These results demonstrate that food insecurity may have an effect on the types of complementary foods consumed by infants.

In addition to possible effects on types and timing of complementary food introduction, food insecurity has been shown to impact *how* an infant is fed.[4,5,40] A study published in 2012 explored the relationship between food insecurity and infant feeding practices in a sample of about 200 mothers who were utilizing.[4] The participants filled out a few questionnaires related to infant feeding, including one on feeding style. In statistical analyses of collected data, researchers noticed that both the pressuring feeding style and restrictive feeding style were utilized more among moms that experienced food insecurity.[4] It is also worth noting that these moms also expressed concern about their infant being overweight in the future more than their food-secure counterparts.[4]

In a different study by the same researchers, mothers who experienced food insecurity reported that they control how much food their children eat.[40] When a parent demonstrates controlling feeding styles, they may be utilizing pressuring or restrictive

styles.[43] These feeding styles are not in line with responsive feeding (described at the beginning of this section) and it is important to recognize the styles as separate because each can result in very different effects on what and how food is served to a child.[33,35,43] A pressuring feeding style is characterized by a caregivers desire to ensure that plenty of food is provided to their child.[43] This may look like a caregiver utilizing food for soothing techniques and mixing in cereal with their child's nightly bottle, as a couple of examples. On the other hand, restrictive feeding styles may include the behavior of withholding food from baby at all times.[43]

As a final example, in a cohort study of about 8,500 food-insecure participants, researchers found that the more beneficial parenting practices (including awareness of their child's cues) that a caregiver employed, the better their infant feeding practices. And, the beneficial parenting practices had an inverse relationship with food insecurity.[5] These studies accordingly show that feeding styles and feeding practices of parents may be influenced by food insecurity and that a pressuring feeding style is more directly associated with using food to soothe a child.

In addition to inappropriate feeding styles, another discouraged feeding practice is adding cereal to a baby's bottle prior to the recommended four to six months of age.[47] The use of bottle-feeding and the practice of adding flour or crumbs of bread to milk and/or water has been around for centuries.[48] This provides critical context as one considers the current prevalence of adding rice cereal to a bottle of milk for an infant.

Despite specific guidance from the AAP against the practice of putting cereal in a bottle, a recent study found that, within a sample of almost 400 caregivers, 43% put

cereal in a bottle for baby.[47] Sometimes used as a way to help babies sleep, adding cereal to a bottle of milk is discouraged due to the potential digestive issues and choking hazards that may result.[47] How the practice may influence weight gain is also a concern with a study conducted in 2013 showing that providing a bottle of milk mixed with rice to six-month-old babies was associated with a greater risk of having a high BMI later in infancy.[49]

The practice of adding cereal to a bottle has been studied at least since 1989, when a group of researchers studies how the practice may affect sleep duration in infants.[50] With a sample of 106 infants, participants were randomized into two groups: one would start the intervention at five weeks of age, while the other would start the intervention at 16 weeks of age. Both groups received the same amount of rice and milk, and after statistical analyses, it was determined that the intervention did not result in statistically significant differences between the groups. The duration of infant sleep was also found to be unaffected by the intervention.[50]

The concern for early introduction to solid foods (which may occur as rice mixed with a bottle of milk) has resulted in many studies focused on mothers that are low-income.[51] Though having a low income is not the same as experiencing food insecurity. However, having a low income is a risk factor for food insecurity and thus the link between the practice of adding cereal to a bottle and low-income is worth discussing.[3]

One of the earlier studies addressing the possible association between cereal in the bottle and a low household income was published in 1992 by Bonnie Solem and her team.[51] In a sample of largely Black and Hispanic females living with low income,

researchers found that approximately 37% of the mothers reported that they introduced complementary foods to their child prior to their child being four-months-old. When asked specifically about introducing cereal in a bottle to their baby, about 75% of those that implementing the practice also reported doing so prior to baby turning four-months-old.[51] Similar results were found in a study published in 2011 in a sample of young, African-American mothers.[52] Researchers from this study found that, out of 67 mothers, about 82% utilized the practice of adding cereal to their baby's bottle.[52] This demonstrates that cereal in the bottle may be a misunderstood practice of early solid introduction.

Several other studies attempt to explain why cereal in the bottle is still a practice and how often it occurs among various populations.[52–58] One that tries to explain why cereal in the bottle is still commonplace looks specifically at the infant feeding practices of African-American women with low incomes.[54] Researchers conducted interviews with both teenage moms and their grandmothers. Of the 19 pairs that were interviewed, over half reported that cereal was added to baby's bottle of formula and often before the baby was one month old. In discussing the reasons behind this decision, researchers found that grandmothers heavily influenced the decision. Some grandmothers also reportedly explained that rice is not considered a solid food, while others mentioned that adding the rice to the milk was necessary to provide proper nutrition for the baby.[54] Thus, cultural and generational practices may help to explain cereal in the bottle, at least for African-American populations.

Another study looking to explain this practice utilized a sample recruited through a WIC clinic in Kentucky.[53] Researchers facilitated four focus groups (one of registered dietitians, two of adult mothers, and one of adolescent mothers) and used audio and video recordings to aid in the process of examining group responses to questions about infant feeding practices. Researchers found that mothers not only put cereal in formula prior to their child being one month old, but many also reported that this was done in an attempt to aid baby's sleep.[53]

One other possible risk factor for employing the practice of adding cereal to a bottle is a poor mental health status.[56,57] Researchers Kristen Hurley et. al. looked at a group of WIC participants in Maryland and examined symptoms of mental health issues such as depression stress, and anxiety alongside infant feeding practices.[57] Of the 689 participants, about 40% responded to a telephone survey that they did put cereal in their baby's bottle. It was also discovered that greater reports of mental health crises in the mother were associated with a greater likelihood of putting cereal in their baby's bottle.[57] Another study of 216 mother-infant dyads examined symptoms related specifically to depression and consisted mostly of Hispanic females.[56] In this study, an increased likelihood of adding cereal to a bottle for baby was demonstrated among mothers considered to have exhibited moderate to severe signs of depression.[56] Thus, mental health issues may be another contributing factor to the practice of adding cereal to an infant's bottle.

INFANT SLEEP AND SOOTHING

Sleep is a crucial building block of healthy development for infants.[59–61] Sleeping allows for the maturation of an infant's brain which impacts the infant's ability to be attentive, regulate mood, and develop motor skills.[59,60] Within the first few weeks of life, babies are spending an average of 13 hours asleep in a 24-hour period or day.[61–63] The amount of time it takes for a baby to fall asleep when they are around two-weeks-old is about .35 hours and this has been evidenced to increase over time.[61] So, as babies get older, they require less sleep and take longer to fall asleep.

Healthy pediatric sleep is not solely based on the amount of sleep nor the ease of falling to sleep. Instead, there are several domains or components of sleep health and the domains vary slightly between adults and children.[64] Like adult sleep health, these domains include quality/satisfaction of sleep, sleepiness/alertness, timing, continuity, and duration. But it is also important to evaluate sleep behaviors with children such as a bedtime routine, electronic device screen time, and the interactions between a caregiver and child at bedtime as these can derail a child's sleep health.[64]

Related to the establishment of healthy sleep behaviors, is the development of an infant's circadian rhythm or biological 24-hour clock.[24] Researchers E. Juulia Paavonen et. al. recently conducted a cohort study in which 1,673 parents and children participated. The objective of the study was to assess sleep-wake pattern development and they used questionnaires given to parents when their child was three and eight months of age.[24] Results indicated that by three months of age, more than half of the participating infants slept more during the night than the day and by eight months of age, only 25% of the

infant's total sleep occurred during the day.[24] It was also observed that the majority of infants developed a typical sleep circadian rhythm without difficulty, but for those that did struggle, more sleep happened during the day and, in turn, less sleep occurred at night.[24] Both environmental and biological factors, including whether or not a child was breastfed, seemed to contribute to the difficulty in developing a sleep-wake pattern.[24]

A study led by Marie-Hélène Pennestri explored sleep duration and breastfeeding. Participants (388 mothers) submitted questionnaires related to their infant's sleep when their infant was six and twelve months of age.[59] The results of this study showed that at the six-month mark, more than half of the infants who achieved a long nighttime sleep were being fed by the breast. Yet the number of infants who did not achieve a long nighttime sleep had a greater percentage of breastfeeding incidence. This held true at the twelve-month mark also.[59] In a similar study led by Elizabeth Adams, researchers evaluated infant feedings and the incidence of baby-only wake periods at night.[65] The results of this study showed that the number of times an infant alone woke up during the night decreased with age. In turn, the researchers found (at six-months postpartum) that with a 10% increase in baby-only wake periods, about 0.36 less feeding instances occurred during the night. At this same time point, it was also observed that babies who were primarily fed by breast experienced a smaller proportion of baby-only wake periods at night than infants not primarily fed by breast.[65] This demonstrates that how an infant is fed at night may impact their sleeping patterns and vice versa.

Additionally, though infants sleep longer during the night as they get older, frequent stirrings and waking periods in the night are common for infants.[64] As a result,

caregivers must employ a variety of soothing techniques to coax a child back to sleep. However, soothing techniques are not always utilized in the context of helping an infant go to sleep, so they will be described in both contexts here.

Swaddling is a practice that has been used for centuries, but its effects on sleep are still under review.[66,67] In a study of 16 infants, researchers examined whether swaddling a baby affected the total amount of time the baby spent sleeping during the night.[67] All infants were initially asleep without a swaddle. One group of infants was swaddled immediately after falling asleep and then the swaddle was removed about 4 hours later. The others were not swaddled until after being asleep for approximately four hours. Thus, each baby went through periods of sleep while swaddled and not swaddled. To test the effect of the swaddle on sleep efficiency and duration, researchers exposed the babies to auditory stimuli in both swaddled and non-swaddled conditions. The researchers found that sleep efficiency was greater and the amount of time the baby was awake after falling asleep was lesser when a baby was swaddled.[67] This supports the use of the swaddle in helping infants sleep.

Feeding an infant is also used as a means to soothe. One study that provides insight into infant feeding as soothing at night is one performed by Amy Brown and Victoria Harries.[68] In a sample of 756 infants between the ages of six and twelve months old, a large majority of mothers reported that their infant awakened during the night at least one time. Close to 60% of those mothers also reported feeding their child during that time.[68] Likewise, in a study that explored whether an educational intervention about

responsive parenting affected feeding to soothe habits, researchers found that babies were more likely to be fed as a beginning soothing technique at night than during the day.[69]

Other studies have attempted to establish variables that may increase or decrease the likelihood of parents using food to soothe their child. In a study conducted by Esther Leerkes et. al., data on parent sleeping issues, parent mental health status, household income, and WIC enrollment was collected alongside data regarding feeding to soothe.[70] The researchers found that mothers who reported having a higher amount of sleep problems and younger mothers had a statistically significant association with using food to soothe their infant. There were also some findings to suggest that WIC enrollment combined with a clinical depression diagnosis of a mother may be linked with more utilization of food to soothe.[70]

Food insecurity's effect on soothing techniques have not been studied to a wide extent. However, one relevant study has been conducted by Colin Orr et. al.[15] In this study, parents of infants aged 2 months were asked to fill out a two-item screener for food insecurity and the Infant Feeding Style Questionnaire. Almost half of the 842 parents enrolled in the study were found to be food-insecure. These parents were shown to have higher odds of being in support of using food to calm an infant as soon as the infant cries. They also had higher odds of holding the belief that giving an infant food is the most ideal way of hushing an infant's cries.[15]

In addition to soothing to sleep techniques, food insecurity has been linked with a variety of sleep behaviors and duration in children. As mentioned previously, establishing a bedtime routine can be beneficial to sleep length and quality for children.[71] In research

conducted by George Kitsaras et. al., five practices identified as part of a proper bedtime routine (including a lack of drinking and eating prior to bedtime) and parenting style were assessed in a sample of 50 families.[71] Of the children identified as having a less than desirable bedtime routine, parenting styles that were also undesirable were more commonly employed. On the other hand, those with a proper bedtime routine more commonly had parents that used authoritative (a desirable) parenting style.[71] These results are supported by evidence from other studies that also measure food insecurity.[16–18]

A study published in 2019 explored the relationship between maternal mood, experience of food insecurity, and bedtime routine establishment.[18] Utilizing three separate validated questionnaires for each variable, researchers found that bedtime routine establishment was related to a mother's experience with depression and food insecurity. Less than half of the mothers identified as experiencing symptoms of depression had established a bedtime routine and a large majority of food-insecure mothers did not establish a bedtime routine.[18]

Research conducted with children enrolled in Head Start demonstrated that food insecurity may impact a child's sleep quality.[16] Close to 400 children and their caregivers participated in this study and validated questionnaires filled out by parents were utilized to determine sleep quality and food security status. Food insecurity was reported more than food security in cases where child sleep quality was identified as poor. Additionally, for children with low sleep quality, the experience of food insecurity was statistically significant and highly associated.[16]

Lastly, in a study that included a sample of Hispanic families who also had low household income, the link between unfavorable sleep practices, child sleep duration, and food insecurity was again established.[17] Unlike the previous two studies, this one targeted a group known to have high rates of food insecurity.[1] Results in this study showed that sources of financial and material strain may indirectly impact a child's sleep. This was indicated by the fact that as poor sleep practices increased, the duration of nighttime sleep decreased; and, for food-insecure children, as poor sleep practices increased in infancy, an associated increase in poor sleep practices during the toddler years was observed.[17] Based on the results of these three previously described studies, it may be determined that food insecurity and parenting style may affect bedtime routines and, consequently, sleep quality and quantity in children. This, in turn, may impact how a child is soothed back to sleep.

METHODS

STUDY DESIGN

This research study is set up as a cross sectional and longitudinal review of nighttime infant soothing techniques (NIST) and food insecurity. Surveys addressing food insecurity and NIST will be conducted when the infant is 3 weeks, 6 months, and 12 months of age, as previously determined for the overarching study. The Brief Infant Sleep Questionnaire (BISQ) will be utilized to assess NIST, and the United States Department of Agriculture Household Food Security Survey will be utilized to assess the level of food insecurity experienced by the mother of the infant.[72,73] Each questionnaire was administered with an option of online or hard copy format and all data was self-reported.

PARTICIPANTS

Due to the exploratory nature of the study, a sample size was not calculated. Instead, a convenient sample of 69 females will be utilized for this research. Females aged 18 years through 40 years were recruited from the greater metropolitan area of Phoenix, Arizona, for this study. Participants came from a larger study looking at the gut microbiome and sleep in mother-infant dyads.[74] The recruitment efforts for the study were diverse and included social media posts, partnership with two local healthcare systems, and flyers posted in a variety of community settings.

Inclusion criteria for participants include that they had to be at least 27 weeks pregnant OR have a baby less than 3 weeks old. Participants were required to speak

English or Spanish, be reachable via telephone, and verify intention to stay within the greater Phoenix area for at least 1.25 years.

Because the main outcomes of the original study were focused on the rapid weight gain of infants, several exclusion criteria have been imposed. For example, participants who birthed a baby greater than 4000 grams or less than 2500 grams in weight were disqualified from the study. Other exclusion criteria include participant having a diagnosed high-risk pregnancy; metabolic disease; having used illicit drugs during any trimester; having used tobacco, alcohol, or marijuana in the second and/or third trimester; separation from infant; serious complications postpartum; and infant hospitalization after discharge.

PROCEDURES

As mentioned previously, the BISQ is the tool being utilized for the assessment of techniques being used by parents at night to soothe their infant. The BISQ is a 24-item, validated questionnaire used to assess various sleep and wake characteristics of an infant including where they sleep, how often they wake, and challenges of sleeping.[72,74] To assess NIST, the answer to the question "When your child wakes up during the night, what do you do? (Check all that apply.)" was used. Participants were able to answer this question with five predetermined responses. These responses include, 1) "Pick up my child and put him/her back down while still awake," 2) "Bottle feed or give a sippy cup to put my child back to sleep," 3) "Breastfeed/nurse my child back to sleep," 4) "Play with my child, watch TV, or use/show smartphone/tablet," and 5) "None of these." Of the five, two answers indicate that some type of food was used to soothe the infant back to sleep.[72]

Because of this, it is possible for NIST to be analyzed in a bivariate fashion (baby was soothed with food or without food) and this is the approach that will be used.

Then to assess food insecurity, the short form of the U.S. Department of Agriculture Food Security Survey was utilized. Participants had to answer six questions, and two or more answers in the affirmative indicates food insecurity.[73] Thus, food security status and NIST can be presented in an either/or fashion.

In addition to information on food security status and NIST, demographic information (including age, income, race, and ethnicity) will be obtained. Because enrollment in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) may have an effect on outcomes of this study, data on enrollment was also collected.[28]

STATISTICAL ANALYSIS

In all analyses, food insecurity is the independent variable and NIST is the dependent variable. The relationship between these variables and other possible covariates will be assessed via statistical analysis. The relationship between food security status and NIST will first be analyzed via a chi-square test. Both variables are categorical with two potential outcomes (food-secure vs food-insecure and use of food in NIST or no use of food in NIST) and therefore a chi-square analysis is most appropriate to determine whether food security status has an effect on NIST. To assess whether enrollment in WIC alters any observed effect of food security status on the use of food in NIST, a logistic regression will be run to produce an odds ratio that may predict how WIC effects the use

of food in NIST. Lastly, change in food security status over time was measured and recorded to identify whether such changes had an effect on any observed outcome of food being used in NIST. To assess whether a change in food security status over time results in changes in NIST, a general linear model will be utilized. As part of the general linear model, certain covariates that may have an impact on one's food security status will be added. To name a few, such variables include age, level of education, and household income status.[3]

Descriptive participant characteristics will be reported as mean±SD or median (IQR) based on normality of data. Results from chi-square tests will be reported as frequencies of mothers using food in NIST (both those experiencing food insecurity and those not experiencing food insecurity), while results of logistic regression analyses will be reported as an odds ratio of mothers using food in NIST while experiencing food insecurity and either being enrolled in WIC or not enrolled in WIC. Normality of each model will be assessed using the Shapiro-Wilk test. Additionally, model residuals will be distributed properly for normality. Statistical significance will be fixed at $P<0.05$ and the statistical software SPSS (IBM, v.28) will be utilized for all statistical calculations.

RESULTS

At the time of data extraction, 69 participants were enrolled in the study. However, not all 69 participants were included in all analyses, due to lack of data regarding food security status. Participant education ranged from less than 9th grade to doctorate level, with a bachelor's degree being the most common level of education (27.5% of participants). Income ranged from <$5000 through >$200,000 with $75-99,999 being the most common range of income (18.8% of participants). Lastly, close to one-third of the participants were of Hispanic or Latina origin. Participant characteristics are provided in Table 1.

Study Sample Demographics

Age in years, (mean ±SD)	31.39±5.39
Less than 9th grade education, n (%)	7 (10.1)
9th thru 12th grade; no high school diploma, n (%)	4 (5.8)
High school graduate or GED recipient, n (%)	4 (5.8)
Some college, no degree, n (%)	4 (5.8)
Associate's, vocational, or technology degree, n (%)	10 (14.5)
Bachelor's Degree, n (%)	19 (27.5)
Graduate Degree, n (%)	18 (26.1)
Less than $10,000 income, n (%)	3 (4.3)
$10-19.9 thousand, n (%)	4 (5.8)
$20-34.9 thousand, n (%)	6 (8.7)
$35-49.9 thousand, n (%)	6 (8.7)
$50-74.9 thousand, n (%)	7 (10.1)
$75-99.9 thousand, n (%)	13 (18.8)
$100-149.9 thousand, n (%)	9 (13)
$150-199.9 thousand, n (%)	4 (5.8)
$200+ thousand, n (%)	3 (4.3)
Unknown income	11 (15.9)
Of Hispanic or Latina origin, n (%)	29 (42)
Food Insecure, n (%)	12 (17.4)
Food Secure, n (%)	49 (71)
Unknown Food Security Status, n (%)	8 (11.6)
Enrolled in WIC, n (%)	20 (29)
Not Enrolled in WIC, n (%)	49 (71)

Table 1. Demographics of sample

To test whether food security status and food-to-soothe status had a relationship with one another, these dichotomous variables were analyzed via chi-square. There was not a statistically significant relationship between food security and food-to-soothe status (Pearson Chi-Square= .506, p=.477), and only six of the 61 included participants did not use food to soothe at the three-week visit.

Logistic regression models were run in an attempt to establish whether being enrolled in WIC or the passing of time affected the relationship between using food to soothe and food security status. The models were inadequately powered and balanced, therefore no data could be extracted from them. This was likely due to the imbalance in number of participants reporting the use of food to soothe or not.

Over time, the percentage of participants using food as part of their NIST varied little (See Figure 1). At the 3-week visit, 63 participants used food as part of their NIST. Data received from participants for the 8-week visit declined with 47 participants reportedly using food to soothe. Finally, 42 participants were observed to used food to soothe at the 3-month visit. Due to the drop in responses received from participants, the percentage of mothers using food-to-soothe over time remained fairly consistent.

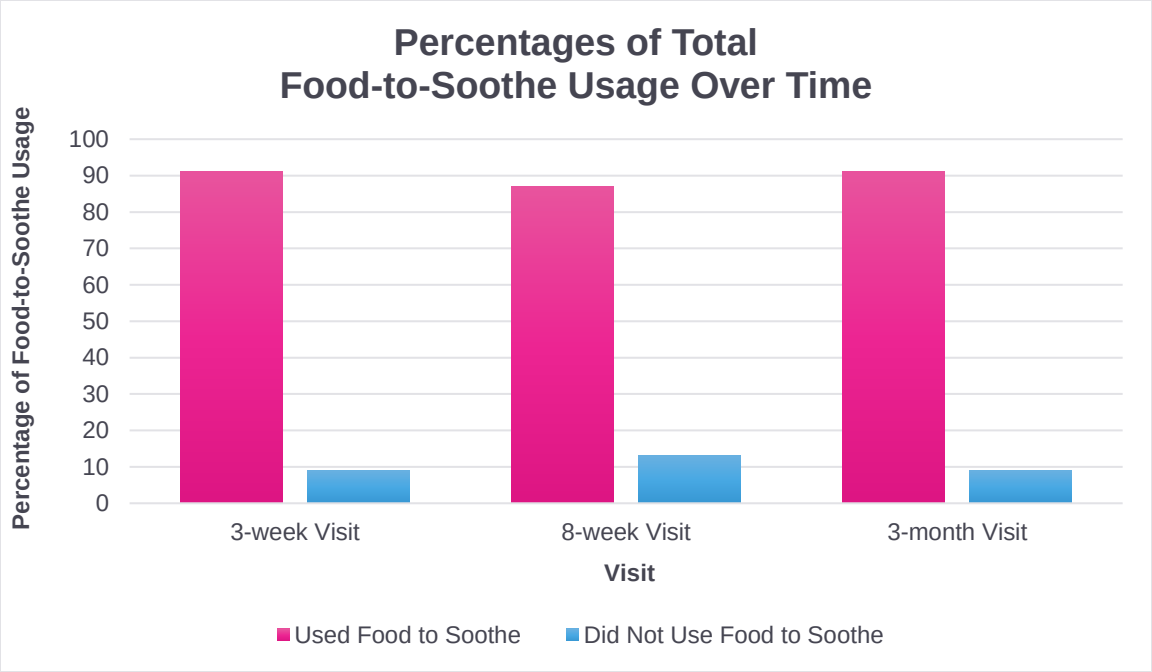

Figure 1. Percentage of participants reporting the use of food-to-soothe over the first three months of life.

Of the enrolled participants, twelve were found to be food insecure based on the results of the USDA's Food Security Survey. All twelve participants used food to soothe at the time their baby turned three-weeks-old. Additionally, twenty participants reported that they were enrolled in WIC services and again, all twenty of these participants used food to soothe at the 3-week visit.

Most participants used food to soothe as part of their NIST for all three visits. However, eight participants only used food to soothe for one or two of the visits. Of the eight participants, two experienced food insecurity and another one was enrolled in WIC. The participant enrolled in WIC only used food to soothe at the 3-week visit.

Of the food used to soothe, mothers were able to report bottle-feeding and/or breastfeeding. At each visit, at least one participant used both bottle-feeding and

breastfeeding as part of their NIST. Still, breastfeeding was used more than bottle-feeding at every visit by about two-fold. Additionally, total bottle-feeding-to-soothe and breastfeeding-to-soothe rates decreased with each visit. For those that were food-insecure, more participants reported using bottle-feeding to soothe at the 8-week visit, then less at the 3-month visit. On the other hand, breastfeeding-to-soothe rates decreased from the 3-week visit to the 8-week visit, then increased from the 8-week visit to the 3-month visit among participants known to be food insecure. And, for those that were enrolled in WIC, the percentage of using bottle-feeding and breastfeeding for soothing increased with each visit (Figures 2, 3, 4, and 5).

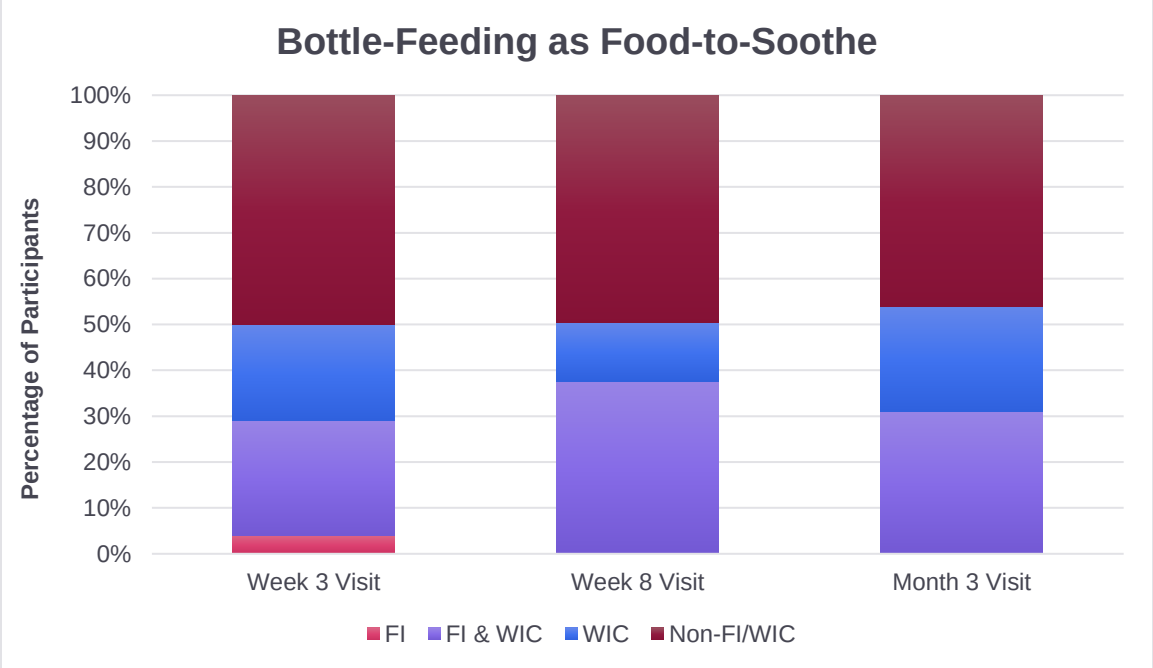

Figure 2. Use of bottle feeding as a soothing mechanism based on food insecurity status and WIC enrollment; Food-insecure (FI); Food-insecure and enrolled in WIC (FI &

WIC); Enrolled in WIC (WIC); Neither food-insecure nor enrolled in WIC (Non-FI/WIC)

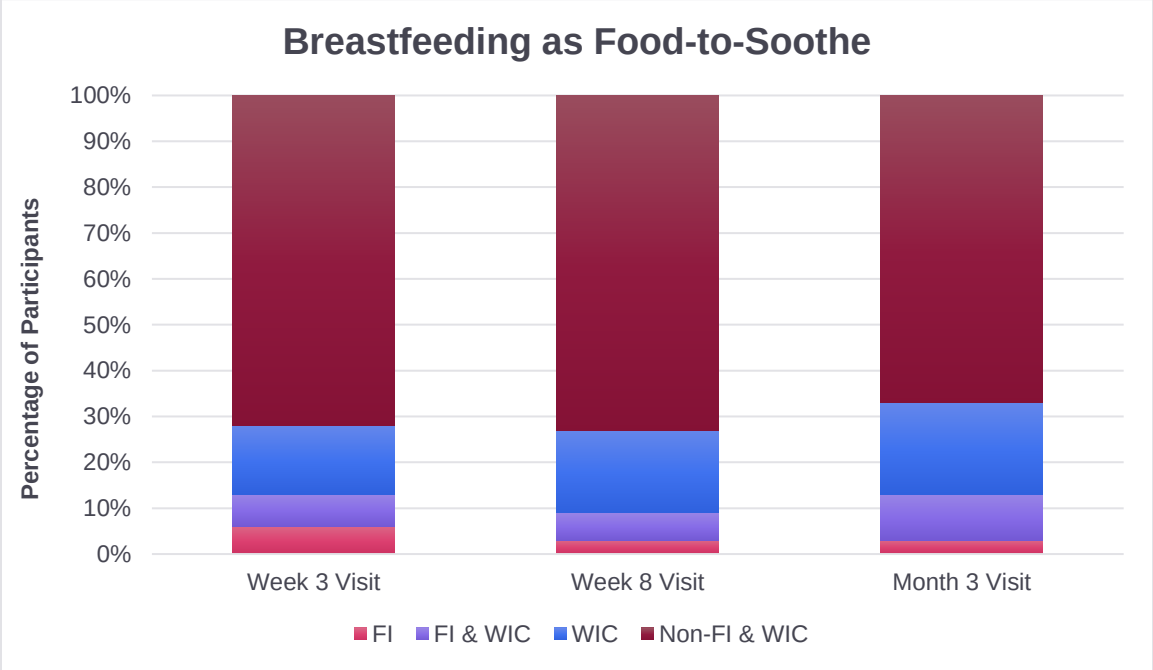

Figure 3. Use of breastfeeding as a soothing mechanism based on food insecurity status and WIC enrollment. Food-insecure (FI); Food-insecure and enrolled in WIC (FI & WIC); Enrolled in WIC (WIC); Neither food-insecure nor enrolled in WIC (Non-FI/WIC)

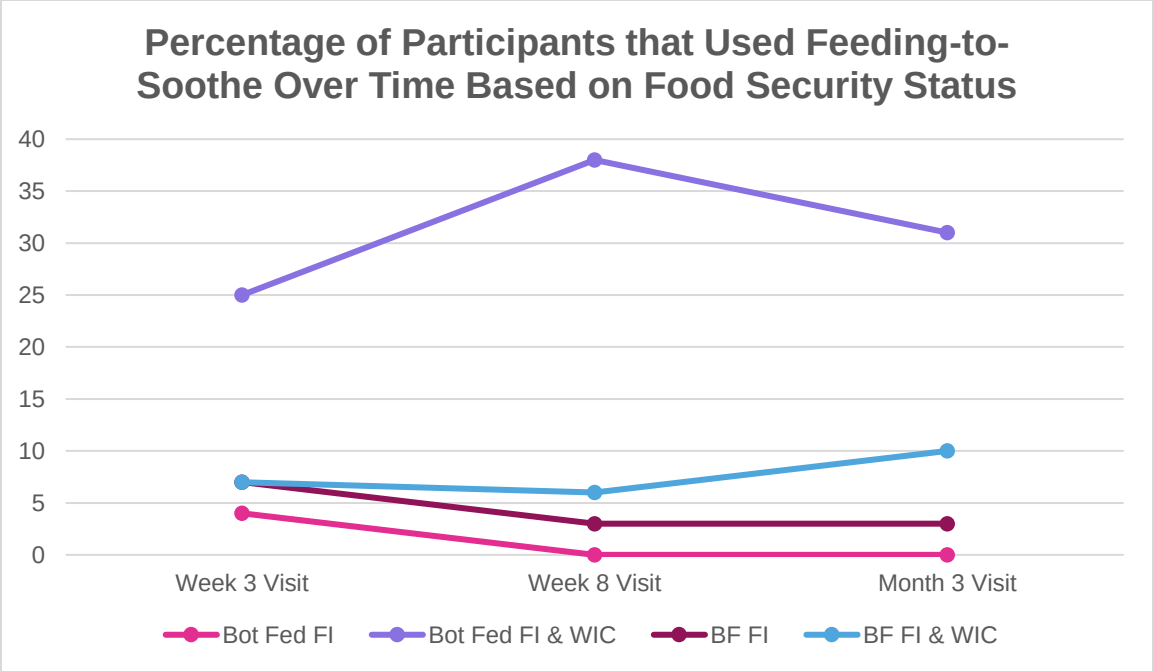

Figure 4. Percentages of the use of bottle-feeding and breastfeeding as a soothing mechanism based on food insecurity (FI) status. Food-insecure only (FI); Food-insecure and enrolled in WIC (FI & WIC)

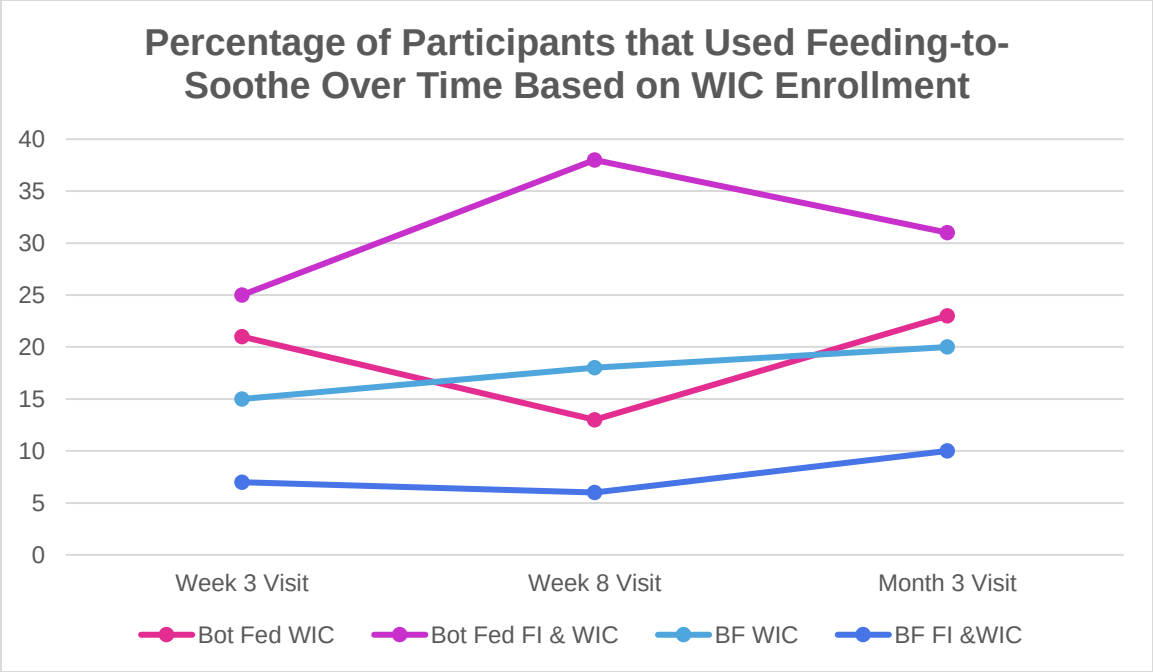

Figure 5. Percentages of the use of bottle-feeding and breastfeeding as a soothing mechanism based on WIC enrollment. WIC (Enrolled in WIC only); Food-insecure and enrolled in WIC (FI & WIC)

DISCUSSION

The goal of this study was to determine what, if any, relationship exists between food insecurity and how a mother soothes her baby back to sleep at night. Using data obtained from 69 mothers, no statistically significant relationship was found. In fact, less than 10% of participants in the study did not use food to soothe their babies back to sleep at the time their babies were three weeks old. And though it was hypothesized otherwise, only one participant that was enrolled in WIC did not use food to soothe her baby back to sleep at each time point. Additionally, both types of feeding-to-soothe (breastfeeding and bottle-feeding) increased over time among mothers enrolled in WIC. Finally, overall, breastfeeding was used more often than bottle-feeding as a means to soothe by all mothers.

A lack of variability in the data made it difficult to establish a statistically significant relationship between food security and using food to soothe. The lack of variability in the data may be explained in two ways. First, there was a smaller number of participants. Second, the data obtained was based on the mother's behaviors at 3-weeks postpartum. Though studies that explore the use of food to soothe are not common, Elizabeth Adams et. al., found that mothers were more likely to report using food as an initial soothing mechanism at night than during the day when their baby was three-weeks-old.[69] The data from this study may depict similar findings given the greatest percentage of food to soothe being at 3 weeks of age when compared to 8 weeks and 3 months. Moreover, during the early postpartum period, mothers may struggle with sleep, fatigue, physical recovery from childbirth, their emotional wellbeing and/or how to care

for and feed their infant.[75] As a result, how mothers are soothing their child during this period may be different from how they soothe their child six-months or later in postpartum. This is supported by research conducted by Jennifer Savage and Leann Birch who, in 2017, found that moms experiencing symptoms of depression used food to soothe more often than moms who weren't experiencing symptoms of depression.[76] To be in the study, the mothers needed to be caring for a child that was less than two years old, and how far into the postpartum period the participants were was not reported.[76] However, it seems possible that depression (which may affect up to 20% of women during their first year postpartum) may mediate decisions to use food to soothe.[77] Therefore, using data from 3-weeks postpartum was likely not ideal.

Across the first three months of infancy, a decrease was observed in the number of mothers reportedly using food to soothe their infants. Time is likely not the only factor that affects how a mother soothes her baby though. In a study performed by Chelsie Temmen et. al., food-to-soothe behaviors and personal eating behaviors among postpartum mothers were examined. The researchers observed that consistent feeding-to-soothe during the 4th trimester was associated with consistent feeding-to-soothe (related to high responsiveness to food) when the baby was around six-months-old.[78] In a different study, researchers examined a mother's tendency to feed her infant responsively at 3-months-postpartum.[79] The study conducted in Taiwan had a sample size of 438 mothers who ranged in age from 20-43 years. A total of three surveys were administered to the mothers in the study, with the final survey at 3-months-postpartum asking about the mother's feeding practices. The researchers found that moms who reported

breastfeeding exclusively when their baby was 1-month-old as well as mothers who were 28 years old or younger had higher scores on the responsive feeding survey. Therefore, these mothers displayed higher tendencies to feed responsively. In contrast, those who were giving birth to their first baby, had symptoms of postpartum depression, *or* had a baby whose weight-for-length z-score was declining displayed lower tendencies to feed responsively.[79] So, factors such as a baby's responsiveness to food, being a first-time mom, and having a baby after age 30 may be impactful in altering feeding-to-soothe behaviors. Unfortunately, these factors were not evaluated in this analysis.

Another possible factor to consider in the study of using food to soothe is an infant's temperament. The Infant Behavior Questionnaire-Revised is a validated tool for assessing an infant's demeanor as perceived by a parent.[80] This questionnaire was utilized in a study aiming to identify the relationship between a baby's temperament and when complementary feeding was introduced. Characteristics such as a baby's level of activity in response to outside stimuli as well as distress in response to inflicted barriers to movement were assessed with a Likert scale. The scale ranged from 1-7; 1 denoted that a baby never responded in a certain way and 7 denoted that the baby always responded in a certain way. A significant finding from this study was that babies who reportedly showed more distress to limitations and more activity in response to outside stimuli faced a near two-fold increase in likelihood of being fed solid foods prior to becoming 4-months-old.[80] Though early introduction to solids and using food to soothe are separate from one another, both are undesirable feeding practices. Additionally, it has been shown that parents who experience food insecurity are already more likely to have poor

responsiveness to a baby's cues.[5,15] Thus, whether a baby's fussiness is another mediator in the relationship between food insecurity and using food-to-soothe remains to be established.

Based on the data obtained in the current study, it also seems that WIC is not a protective factor against feeding to soothe as was originally hypothesized. Because WIC has been shown to decrease the experience of food insecurity among pregnant women and children and includes nutrition education, it was thought that enrolled mothers would not use food as a soothing mechanism as much as mothers that were not enrolled.[27,28,81] Unfortunately, no evidence for this idea was found in this study (possibly due to the lack of variability in the data), but mental health of postpartum mothers enrolled in WIC may also explain why. Among a sample of 60 mothers enrolled in WIC, 38% were found to have symptoms of depression that warranted further evaluation for clinical diagnosis of depression.[76] Although WIC has the potential to be beneficial for moms learning to feed their infants, the stress that women enrolled in WIC experience may be keeping them from truly benefitting.

However, it is also possible that new interventions addressing food-to-soothe behaviors may be incorporated into WIC procedures and provide needed aid regarding feeding practices for mothers. In a study of six WIC clinics in Los Angeles County, researchers examined the possible relationship between frequency in feeding to soothe and a policy, systems, and environmental (PSE) intervention.[82] This PSE intervention had two main components, 1) WIC staff was trained to more accurately assess maternal feeding practices for issues like inappropriately responding to a baby's cues or feeding

the baby too often; and 2) WIC staff were instructed to provide targeted messaging on responsive bottle-feeding during individual education sessions and with text messaging to the mother. Results from this study included that frequency of using food to soothe was significantly less when mothers received help from a WIC clinic using the PSE intervention than mothers receiving help from control WIC clinics. However, this result was observed only among mothers whose infants had a high negative affectivity or infants who most often reportedly experienced distress to limitations, fear, and sadness.[82] These findings not only support the use of PSE interventions to reduce the use of food-to-soothe techniques, but they also further signify the need to study infant temperament as a factor in predicting the use of food-to-soothe techniques.

Nearly double the number of participants reported breastfeeding as their food to soothe mechanism as those that reported bottle-feeding at every time point. Breastfeeding is recommended by the AAP and the World Health Organization (WHO).[39,83] In Arizona, it's estimated that 48.8% of infants born are fed exclusively with breastmilk up to 3 months of age.[32] Breastfeeding has been shown to provide many benefits for both the mother and infant.[11] For the mom, breastfeeding may contribute to lowered risk of ovarian cancer and diabetes. For the infant, receiving breastmilk can help lower the risk of dental caries, mortality caused by infections, and diabetes.[11] For these reasons it is encouraging that so many were breastfeeding their children, even though using food to soothe their infants may not have been the ideal soothing mechanism.

STRENGTHS, DELIMITATIONS, AND LIMITATIONS

To our knowledge, no other study has collected and compared data on food security status and nighttime soothing techniques. Additionally, Hispanic and/or English-speaking mothers from a variety of socioeconomic backgrounds were recruited as participants. This diversity is not always obtained or sought after in research. Lastly, the surveys used in this study were validated and take little time to fill out, making data reliable and easily attainable.

Participants in this study had to meet basic inclusion criteria. First, each had to be a mother of an infant less than 3 weeks old at the beginning of the study. Second, each had to live within a 35-mile radius of the Downtown Phoenix campus of Arizona State University. No exclusion criteria existed based on race or ethnicity.

Some limitations of this study include that the survey utilized to assess food security status, while validated, was not as comprehensive as others. Another limitation worthy of note is that the survey utilized to assess nighttime soothing techniques identifies food as breastmilk or non-breastmilk. This made it difficult to make any secondary analyses of food soothing techniques and their effectiveness. Finally, all data were self-reported and therefore may be prone to reporting bias.

FUTURE DIRECTIONS

Because of the variety of factors that may affect whether a parent uses food-to-soothe techniques with their infant, comprehensive research is needed before concrete public health interventions can be implemented. It has been established that factors such as infant temperament and weight, maternal emotional health and age, primiparity, and

breastfeeding exclusivity are associated with tendencies to use or not use food to soothe.[76,78–80] However, there remains opportunity to study these factors altogether and at several time points (many of the studies examined in this work were cross-sectional). Without more comprehensive research, attempts to address the use of food-to-soothe among parents of infants are unlikely to result in widespread change.

CONCLUSION

This study of both cross-sectional and longitudinal data did not establish a link between the experience of food insecurity and the use of food to soothe infants to sleep amongst a financially and racially diverse participant sample. It was observed that the use of food to soothe at 3 weeks postpartum was widespread with no significant differences between participants based on enrollment in WIC or food security status. Breastfeeding was also reportedly used more than bottle-feeding as a means to soothe. The sample size of the study was small, with only 61 participants included in the evaluation of food insecurity and use of food to soothe. Additionally, measures beyond the experience of food insecurity and whether food was used to soothe an infant to sleep at night were not included in this study. Future research should seek to analyze these variables with a much larger sample and alongside possible mediating factors such as infant temperament, maternal emotional health, and primiparity. Doing so may inform future development of interventions aimed at addressing the use of food to soothe amongst parents.

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